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FYODOR ZUBOV – REPRESENTATIVE OF THE USTYUG SCHOOL OF PAINTING

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Abstract. This paper discusses the most significant works of the icon painter in different periods of creativity. As a result of the analysis, the main features of the Ustyug school of painting in the icons of Fyodor Zubov are formulated, as well as the individual features of the painting. The article will be useful to students of art universities, historians and icon restorers.

Keywords: icon painter, iconography, archaization, Ustyug-Stroganov technique, ornament, ornamentation, niello ornament.

ФЕДОР ЗУБОВ – ПРЕДСТАВИТЕЛЬ УСТЮЖСКОЙ ШКОЛЫ ЖИВОПИСИ

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Аннотация. В работе рассматриваются наиболее значимые произведения иконописца в разные периоды творчества. В результате анализа сформулированы основные черты устюжской школы живописи в иконах Федора Зубова, а также индивидуальные особенности письма. Статья будет полезна студентам художественных вузов, историкам и реставраторам икон.

Ключевые слова: изограф, иконопись, архаизация, устюжско-строгановское письмо, узорочье, орнаментика, черневой узор.

Zubov Fyodor Evtikhiev, the royal iconographer of the 17th century, was recognized as one of the best icon painters of his time during his lifetime. The main information about his biography was collected in research works of scientists of the 19th – early 20th centuries. Among them, I. E. Zabelin, A. E. Viktorov and A. I. Uspensky should be noted. Their research is based on the analysis of archival materials of the palace offices of the 17th century: the Armory, Gold, Silver Chambers and the Ambassadorial Office, which contain information about the work of icon painters of that time. The birth date of Fyodor Evtikhiev is unknown, the period of 1610-1615 is conventionally accepted, since by the forties Zubov was an experienced artist with a well-formed painting technique. Also, brief biography information is indicated in the petition of 1689, filed on behalf of the children Alexei and Ivan

Zubov to the Tsars Ioan Alekseevich and Peter Alekseevich after the death of the icon painter. From this petition it becomes clear that artist served the grandfather of the tsars, Mikhail Fedorovich and his father, Alexei Mikhailovich, for more than forty years [1].

The first documents mentioning the works of Fyodor Evtikhiev date back to the 1650s. The icon painter has been actively working on invitations for "sovereign's works" since that time. Analyzing the researches, scientists note a delicate elegant taste, the art of soft modeling of forms, exquisite ornamentation and freedom of improvisation. Despite the large list of works and surviving signature documents, it is still difficult to set up specific features of Zubov's artistic style. His individual style of writing seems to dissolve in the style characteristics of the school of royal iconographers. The early period of Fyodor Evtikhiev's work is associated with the Ustyug school of painting, known for its delicacy of painting. This city became a kind of academy for Zubov, which promoted him to the ranks of the best icon painters in Russia [2, p. 9]. And yet, in the future, Fyodor kept devotion to his home town, Solikamsk. Even as a royal icon painter, he signed his works as "usolets" or "icon painter of Usolye Kamskoe".

The main feature of the Ustyug school was the depiction of figures with strongly elongated proportions. They are also depicted in an unstable setting, they are characterized by a pretty type of head and a manner of painting faces with an overlay of reddish-whitish hues on a pink-red and reddish-brown substrate. Because of this technique, it seems that the faces are slightly touched by a tan. Some archaization of painting techniques also stands out clearly, which is expressed, in particular, in emphasizing the plane of the icon by depicting the architectural background, as it were, in the form of a screen of bizarre chambers, the forms of which gravitate toward the miniature of Godunov's time with its Western and Eastern reminiscences, but are reworked in the spirit of Russian folk traditions [2, p. 13]. In general, the Ustyug style preserves its originality. The most important feature is the cultivation of refined, sophisticated painting. Unfortunately, almost no works of the Ustyug period of the icon painter's works have survived until our time, so the analysis seems to be possible only on the basis of a few written documents. The icon for the Vsegradskaya Church "The Savior Not Made by Hands" is one of such paintings. The caption reads: "This Savior Not Made by Hands image of the Lord God and our Savior Jesus Christ was written according to the faith of all Orthodox Christians for prayer and for salvation and for approval of this summer of 1651, the month of September on the 16th day, and wrote by a sinful and unworthy man O Usolye Kamskoe Fedor Evtikhiev son of Zubov" [2, p. 24].

One more example of painting an icon using the rules of the Ustyug school of painting is the work for the Cathedral Church of the Antoniev-Siya Monastery (Arkhangelsk Region, Kholmogory Municipal District), painted in 1658 with Vasily Osipov Kondakov and Bogdan Zotikov. At that time, Fyodor Romanov was in exile under the Godunovs here, so the Siysky Monastery enjoyed the patronage of the royal family. In this monastery, Fyodor Evtikhiev painted an inlaid icon "John the Forerunner at the waist" (Figure 1).



Figure 1. Icon “John the Forerunner”, 1658

This icon is painted in the style characteristic of the Ustyug-Stroganov paintings. The Forerunner is depicted in the canonical type of a hermit, a winged angel of the desert. In his left hand he holds a bowl of addiction with a figurine of a naked baby – a sacrificial angel, and with his right hand he points to him. The image of John is associated with the legend of the descent into Hell. The Eucharistic chalice with Christ is a symbol of the prophetic mission. John’s face is emaciated, his cheeks are hollow, his eyes are close to each other. The application of ocher over the sankir (the main tone of the personal letter on top of which the inscriptions are applied) of reddish color gives a detailed three-dimensional study, distinguished by a chased clarity of form. The hair is painted softly, it gives the impression of the formation of an ornament from strands. The folds of the clothes are made using gold. There is an elegant niello ornament, which is typical for the Ustyug school of painting. The wings are painted using stylized silver rhombuses on a pinkish background, creating a shimmering effect. The sackcloth made of camel hair indicates the ascetic life in the desert, where the Forerunner was taken by an angel in his childhood. This icon clearly shows Fyodor Zubov’s belonging to the Ustyug school of painting. However, this painting does not fully reveal all the virtuosity and talent of the icon painter [3].

In the works of the Ustyug period, Fyodor Zubov appears as a typical representative of the art of the Dvina cities. His works are full of striving for perfection in every detail, they clearly show the icon painter's love for complex color combinations. Thanks to Zubov's art, Ustyug rises to a higher level of art. Such works include icons of the Ilyinsky-Intercession Church. The ensemble has survived to our time. It includes the following icons – “Elijah the Prophet in the Desert”, “Protection

of the Mother of God", "John the Baptist – Angel of the Desert", "Ascension of the Lord", "Annunciation to the Most Holy Theotokos", "Apostolic Sermon", "Our Lady of Vladimir", "St. the presence of the Mother of God of the Sign" and the stigma of the frame with the "Akathist to the Mother of God" of the icon "Our Lady of Tikhvin" [4, p. 183].

By the beginning of the 60s. XVII century Fyodor Zubov has already earned recognition in his home northern lands. This time is a kind of frontier, which ends the early period of creativity. In 1660-1662 in Yaroslavl, Zubov created works that allow us to fully understand all the characteristic features of his painting. The icon "Ilya the Prophet in deeds" belongs to the Yaroslavl period of creativity. The motif of the book frontispiece is used as a frame for the central figure. Neatly executed columns of inscriptions in each scene are likened to a small pattern. In most works of this period, spatial searches recede into the background before the symbolic meaning of the depicted scenes on the icons. For example, in the scene "The Nativity of Elijah the Prophet", the flapping of symmetrically arranged wings of angels reveals the unusual nature of the event. The artist builds a clear composition, emphasizing the harmony of vertical rhythms with an elongated hipped tower and narrow window openings.

After completing work in Yaroslavl, he left for Moscow, and in 1662 he was enrolled in the staff of the Armory. Important documents can be found in the archives: a royal charter to the Yaroslavl governor V. Ya. Unkovsky and the petitions of the builders of the church of Elijah the Prophet Ioannikius and Vonifaty Skripin to the Tsar Alexei Mikhailovich. By royal charter of February 10, 1660, Fyodor Zubov was immediately called to Moscow as an icon painter from Ustyug. The method of ancient Russian icon painting in his painting remains unchanged, but now it is complemented by new features of the icon painter with the complication of the color palette used, the elaboration of all layers. Despite the fact that further works are associated with the royal school of icon painters, the features of the Ustyug school remain characteristic for all Zubov's work. In Moscow, he was instructed to paint a local icon of saints – royal angels: Alexei the Metropolitan, Alexei the Man of God, Theodore Stratilat, Mary of Egypt and all the eminent saints of the royal figures. Such an order could only be entrusted to a prominent icon painter. In the Armory at that time, besides him, there were only three paid icon painters: Simon Ushakov, Stepan Rezanets and Fyodor Kozlov. During this period, Zubov does a large amount of work. It is necessary to understand that in addition to monumental decorative paintings, icon painters made letters of military banners, plans of cities, fortresses and monasteries during the military campaigns of the king, illustrated manuscripts – from the Gospels, Amusing books for princes and the like. They also painted household items, such as window frames, chess and Easter eggs. The name of Fyodor Zubov is often found in office papers. Due to his penchant for meticulous icon painting, Fyodor Evtikhiev was often commissioned to paint images of saints and members of the royal family.

The works of the early 60s are characterized by the stamp of the author's vision. In the icons, the redundancy of forms in relation to the surrounding space is clearly visible. In these works, the icon painter uses a light color palette. The icons are also characterized by a high degree of filling of the pictorial field with patterns

(an architectural style that was formed in the 17th century on the territory of the Russian state, which is characterized by intricate forms and an abundance of decor). Accents are made on thin graceful contours, brittle outlines of figures and objects. The folds of the clothes that dress the figures of the saints are very plastic. The example that reflects these features is an icon from the church of Elijah the Prophet dating back to the early 1660s “Prelates in the presence of Our Lady of the Sign” (Figure 2) [4, p. 192].



Figure 2. Saint Leonty of Rostov. Fragment of the painting of the icon “Prelates in anticipation of the “Our Lady of the Sign” 1660-1662. Fedor Zubov and workshop

As mentioned earlier, Zubov does not show the folds on the saint's clothes. The white fabric is shown using a single white tone, embellished with a silver flower ornament. We can see the technique of using ocher shades to create volume on the face, which gives the impression of dark skin. Curls of hair and beard also form a separate ornament due to the softness of the painting technique. We should pay attention to the detailed elaboration of the decorations on the neck of the saint, which is characterized by the lightness and elegance of the lines used. All these features once again indicate that the icon painter belongs to the Ustyug school of painting. One more feature of Zubov's painting should be noted. In commissioned works, he often used ornamental stripes of O- and X-shaped elements, which were popular in the 17th century, for decoration of clothes. In 1663, Zubov painted an icon of the Mother of God to be sent to the Don. In the same year, he participated in the repair of the Great Deesis of Theophan the Greek and Andrei Rublev in the Cathedral of the Annunciation. The icons have survived to our time, which indicates high-quality and conscientious work. In 1655 the icon “Simeon, like in Persis” was awarded with a special award - a piece of crimson cloth and taffeta.

The icon “Nicholas the Wonderworker” deserves a more detailed analysis. It belongs to the late period of creativity of the 70s. It clearly shows the features of Zubov's painting (Figure 3).



Figure 3. Icon “Nicholas the Wonderworker”, 1677

The ornament described above adorns the saint's omophorion on the icon. Detailed elaboration of patterns, elegance of lines and shapes indicate a high level of skill of the icon painter. It is worth to note the special veneration of St. Nicholas as a kind and omnipotent "Russian God" in the religious and Christian beliefs of the baptized Volga peoples. He is the most revered saint, his veneration is comparable to the veneration of the Virgin and even Christ. The order to paint such a significant saint of the Russian Orthodox Church once again indicates the high level of the icon painter. The icon also shows Zubov's belonging to the Ustyug school of painting. The face of the saint is elongated, has a reddish-whitish hue. Still, the icon painter uses a pinkish-reddish substrate, characteristic of this school of painting. This includes a high degree of elaboration of patterns resembling jewelry niello.

Refined painting fully reveals the talent of the icon painter in the later periods of his work. Considering later works, we should pay attention to the “Longinus Centurion” icon, painted in 1680 (Figure 4).

The icon has a patronal meaning: Longin Sotnik was revered as “an assistant to Russian sovereigns”. His image was on the banner of Tsar Alexei Mikhailovich. The face of the saint has a tanned hue, light curly curls reflect the artistic manner of painting by Fyodor Zubov. The finely crafted patterns on the saint's clothes also

resemble jewelry niello. The ease of writing attracts the viewer's attention, it is interesting to look at it up close, but it does not lose its expressiveness even at a distance.



Figure 4. Icon “Longinus Centurion”, 1680

Throughout all periods of creativity, Fedor Zubov remains true to the foundations of the Ustyug school of painting. The early period is characterized by complete adherence to the canons of the school. An example of such works is the above-described icon “John the Forerunner” and other works, for example, “The half-length figure of Nikola” or “Our Lady of Tikhvin”. The surviving sample drawings in the Siysk icon-painting original, “The half-length figure of Nicholas” and other works of the 60s were also painted according to all the rules of the Ustyug school. The faces of the saints are elongated, the full-length figures assume unstable poses. In some works, attention is drawn to detailed ornaments, architectural backgrounds, patterns on clothes often resemble jewelry niello. In later works, individual features of writing appear [5, 6, 7, 8]. The faces of the saints are not so elongated, the figures are more stable, the icon painter uses a more complex color palette. However, the Ustyug school can also be clearly seen here. For example, on the icon “Victory over the Agarians” we see an architectural background resembling a screen. Only in some works a landscape made in a realistic manner appear. In most of his works, Zubov does not pay much attention to the background, focusing on the symbols of the plots depicted. All his works are characterized by a warm color, pretty faces with an orange tint, reminiscent of a tan. An interesting feature is the detailed curls of hair

and beard, which form another subtle pattern on the icon. Soft modeling of forms, emphasis on fine, detailed ornaments - all of these features are elements of the Ustyug school of painting, which we can find in all the works of the icon painter.

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ADAPTIVE MANAGEMENT WITH PREDICTIVE MODEL AS A TOOL FOR OPTIMIZATION OF MODERN PRODUCTION

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Abstract. This article presents positive aspects of the application of adaptive control with predictive model in modern production. A generalized scheme of this control is presented, and the structure and operating principle are described.

Keywords: adaptive control, predictive model, virtual sensor, virtual analyzer, optimization, technological process.

АДАПТИВНОЕ УПРАВЛЕНИЕ С ПРЕДИКТИВНОЙ МОДЕЛЬЮ КАК ИНСТРУМЕНТ ОПТИМИЗАЦИИ СОВРЕМЕННОГО ПРОИЗВОДСТВА

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Аннотация. В данной статье представлены положительные аспекты применения адаптивного управления с предиктивной моделью на современном производстве. Представлена обобщенная схема данного управления, а также описаны структура и принцип работы.

Ключевые слова: адаптивное управление, предиктивная модель, виртуальный датчик, виртуальный анализатор, оптимизация, технологический процесс.

The increase in the population, the increase in the level and quality of life, the professional synthesis and the implementation of marketing systems forces production to adjust to the modern, rapidly developing pace of life. If an enterprise wants to remain competitive on the market of goods and services, it is necessary not only to increase the rate of production, adjust logistics, but also to increase the quality of the final product and reduce the costs of the enterprise.

It's no secret that modern technological production is characterized by the use of the latest technology, automation and computerization of all processes, maximum efficiency and economy of production. Such production provides high quality of the

product in minimum time with minimum consumption of resources, and also promotes increase of productivity and competitiveness of the enterprise. In addition, modern technological production includes the use of unique materials and innovative solutions to create products that meet even the highest requirements of consumers.

In order to realize such a complex and sophisticated task, it is necessary to provide accurate and reliable measurement of various process parameters and product characteristics, but in some enterprises, such as the pulp and paper industry, it is common that some critical parameters and product characteristics cannot be measured in real time or on a regular basis [1].

In recent years, there has been a growing trend towards the use of adaptive control using predictive models as a tool to optimize modern production and this is due to the fact that modern production has become highly automated and uses a large number of technologies and equipment. Therefore, effective management of the production process requires a modern approach that takes into account changes in the production process and adapts to them [1].

Adaptive management is based on the idea that production systems are complex and unpredictable, and therefore require a more flexible and dynamic approach to management. Adaptive management involves continuous monitoring of production systems, data collection and real-time analysis to identify patterns and trends. This allows management personnel to make informed decisions and adjust production processes to optimize performance [2].

The main features of adaptive process control are:

1. Active use of data. It is understood that this type of control works constantly and in real time, so throughout the control process, data on the current state of the technological process are used.

2. Fast adjustment of control parameters. The most important feature of adaptive control is quick correction of control parameters to achieve the set goal and maintain the technological process within acceptable limits.

3. Result orientation. Adaptive management is designed to achieve goals, which are formulated according to the current desires of the director of the enterprise.

4. Possibility of interaction with artificial intelligence. Recently adaptive management more and more often uses technologies of artificial intelligence for prediction of possible problems and optimization of processes.

Adaptive management with a predictive model is a management approach based on the use of mathematical models that allow predicting the system's behavior in the future and responding to changes in real time.

The application of adaptive control with a predictive model achieves:

1. Improved control accuracy by accounting for nonlinear dependencies between process parameters.

2. Improved performance and system efficiency through real-time optimization of operating modes.

3. Higher reliability and lower risk of emergency situations due to prompt detection of deviations in system operation.

4. Optimization of system's operation and maintenance costs.

The possibility of emergence of adaptive control with predictive model is due to several factors [2].

One of these factors is the development and improvement of mathematical models that are used to predict future system behavior. This has improved control accuracy and optimized production processes.

Another factor is the development of technologies related to data collection and analysis. With the help of modern technologies, it is possible to collect large amounts of data about production processes and use them to create more accurate mathematical models.

The third factor is the ability to integrate adaptive control with other technologies such as artificial intelligence, machine learning, etc. This factor has made it possible to create more flexible control systems and improve production efficiency.

In modern production, a tool for collecting data on the state of the technological process and their analysis is a virtual analyzer [3].

Virtual analyzer (VA) is a software, which, based on real or virtual sensors, simulates the work of analyzer and allows you to analyze data in real time.

VA usually consists of two main components: a predictive model and virtual or real sensors [4]. The predictive model is used to analyze data and predict future events based on past results. Virtual or real sensors are used to obtain data about the current state of the system. Both of these components interact to form a virtual analyzer to provide adaptive process control [5].

An adaptive control system with a predictive model and virtual sensors consists of several major components:

1. Data accumulation system. This system receives information about the state of the control object from real and/or virtual sensors.

2. Predictive model. The model is used to calculate the future behavior of the system based on the received information about the state of the control object.

3. An adaptation algorithm. This algorithm is designed to analyze the information received and to adapt the system to the changing conditions of the technological process.

4. The regulator, which receives data from the predictive model and the adaptation algorithm, calculates and controls the control signals sent through actuators to the control object.

5. Virtual sensors. They are created on the basis of information about technological processes about which there is no direct information and are used to expand the possibilities of control.

It should be clarified that the predictive model and the adaptation algorithm are interrelated and influence each other. The predictive model is used to predict future outcomes and helps the adaptive algorithm make better decisions, and the adaptive algorithm is used to adjust the predictive model to changing process conditions.

The sequence of actions in an adaptive control system with a predictive model and virtual sensors is as follows:

1. Measurement of the actual characteristics of the control object using real sensors.

2. Transferring data from real sensors to the data acquisition system and virtual sensors.

3. Data accumulation system and virtual sensors transfer information about the state of the control object to the predictive model and the adaptation algorithm.

4. Based on the received data, the predictive model calculates the future behavior of the system.

5. The adaptation algorithm analyzes the data obtained from the data accumulation system and the predictive model and adjusts the parameters of the predictive model.

6. The controller receives data from the predictive model and the adaptation algorithm, calculates and controls the control signals routed through the actuator to the control object.

The tracking and control process continues throughout the control time, with real and virtual sensors providing feedback that is used to correct the predictive model and the adaptation algorithm.

Figure shows a generalized scheme of adaptive control with a predictive model and application of virtual sensors.

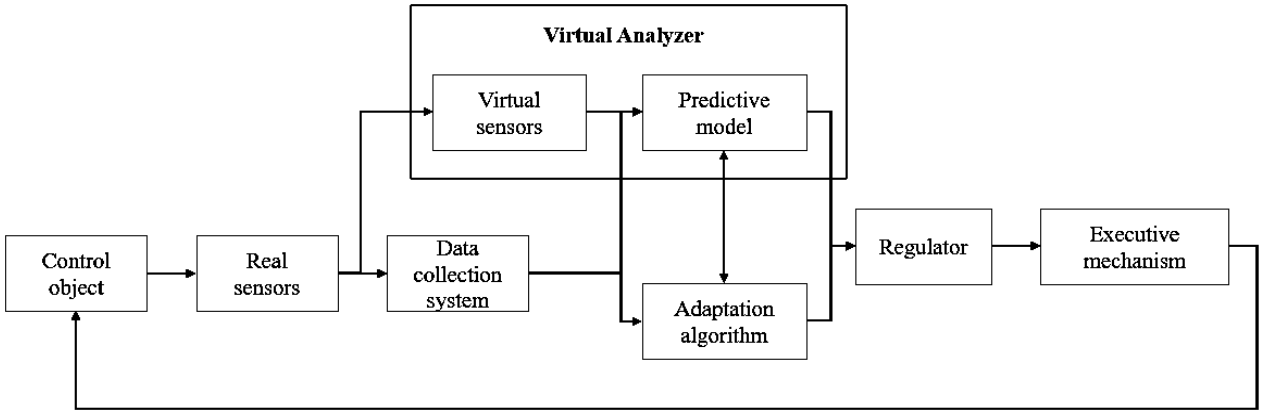


Figure. Generalized scheme of adaptive control with predictive model and application of virtual sensors

Adaptive management with prediction is used in various fields and industries.

In industry, this could be the implementation of an Enterprise Resource Planning (ERP) system, which includes analytical tools and predictive algorithms. In the automotive industry, this approach can be implemented in ADAS (Advanced Driver-Assistance Systems), which offers adaptive driver control based on data from various sensors [4, 5].

Here is a specific example of adaptive control with a predictive model.

Suppose there is a project to develop a program to control the production process at a car manufacturing plant. The following approach can be proposed as an adaptive control with a predictive model:

1. Collect data about the current state of the production process, including temperature, humidity, pressure, speed, machine load, number of workers, and other parameters.

2. Use this data to train a predictive model using machine learning techniques such as regression, random forest (sets of decision trees), or neural networks. The model should predict properties of the production process based on current parameters.

3. Compare the predicted values with the actual values to determine the deviations from what is expected, using quality metrics.

4. Use the results to adaptively control the production process. If the actual values differ from the predicted values by more than a certain acceptable number, the production process can be adjusted, e. g. by changing temperature, increasing or decreasing machine capacity, reallocating workers, etc.

Optimization of modern production includes the use of modern technologies and methods to improve the productivity and efficiency of the production process. In this case, optimization with the help of adaptive control with predictive model implies the use of structured data for forecasting of production processes, which allows making informed decisions and applying effective methods of production management.

Adaptive Predictive Control can be used to improve the performance of automated systems. It allows you to predict future events and use those predictions to adapt the system to changing conditions. Adaptive predictive control can be used to automate processes such as production planning, production management, inventory management, etc. It can also be used to optimize resources such as energy, time, and raw materials.

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APPLICATION OF NEW TYPES OF THERMAL INSULATION OF EXTERNAL PIPELINES

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Abstract. The correct selection of thermal insulation for pipelines is one of the most significant factors of its effective and long-term operation. To date, new types of thermal insulation are being put into operation, which have great advantages over old materials. This article discusses the most proven types of thermal insulation for pipelines.

Keywords: thermal insulation, polyurethane foam, foam glass, fiberglass, pipeline.

ПРИМЕНЕНИЕ НОВЫХ ВИДОВ ТЕПЛОИЗОЛЯЦИИ НАРУЖНЫХ ТРУБОПРОВОДОВ

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Аннотация. Правильный подбор тепловой изоляции для трубопроводов является одним из самых значимых факторов его эффективной и долгой работы. На сегодняшний день вводятся в эксплуатацию новые виды теплоизоляции, обладающие большими преимуществами относительно старых материалов. В данной статье рассмотрены наиболее проявившие себя виды тепловой изоляции для трубопроводов.

Ключевые слова: теплоизоляция, пенополиуретан, пеностекло, стекловолокно, трубопровод.

The pipeline is a special device consisting of pipes and intended for the transportation of various substances [1]. In order to increase the efficiency of pipelines, they need to be insulated in the cold season. High-quality installation of thermal insulation reduces the wear of communications, and also minimizes the risk of freezing of liquid in the pipe, even in the most severe frosts. Good thermal

insulation of pipes helps to reduce the frequency of replacement of failed sections of pipelines and connections, which significantly reduces the cost of their replacement.

The right choice of thermal insulation for pipelines is of great importance, because it reduces energy losses and increases the efficiency of the system. Thermal insulation prevents heat leakage from the heating or air conditioning system. In addition, properly selected thermal insulation helps protect the equipment from overheating and corrosion. It also helps to reduce noise when transferring liquids or gases through pipelines.

It is important to consider various factors when choosing a material for insulation: the type of liquid or gas inside the system, the pressure and velocity of the substance through the pipes, as well as environmental conditions (ambient temperature).

For example, if we are talking about high-temperature processes (in steam generator sets), then it is necessary to use a material with the ability to withstand very high values of operating parameters without changing its chemical and physical properties.

The correct choice of thermal insulation depends on the implementation of one of the most important principles – the requirement of energy efficiency, and, accordingly, safety for working personnel. Today, in addition to mineral wool, polyethylene foam and synthetic rubber, polyurethane foam, foam glass and fiberglass have begun to be used.

The coating of polyurethane foam products can be made of roofing material or folgoizol (Figure 1). Polyurethane foam itself has such characteristics as high strength, wear resistance, resistance to swelling in various solvents and oils, and also provides high heat preservation, relative to the insulation of mineral wool. The use of pipes in polyurethane foam insulation allows to increase the service life of pipelines up to 25 years [2]. On the economic side, the operation of this type of insulation reduces the installation time of heating networks by about 3 times, reducing maintenance costs by 9 times, and, accordingly, repair work – by 3 times.

Pipes in polyurethane foam insulation are resistant to corrosion and provide low heat losses during the operation of pipeline transport. The operating temperature of pipes in insulation is from -80℃ to +130℃.

The disadvantages include the high cost of this material, poor resistance to direct sunlight, and, accordingly, the inability to insulate pipes with a surface temperature above +130 ℃. When the polyurethane foam insulation is moistened, it is subject to destruction and can have an aggressive effect on pipelines. This factor determines the mandatory use of a hydro-protective shell and an operational remote control system for the humidification of insulation of this type. It can also be noted that if the insulation is damaged, the entire section of the heating network is completely replaced, based on this, it can be concluded that it is not repair-suitable.

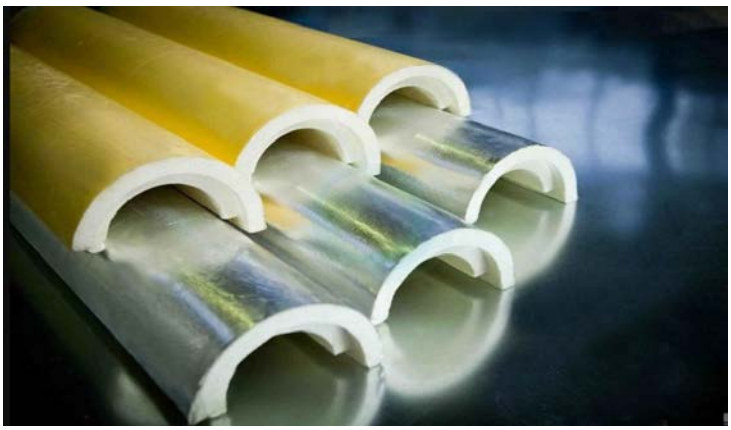


Figure 1. Polyurethane foam insulation

Foam glass is a modern thermal insulation material obtained during the processing of silicate glass and the introduction of a gas-forming agent (Figure 2). In the process, the material increases in volume by about 15 times and takes the form of a porous raw material containing a large number of bubbles filled with gas [3]. The chemical composition of foam glass coincides with ordinary glass – it may contain oxides of magnesium, silicon, aluminum, potassium, sodium, etc. The main characteristic of foam glass is resistance to the influence of temperatures. This material can withstand high temperatures up to +400℃. It is also worth noting the water resistance, it practically does not absorb liquids, does not increase in size and has the ability to protect the rest of the structure from leakage. Foam glass has chemical resistance and is not affected by chemicals, with the exception of hydrofluoric acid. It serves for at least 100 years, while not losing technical characteristics, does not deform and does not shrink. It is worth noting that, if necessary, foam glass insulation can be crushed, crushed and re-sent to production, respectively, we conclude that it is possible to reuse it.

With all the advantages of this type of insulation, there are disadvantages, such as high cost, low impact strength, lack of steam conductivity. The high cost, in turn, is due to the fact that the manufacturing technology of this material is associated with high energy costs. Its annealing is a very complex and time-consuming process.

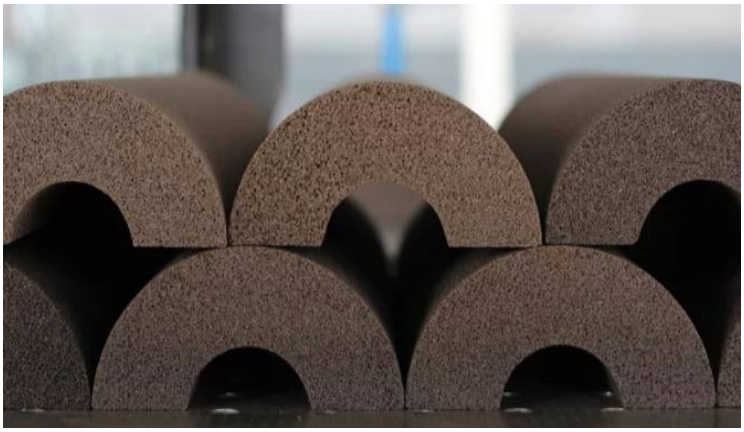


Figure 2. Foam glass

Fiberglass is a complex thread that is formed from glass (Figure 3). Glass is subjected to melting, pressing through special spinning molds [4]. The resulting threads have high strength. The technology of glass fiber manufacturing itself does not imply the use of complex equipment, it is quite simple. The manufacturing process of this material consists in blowing thin threads out of it. To do this, the broken glass or quartz sand is heated to a temperature of 1400 ℃. The molten viscous mass is fed to the forming equipment. If it is passed through a centrifuge, you will get glass wool with intertwined fibers. If you use a special sieve with micro-holes through which the mass is blown out under steam pressure, then long fibers are obtained. Fiberglass is divided into woven and non-woven. For the woven one, a certain orientation of the threads is maintained, while the non-woven one fits chaotically in the material, not gathering into bundles. Depending on the area of use, it is impregnated with various binders- latex, resins, etc., which gives the material additional properties.

Fiberglass demonstrates such characteristics as high mechanical strength, heat resistance, resistance to moisture and rot, stability of initial parameters, chemical resistance [5]. Since fiberglass consists almost entirely of quartz sand, when exposed to alkalis, there is no chemical reaction, which makes the fiber almost universal for combination with absolutely any building materials.

The disadvantages include the need to comply with strict safety rules during disposal.



Figure 3. Fiberglass

Thermal insulation of pipes is the basis for rational transfer and redistribution of heat carriers through an extensive system and main pipeline without loss of temperature. A deliberate choice of materials for different sections of communications is a guarantee of maximum protection of the system from temperature changes in the carrier.

Problems of freezing systems lead to costs. Emergencies often occur in the cold season. Troubleshooting involves working outdoors with frozen ground. This complicates the repairs being carried out. Frozen water is a common cause of rupture

(damage) of steel, copper, plastic pipes. The interaction of different media leads to a loss of the integrity of materials.

Thermal insulation of external pipelines helps to reduce heat losses in heating pipelines, and also protects them from freezing. Poor-quality thermal insulation can lead to emergency situations, for example, freezing of pipelines. The device of thermal insulation of pipelines differs in climatic conditions, as well as the materials used for their manufacture. High-quality and reliable thermal insulation will protect the pipeline from temperature losses and protect it from adverse environmental influences.

A competent approach to this issue will significantly reduce the load of the system and reduce the wear of the pipeline. Timely performance of thermal insulation works can guarantee a person confidence in the future and protect his life.

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WAYS TO MINIMIZE THE MANIFESTATION OF THE SHADOW ECONOMY IN THE RUSSIAN FEDERATION AS A SOCIAL PHENOMENON

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Abstract. The article examines the common facts of the shadow economy among people in society within the state. The special cases of each fact under consideration are analyzed, the prospects for their solution and further prevention are proposed. Based on the conducted research, the real possibility of minimizing the shadow economy within the framework of the proposed material by the state and society is substantiated.

Keywords: shadow economy, minimization methods, society, person, state, law, corruption, tax evasion, terrorism.

СПОСОБЫ МИНИМИЗАЦИИ ПРОЯВЛЕНИЯ ТЕНЕВОЙ ЭКОНОМИКИ В РОССИЙСКОЙ ФЕДЕРАЦИИ КАК СОЦИАЛЬНОГО ЯВЛЕНИЯ

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Аннотация. В статье рассмотрены распространенные факты проявления теневой экономики среди людей в обществе внутри государства. Проанализированы частные случаи каждого рассматриваемого факта, предложены перспективы их решения и дальнейшего предотвращения. На основе проведенного исследования обосновывается реальная возможность минимизации теневой экономики в рамках предложенного материала государством и обществом.

Ключевые слова: теневая экономика, способы минимизации, общество, человек, государство, закон, коррупция, уклонение от налогов, терроризм.

The shadow economy is a widespread negative phenomenon, despite its small, insignificant positive aspects, in modern society, which does not give the economy potential growth and development. Also known as the underground economy, it has been resisting the established legislation of our state for many decades and the fight

against such an economy continues at the present time, which gives relevance to this problem considered in this scientific work. This hidden economic activity cannot be completely eliminated, but minimizing the manifestation of such activities is one of the main tasks of the state.

Under the impact of the 2022 sanctions, major international IT companies disconnected citizens of the Russian Federation from the Apple pay and Google pay payment systems, bank Visa and MasterCard have partially stopped working. Almost 70 % of the Russian citizens paid for goods and services by attaching a cell phone to payment terminals. However, since March 10, this function is no longer available. In light of these restrictions the majority of citizens will start to pay for goods and services in cash. Thus, a number of transactions will become untraceable, and in the conditions of the current restrictions it is expected increase in the volume of cash payments on the territory of Russia.

Another prerequisite for the growth of cash volumes on the territory of Russia is the exchange rate of the ruble to the currency, which established itself at the end of February – beginning of March 2022, as well as restrictions imposed by the RF Central Bank on currency transactions. Thus, according to the new rules of the RF CB, until September 9, Russians can withdraw foreign currency in cash only in the amount of up to 10 thousand USD in cash up to September 9, the commission fee for foreign currency transactions has increased. The abrupt changes on the currency market can encourage the activation of illegal activities among the so called "currency dealers", widespread in the 90's of the last century. Currency exchange for rubles is a banking transaction, hence, it is expected a surge of illegal banking activities among the population, the responsibility for which is stipulated by Art. 172 of the Criminal Code of the Russian Federation.

Moreover, it should be stressed that the manifestation of all the facts of the shadow economy is based on a person and, as a rule, all these facts affect more than one sphere of society. For example, corruption is a socio-economic phenomenon. Tax evasion is a socio-legal phenomenon, and demoralizing, self-destructive human activity is a socio-social phenomenon.

Considering the first phenomenon, in modern society, the state service causes the greatest indignation. It is considered by people to be one of the most favorable areas for the flourishing of corruption, which manifests itself in the abuse of state power by an official, using his position and extracting material benefits.

However, to interpret the above in this way, although relevant, is not correct, since basically adhering to this position means denying the following: The "average" police officer does not have the necessary amount of funds to provide the family component at the proper level, since each time he faces a salary that is quite low for his official life. Without considering separately the costs not only for the family, but also for himself. This indicates a slight misunderstanding on the part of citizens in relation to the financial situation of people in uniform. Returning to the problem, we can say the following: Having studied the aspect of financial equipment of police officers of the Ministry of Internal Affairs of Russia, relying on the Federal Law "On Social Guarantees for employees of Internal Affairs Bodies of the Russian Federation

and Amendments to certain Legislative Acts of the Russian Federation" of 19.07.2011 N 247-FZ, it is revealed that the salaries of the monthly those who are in positions of senior, senior, and middle-level management make an average of 24.500 rubles. It lists exactly those categories of positions that are most closely in contact with society, where the facts of obtaining material benefits using official position, that is, manifestations of corruption, are most frequent. Let's imagine an idealized situation where an employee receives all possible but rational allowances to the minimum salary, based on the last considered NPA:

- monthly allowance to the salary of monetary support for the length of service (length of service);

The 20 % bonus to the salary of an employee with 10 to 15 years of experience will amount to 4,900 rubles.

- monthly supplement to the official salary for the qualification title;

In this case, the premium for the qualification title of a second-class specialist is 10 %, 2,450 rubles.

- monthly supplement to the official salary for special conditions of service;

- monthly supplement to the official salary for working with information constituting a state secret;

For this position, a supplement of up to 65 % of the official salary is established. We realize this percentage. The final statistics will include 50 %, 12.250 rubles.

- awards for conscientious performance of official duties;

Let's assume that the employee does not have any serious comments on the service, in this case, let the bonus be 10,000 rubles.

- incentive payments for special achievements in the service;

It is possible to get 100 % of the official salary under this item, but 80 % will go to statistics (it is not possible to get 100 % in practice), this is 19.600 rubles.

- a supplement to the official salary for performing tasks directly related to the risk (increased danger) to life and health in peacetime;

For the last item, an indicator of 100 % is also possible, but most of the employees of the considered categories of posts do not have tasks directly related to the risk (increased danger) to life and health in peacetime, so the allowance for this item as a result of considering this ideal situation will not be taken into account.

Making calculations and summing up the micro conclusion from what has been said, the general conclusion (statistics) is as follows:

73,700 rubles will be received by the police officer of the Department of Internal Affairs if all the above conditions are met. Despite the "ideality" of the situation considered, it is possible to obtain these results. This depends not only on the employee himself, but also on his colleagues, superiors, and a number of external factors. Since we are talking about the Federal Executive Body, then, accordingly, by resolving this issue at the legislative level (On raising the level of employees ' salaries), achieving this result will helpto minimize theя manifestations of corruption as a social element of the shadow economy.

Next, we will present one of the main facts of tax evasion as a socio-legal element of the shadow economy. The Tax Code is a law that establishes the system of taxes and fees in Russia. The first part of the Tax Code of the Russian Federation describes general concepts and provisions of the tax legislation of the state, the second part of this law is aimed at specific types of taxes, contributions or fees. Compliance with the tax Code is the responsibility of the tax inspectorate, and violations of tax legislation are subject to penalties up to imprisonment. Directly consideringя the calculation of the amount of personal income tax and net income of a resident and non-resident of the Russian Federation as a social and legal phenomenon, we can say the following: at the very beginning of the Tax Code of the Russian Federation, it is said about the principle of equal taxation, i. e. that taxes cannot discriminate, namely, they can be applied taking into account racial, national and other similar criteria. The Constitution of the Russian Federation also says that we are a multinational people and the state has established equality of human and civil rights and freedoms regardless of gender, race, nationality, language, origin, property and official status, place of residence, attitude to religion, beliefs, membership in public associations, as well as others circumstances.

However, these principles are violated in paragraph 3 of Article 224 of the Tax Code, which significantly increases the personal income tax rate for non-residents of our country, and in conjunction with paragraph 4 of Article 210 deprives them of the right to receive tax deductions. Table shows the disadvantage that these circumstances place the specified part of the Russian population in the official labor market.

Table – Calculation of personal income tax and net income resident and non-resident of the Russian Federation

Criteria for comparison	*Resident of the Russian Federation*	*Non-resident of the Russian Federation*
Salary, rubles	40 000	40 000
Amount of tax deductions, p.:		
for the first child	1 400	-
for the second child	1 400	-
for the third child	3 000	-
Tax base, p	34 400	40 000
Tax rate, %	13	30
Amount of personal income tax, p	4 446	12 000
Net income, p	35 554	28 000

From Table, there is a fairly significant difference in the amount of net income of residents and non-residents of our country who have three children. It should be noted that this difference is significant even if they do not have the right to tax deductions. In this case, the net income of a resident with a salary of 40 thousand rubles will amount to 34.8 thousand rubles, which is 6.8 thousand rubles more than the remuneration for decent work received by a non-resident of our country working under similar conditions. Such circumstances probably encourage people living in Russia for less than 183 calendar days to avoid paying personal income tax in various ways. As such, they can choose to provide citizens with certain legal services for a relatively low fee (for example, garbage collection, shoe repair, installation of locks, etc.), which will bring them a competitive advantage over official employees engaged in similar activities. In addition, it can be the manufacture and sale of counterfeit goods, drug trafficking, theft, robbery, robbery and other illegal actions. Accordingly, this phenomenon can be called a partial absence in the current legislation of the necessary legal norms that would resolve this problem. It can be described as a gap in the legislation, and in the tax Code, which, as mentioned earlier, establishes the system of taxes and fees in Russia. It is no longer necessary to emphasize the importance of the absence of such problems-gaps in the laws, since the fact considered is also involved in the flourishing of the shadow economy in the previously listed items, starting with counterfeit goods and ending with other illegal actions.

As a solution to this problem, additional law-making should be implemented, since the discovered gap in tax legislation should either be eliminated or overcome (filled in). The gap can be eliminated only by issuing new regulations or supplementing existing ones. It is necessary to abandon the unqualified thesis that gaps in the law are eliminated by courts or other bodies in the process of applying the law. The only way to eliminate the legal gap is through additional rule-making. In order to assign the duty of eliminating gaps to the court, it is necessary to recognize it as a law-making body.

For the standard-setting body to adopt a new rule of law, the following conditions must be met:

- public relations must reach a certain maturity;
- the circumstances of the gap should be thoroughly checked, and the fact of the gap should be revealed.
- recognition of a gap should not be contrary to state policy.

The publication by the competent authorities of a missing legal norm – normative legal act) is usually a lengthy process that does not allow for prompt response to the needs of legal regulation, but the most qualitative solution to this problem is currently not available in the framework of considering this problem with the income of residents and non-residents.

At present, the demoralizing, self -destructive human activity is terrorism. Recognized as one of the main global problems in society. Terrorism is growing more and more, already covering entire regions of the world, and it is gradually

escalating, building up the financial base, professionalizing terrorism, and creating network terrorist structures. Modern globalization opens up new horizons not only for the exchange of knowledge, techniques and technologies, joint production of goods and services, but also for a variety of shadow actors (criminal syndicates, terrorist and extremist organizations, drug traffickers and shadow financiers specializing in money laundering).

In turn, a significant part of the financial resources of terrorists is made up of funds received in the shadow sector of the economy, these are revenues from trafficking in human beings and human body organs, drugs, cultural and historical values and natural resources from the territories controlled by terrorists. At the same time, terrorists are actively exploring the global information space of the Internet and the benefits of using electronic payment systems, for example, in Russia there is also a serious gap associated with the growing popularity of operations with cryptocurrencies and block chain technology. Despite the fact that cryptocurrencies are recognized in a number of countries and national legislation is widely integrated with the norms of control over income received from operations with cryptocurrencies [1, 2, 3, 4].

Below, as a special example, we present an approximate scheme (Figure) of electronic banking, which can be used to finance terrorism.

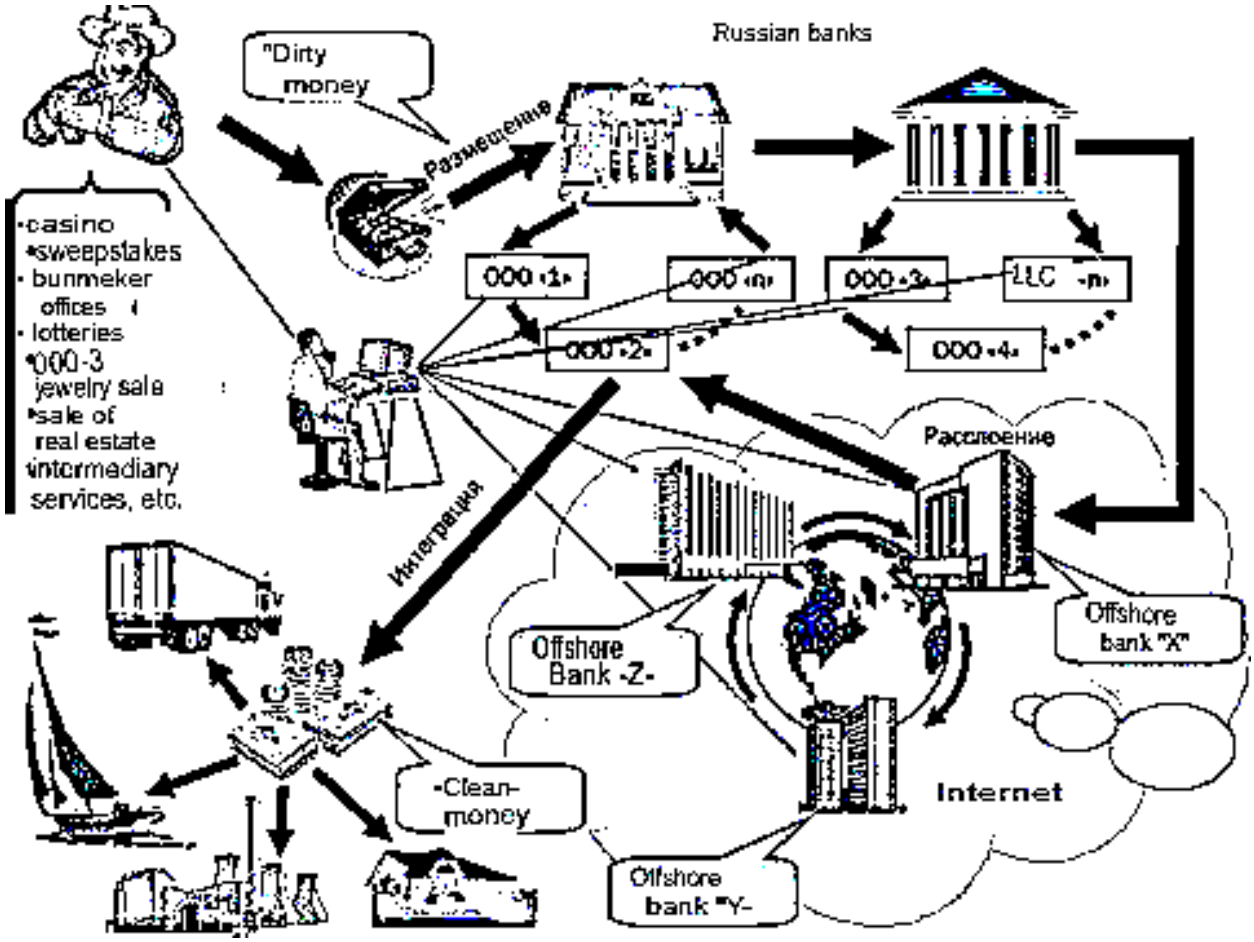


Figure. An approximate scheme of electronic banking

An approximate electronic banking scheme that can be used to finance terrorism. Thus, in order to combat the shadow economy from the point of view of countering the financing of terrorism, it is necessary to focus on the following areas:

- increasing the transparency of financial flows, including in offshore jurisdictions;
- strengthening control over activity in social networks, instant messengers, and monitoring of charitable activities;
- a consistent decrease in the share of "gray" and "black" financial transactions in the activities of business entities;
- management of migration processes and passport and visa work;
- creating conditions in which any form of illegal income generation would be difficult to implement [5, 6].

The solution to this problem should be comprehensive, including law enforcement practices, economic strategies, and strategies for social recovery and elimination of the consequences of terrorist attacks, the probability of which is only increasing in the foreseeable future.

Summing up the general result of the analysed areas and specific, individual examples, for each of them it is clearly visible that the basis for the manifestation of all these facts of the shadow economy is a person. Therefore, only a person can minimize the manifestations of the shadow economy, in this case in the Russian Federation. The solutions proposed in the article to current problems related to corruption, tax evasion, and terrorism should help the state and society resolve issues related to the development of the shadow economy.

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AUTOMATION AND ROBOTICS IN EDUCATION: HOW ARTIFICAL INTELLIGENCE CAN IMPROVE LEARNING

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Abstract. This topic explores the potential of artificial intelligence in automating and robotizing the education process, with the goal of improving learning effectiveness. The article discusses various aspects, including personalized education, automation of routine tasks, improvement of students' knowledge assessment quality, and data security issues. The role of teachers in the context of using artificial intelligence in education will also be examined.

Keywords: automation, robotics, artificial intelligence, education, learning process, personalization, efficiency, knowledge assessment, data security, teacher.

АВТОМАТИЗАЦИЯ И РОБОТИЗАЦИЯ В СФЕРЕ ОБРАЗОВАНИЯ: КАК ИСКУССТВЕННЫЙ ИНТЕЛЛЕКТ МОЖЕТ УЛУЧШИТЬ ПРОЦЕСС ОБУЧЕНИЯ

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Аннотация. Данная тема исследует потенциал искусственного интеллекта в автоматизации и роботизации процесса образования с целью улучшения эффективности обучения. В статье обсуждаются различные аспекты, включая персонализацию образования, автоматизацию рутинных задач, улучшение качества оценки знаний студентов и вопросы безопасности данных. Рассмотрена также роль учителя в контексте использования искусственного интеллекта в образовании.

Ключевые слова: автоматизация, роботизация, искусственный интеллект, образование, процесс обучения, персонализация, эффективность, оценка знаний, безопасность данных, учитель.

Artificial intelligence (AI) can help personalize education by allowing teachers to create individualized learning plans for each student according to their level of

knowledge, skills, and interests. This can improve students' motivation and help them learn faster and more effectively.

AI can also be used to create and develop new learning materials as well as assess students' knowledge and skills. This can help teachers better understand students' needs and provide them with appropriate help and support.

It is also important to note that the use of AI in education can help with the problem of teacher shortages in some parts of the world, which is a serious problem in some countries.

Because of this, the relevance of using AI in education cannot be underestimated. This article will look at how artificial intelligence can improve learning, as well as what problems and dangers can arise from the use of AI in education.

For example, one of the problems in using AI in education is the lack of transparency and explainability of the algorithms. When automatically evaluating student knowledge or recommending learning materials based on AI, it can be difficult to understand what criteria and algorithms were used to make decisions. This can raise doubts about the honesty and accuracy of the assessment, as well as create problems with the credibility of the system.

In addition, the use of AI in education can raise certain ethical issues, such as issues of student data privacy and discrimination problems in the choice of algorithms and data for AI training.

However, despite these challenges, the use of AI in education has enormous potential to improve the learning process and improve the effectiveness of education in general. Thus, this article will explore what opportunities AI offers for education, what challenges it poses, and what solutions and practical recommendations can be applied to maximize the effectiveness and safety of AI in education.

The use of artificial intelligence in education can bring enormous benefits and improvements in the learning process.

Below are some of the benefits of using AI in education:

1. Increased learning effectiveness. AI can be used to adaptively assess and personalize curricula based on the knowledge level and individual needs of students. AI can also be used to analyze the effectiveness of instructional methods and materials, and optimize learning.

2. Educational Personalization. AI can be used to create individualized curricula and programs for each student, taking into account their level of knowledge, interests, and learning style. This can help students achieve better results and feel more motivated to learn.

3. Increasing accessibility to education. Using AI can increase the accessibility of education, for example, by creating online courses with automatic learning assessments, which can be especially helpful for people who live in remote locations or have limited access to teachers and learning materials.

4. Creating new teaching methods. AI can be used to create new teaching methods that can be more interactive, multimedia, and engaging for students. For example, AI can be used to create virtual and augmented reality experiences that can help students learn complex topics more effectively.

5. Learning 24/7: AI can teach students at any time of the day or place, which can be especially useful for distance learning. Teachers, on the other hand, may have limitations on work hours and locations.

6. Optimization of educational management. AI can be used to manage learning resources and optimize the management of educational organizations. For example, AI can be used to analyze student and teacher performance statistics to improve decision-making and optimize management processes.

7. Quick feedback: AI can provide instant feedback to students, which can improve learning effectiveness. Unlike teachers, who can take a long time to evaluate student work, AI can conduct assessments instantly.

8. Big data: AI can process a large amount of data, including information about students' learning achievements and teaching methods. Based on this data, AI can determine the best teaching methods and help students improve their learning outcomes [1, 2, 3, 4, 5].

Thus, the use of AI in education has enormous potential to improve the learning process and the quality of education. However, to maximize the effectiveness and safety of using AI in education, it is necessary to study the latest research and keep up with the latest trends in the use of AI in education.

Ethical and legal aspects of the use of AI in education must also be considered, such as transparency and data security, protection of students' personal data, etc. In addition, appropriate training and education for teachers and students is needed so that they can effectively use AI for educational purposes.

AI in education can be used in different fields and at different stages of education, from elementary school to higher education. For example, in science, AI can be used to model and analyze data, predict the results of experiments and research, as well as to process medical data and find new drugs.

In engineering, AI can be used to create automated production control systems, analyze and optimize manufacturing processes, and develop innovative technologies and products.

In art and design, AI can be used to create computer games and animations, visualize data and create graphic designs, as well as to develop new music compositions and sound effects.

AI can also be used in education to automate various processes, such as automatically checking assignments and tests, personalizing education and optimizing the curriculum for each student, and creating customized learning materials and tutorials.

Some specific examples of AI use in education include automatic test and assignment checking systems such as Turnitin and Grammarly, personalized learning platforms such as Knewton and Carnegie Learning, and AI systems for data analysis and visualization such as Tableau and DataCamp.

Looking at such examples of the use of AI in education helps to understand how AI can be used in different areas and at different stages of learning, and what benefits it can provide.

With the advent of AI in education, teachers' responsibilities may change. Instead of spending most of their time preparing and delivering lessons, they may

become more focused on personalizing learning and developing skills that AI cannot provide, such as social and emotional support, motivating students, and developing creative thinking. Teachers can also work in more highly specialized areas, such as coaching and counseling, where the human element is of greater value. Overall, teachers' responsibilities can become more flexible and focused on the needs and interests of each student.

While the use of AI in education can greatly enhance learning and personalize learning for each student, the teacher's role in education must be considered and the human factor must be preserved.

Teachers play a key role in education; they are mentors, guide students through the educational process, and provide support and assistance with problem solving.

Using AI can help teachers in their work, for example, with automatic assignment and test checking, automatic report generation and individualized learning plans, etc. However, the human element in education needs to be preserved and teachers need to recognize that they have unique skills and experiences that cannot be completely replaced by technology.

Teachers can help students learn how to think critically and develop analytical skills, which are key to success in any field of endeavor. Teachers can also help students develop social skills such as communication, interaction, and collaboration, which are also important factors for success in today's world.

In addition, teachers can help students develop skills necessary for their future careers, such as leadership skills, project management, etc. Teachers can also help students overcome personal problems such as low self-esteem, fear of failure, etc.

In the end, using AI in education can greatly improve the learning process and personalize it for each student. However, it is necessary to preserve the human factor in education and consider the role of the teacher in the educational process, as they are key figures. However, despite all the benefits, the use of AI in education also raises some concerns and problems, especially regarding the preservation of the human factor in learning. It is important to remember that technology cannot completely replace the teacher's role in the learning process. Rather, teachers must continue to play a key role in the learning process, providing students with guidance, assessment, motivation, and support student [7, 8].

Thus, a balance must be struck between using technology and preserving the human element in education. Teachers must be able to use technology to enhance the effectiveness and quality of learning, but remain key figures in the educational process. It is important that they have a sufficient level of competence in the use of AI and know how to apply it in combination with traditional teaching methods.

So, the use of AI in education can significantly improve the learning process and make it more effective and personalized. However, it is important to remember that technology cannot replace the teacher's role in the learning process, and teachers must continue to play a key role in ensuring the quality of education [9, 10].

One of the major challenges of using AI in education is the threat of teacher replacement. Many experts fear that the development of AI could lead to computers and robots replacing teachers in schools and universities. This could have serious consequences for the quality of education, since computers cannot replace teachers in

all aspects of teaching, such as motivation, moral support and individual adjustment to the student's needs.

In addition, the use of AI in education can lead to certain data privacy and security problems. Handling the large amount of data that is required for the effective use of AI in education can lead to data privacy issues. It is important that teachers and education system administrators ensure that student data and other system users are adequately protected.

Additionally, the use of AI in education can lead to inequalities in learning. Where some students have access to better technology and others do not, there is a learning disparity that can degrade the quality of education. It is important that education administrators ensure that all students have equal access to technology.

Finally, the use of AI in education can lead to job losses for teachers and other education professionals. This can have serious social and economic consequences, as teachers and other education professionals are important members of society.

Overall, the use of AI in education can have many positive consequences, but it also poses a number of challenges and dangers. It is important that education administrators consider these challenges and work to ensure that the use of AI in education is effective and safe for all students and teachers.

The use of AI in education brings with it some difficulties and problems, but there are possible ways and solutions to overcome them.

One way to solve the problem of replacing teachers and preserving the human element in education is to integrate AI technologies into instructional programs and platforms, but not to completely replace them with automated solutions. Teachers can use these technologies to better adapt to students' needs and personalize education and help them cope with learning difficulties. Teachers can also use AI to automate routine tasks, such as checking assignments and grading students, to free up time to interact more deeply with students and help them learn.

To address data privacy and security concerns, strict rules and policies related to the collection, storage, and use of student data, as well as appropriate security and data protection measures, must be in place.

It is also important to educate teachers and students so that they can properly use and interpret data generated by AI technology and be aware of its limitations and challenges.

In addition, there is a need to develop and implement new AI technologies that will address the specific needs and requirements of the educational environment, such as personalizing education, creating adaptive learning systems, and improving communication between teachers and students.

Thus, the use of AI in education can have significant benefits, but it can also present challenges and dangers. Appropriate measures must be taken to ensure data security and privacy, and to preserve the human element in education and use AI technology to improve learning.

In the conclusion it is possible to summarize the results of the article and outline the main conclusions that were made in the process of its writing. It is worth noting that the use of artificial intelligence in education has great potential to improve the learning process, as well as to personalize the approach to each [7, 8, 9, 10].

However, it is necessary to remember that this also involves certain difficulties and dangers that may arise if AI is used incorrectly. Therefore, it is important to pay attention to the possible risks and to approach the issue of using AI in education responsibly and consciously.

The future applications of AI in education present broad prospects for further research and development in this field. For example, this may include the development of new technologies and algorithms, the improvement of existing educational platforms, and the creation of new learning formats and methods.

It is also important to continue research into the role of the teacher in the context of using artificial intelligence in education and finding the best options for collaboration between the teacher and AI.

Thus, in the future, research and development in the application of artificial intelligence in education will be aimed at ensuring the effectiveness, safety and innovation of learning, which will better prepare students for the future and form a quality workforce in various fields.

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MODERN METHODS FOR INCREASING THERMAL EFFICIENCY OF BUILDINGS

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Abstract. This article substantiates the need to study the energy efficiency of buildings. The losses of thermal efficiency of industrial buildings are also considered and methods for increasing thermal efficiency are proposed.

Keywords: thermal efficiency of a building, heat losses, heat transfer, individual heating, external enclosing structures.

СОВРЕМЕННЫЕ МЕТОДЫ ПОВЫШЕНИЯ ТЕПЛОВОЙ ЭФФЕКТИВНОСТИ ЗДАНИЙ

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Аннотация. В данной статье обосновывается необходимость изучения энергетической эффективности зданий. Также рассматриваются потери тепловой эффективности промышленных зданий и предлагаются методы для повышения тепловой эффективности.

Ключевые слова: тепловая эффективность здания, тепловые потери, теплоотдача, индивидуальное отопление, наружные ограждающие конструкции.

Nowadays, the requirements for increasing the thermal efficiency of buildings are growing along with the advent of innovative technologies and solutions in the field of energy.

With the increase in the volume of construction, the consumption of energy resources and the amount of waste increase. When considering methods for improving thermal efficiency, it is important to take into account some aspects.

The relevance of the study of energy issues is due to the great demand for energy resources, the problem of environmental safety, and the increase in the cost of energy resources. The task of expedient use of energy non-renewable resources is also set.

Our purpose is to consider the concept of "thermal efficiency" of a building, its requirements and methods for assessing thermal efficiency, as well as to identify relevant methods for improving it, taking into account the above requirements.

The concept of "thermal efficiency of the building" includes the following factors:

a) design solutions for the architectural and construction part of the building, heating, ventilation systems and their automation;

b) regulatory requirements for the heat-shielding properties of external enclosing structures;

c) the level of technical operation of the building and the heat supply system. The heat transfer process of buildings is significantly influenced by the volumetric and spatial composition of the building and its design parameters, the heat-shielding properties of external enclosing structures, which are characterized by the value of resistance to heat transfer and heat resistance, the dimensions and designs of filling light openings, heating methods (water, air, electric) and heat transfer control in heated rooms [1].

The main methods for achieving the energy efficiency of buildings:

1) increasing the thermal efficiency of the building envelope, including walls, coatings and windows;

It consists in increasing their resistance to heat transfer of external enclosing structures to standard values and includes:

-cladding of external walls, roofs, ceilings above the basement

-use of heat-shielding materials

- balcony glazing

- the use of interlayer in facades with ventilated outlet from the room

- the use of windows with air outlet through the space between the panes

- use of reflective windows

- glazing of facades for heat accumulation or accumulation of solar radiation

-use of micro ventilation;

2) increasing the energy efficiency of building heating

- replace cast iron radiators with aluminum ones

- install temperature controllers and thermostats

- flush the heating system seasonally

- thermal insulation of pipes [2];

3) increasing the efficiency of the used heat supply systems, including the use of alternative decentralized heat supply systems;

4) introduction of forced ventilation systems using exhaust air heat recovery systems [3].

Also, do not forget that it is possible to increase the thermal efficiency of the building with the help of engineering equipment.

In houses with enclosing structures made of heavy concrete, it is advisable to provide panel heating systems with the placement of heating elements in the inner layer of concrete of multilayer outer wall panels or along the contour of internal reinforced concrete partitions.

Provide for local (per front) regulation of heat supply in heating systems.

Provide scheduling for managing the operation of heat points.

In the absence of feasibility studies, all pipelines laid in the technical underground should be isolated.

In world practice, at the present stage of development of the construction industry, there are many ways to improve the thermal efficiency of buildings. Often these directions, in addition to reducing energy consumption, also provide a high quality of the human environment and increase environmental safety.

The most relevant areas for improving the thermal efficiency of buildings are:

1) the introduction of individual heating points (IHP):

- it becomes possible to regulate and account for heat consumption in each specific building;

- the percentage of heat losses is reduced due to the absence of external heating networks;

- energy losses during transportation are excluded;

2) the use of intermittent heating:

- allows to reduce heat consumption at the time of day when it is possible;

3) the use of climate:

- the thermal effect of the outdoor climate on the surface of a building can have a positive or negative effect on its thermal balance, and hence the thermal load on the heating and air conditioning system. For example, the effect of solar radiation on a building in winter reduces the load on the heating system. The thermal impact of the outdoor climate on the heat balance of a building can be optimized through design choices in the shape and orientation of the building [4];

4) the choice of the shape and orientation of the building:

- depending on the position and orientation of the outer surface of the building, it is exposed to different thermal effects of the outdoor climate. In the absence of solar radiation and wind and at negative outdoor temperatures, the smallest heat loss through the fences is provided by the spherical shape of the building. The closest figure to a sphere is a cube. Therefore, if only the temperature effect of the outdoor climate on the building takes place, then the ideal shape of the building is a cube;

5) the improvement of heating systems:

- regulation of the consumption of thermal energy on a separate heater in accordance with the space-planning decisions of the room and the thermal protection of the enclosing structures, the operating mode and the actual values of the outside temperature, wind speed and direction, that is, taking into account the actual heat balance of the room.

Loss of thermal efficiency.

In any calculation of heating systems, the main task is to determine the loss of thermal efficiency. The outgoing heat from the building is the heat loss, they are summed up from the main and additional ones. The main heat losses are: leaks through the enclosing structures of the premises, and additional: the location of the building, seasonal weather conditions and enclosing structures on the cardinal points.

It is important to understand how heat loss can affect floor installation heating, as the system must provide sufficient heat to be used as the main source heating, or enough heat to increase comfort while use in conjunction with other heating systems. The heat and power production system can be divided into three parts:

1) create thermal energy;

2) thermal energy transfer;

3) consumption of thermal energy.

Each of them has inherent involuntary losses, which reduce the thermal efficiency of buildings.

In the first part, the boiler unit is considered to be the main site, which converts fuel energy into thermal energy by physical and chemical processes. Standard boilers have losses in fuel under burning, boiler lining and blowing, and the boiler house's own needs. Same when starting or stopping the operation of the boiler house wasted a huge amount of fuel.

These losses may not always be obvious, which leads to huge losses in efficiency.

The solution to these problems is repeated inspection, cleaning of the boiler unit. Modern pumping equipment allows to reduce costs two or even three times for the own needs of the boiler house. It is necessary to correctly configure the equipment for continuous operation,

using reliable and high quality equipment.

In the second part, pipelines of heat networks are a striking example. Low-efficiency pumps almost always result in wasted energy. A large length of the pipeline affects the amount of heat loss. Also, one of the main loss factors are heating mains, because energy can be returned in parts through the return pipeline to the boiler house due to incorrect distribution. And the last is the leakage of heat energy in an emergency.

These losses can be prevented by inspecting heating mains, as well as replacing low-quality network pumps. It is imperative to follow all the rules when creating wire pipes in order to avoid emergencies. Control the absence of heat losses through steel valves. Restore or strengthen the thermal insulation of the heating main or economic feasibility of shifting existing pipelines using pre-insulated pipelines for replacement.

At consumer sites, it is quite difficult to immediately determine the losses; it is possible only using heat energy metering devices. The main problems are incorrect distribution of heat over the site, inconsistency with weather conditions, lack of re-treatment of hot water and internal leaks, contamination of tubular boilers.

The solution to the problem is the installation of thermal energy metering devices, if necessary, then a change in the schemes of heating devices. Improve the performance of the boiler with a temperature controller [5]. The overall heat loss can be reduced by considering all the above and add insulation, and make sure that in the existing insulation has no gaps. Probably, in a production already put into operation with installed equipment, perform all of the above recommendations will not come out. But adjust the size of the gate or trace for the state of the fire-resistant insulation during the operation of the drying chamber - the matter is simple. The main thing to remember is that it is important not only to save heat in indoors, but also to keep the equipment operational and follow the rules of safe operation at work.

Overall heat loss can be reduced by considering all of the above and adding insulation, as well as making sure there are no gaps in the existing insulation.

The problem of increasing the thermal efficiency of buildings remains relevant to this day. Further research in this area is extremely important and necessary. However, technology also does not stand still. At the moment, there are several ways to solve this problem, the combination of which can give a visible result. The described methods are economically and environmentally beneficial, and most importantly, efficient.

The implementation of all the above recommendations in mass construction can reduce the heat consumption of residential buildings of new construction by about 30% compared to the current level [6].

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COMPREHENDING THE MUSICAL SPIRIT OF RUSSIA: THE LIFE AND WORK OF S. V. RACHMANINOFF IN THE STUDY OF RUSSIAN AS A FOREIGN LANGUAGE

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Abstract. The article underlines the importance of the personalized approach to the formation of the cultural competence of foreign students. The possibilities of including cultural content related to the life and work of S. Rachmaninoff in the study program are shown.

Keywords: cultural competence, Russian culture, learning Russian as a foreign language, S. V. Rachmaninoff, The Year of Rachmaninoff in Russia.

ПОСТИЖЕНИЕ МУЗЫКАЛЬНОГО ДУХА РОССИИ: ЖИЗНЬ И ТВОРЧЕСТВО С. В. РАХМАНИНОВА В ОБУЧЕНИИ РУССКОМУ ЯЗЫКУ КАК ИНОСТРАННОМУ

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Аннотация. В статье подчеркивается значение персонализированного подхода к формированию культурологической компетенции иностранных студентов и показываются возможности включения в учебную программу культурологического контента, связанного с жизнью и творчеством С. В. Рахманинова.

Ключевые слова: культурологическая компетенция, культура России, изучение русского языка как иностранного, С. В. Рахманинов, год Рахманинова в России.

Speaking about the formation of cultural competence as an important component of studying foreign language we must take into consideration that this process must be aimed not solely to the assimilation by students of a certain amount of information that they can easily forget after the exam. This component has a great potential in inspiring them for further studying and, what is equally important, helps newly arrived foreigners to adapt to the new environment, feel on the same wavelength with the locals, discover familiar features, universal cultural values, similarities with their own cultural traditions and identify for themselves those features of the new culture that they are particularly impressed with.

In order to realize this powerful potential in all its significance, certain specific demands on cultural content must be made.

However, one of the standard demands follows from the didactic principle “from simple to complex” and is often conceived as the correspondence of the amount of information about the culture of the country to the language level [1, p. 11]. On the one hand, this principle facilitates the choice of the cultural content and its adjusting to the program of a certain level; on the other hand, as far as the pre-university stage is concerned, it keeps newly arrived students from immersing themselves in the wonderful world of Russian culture. The effective way to avoid this contradiction is to accompany the linguistic content with a considerable amount of extralinguistic supply. It should be recognized that a number of teaching aids, such as “Doroga v Rossiju” (The Way to Russia) [2], “Privet, Rossiya!” (Hello, Russia!) [3], “O Rossii po-russki” (About Russia in Russian) [4], etc. successfully cope with this task. Particularly, the authors of the latter book Zh. Zherebcova, M. Holodkova, T. Dyakova et al develop the potential of creolized text for the purpose of formation cultural competence of foreign students [5].

At the same time, even in the presence of excellent textbooks, the effectiveness of sociocultural adaptation depends on the relevance and modernity of educational content. An illustrative example of this can be a series of diverse events and tasks that have been performed recently at the preparatory department for foreign students during the celebration of the Rachmaninoff Year. Since new perspectives and opportunities have been discovered during the implementation of this program, they will also be mentioned in this article.

Tambov region is closely connected with the name of the great composer, as he spent the most fruitful years of his life in the famous Ivanovka manor where he composed his most prominent opuses [6]. Moreover, as an assistant to the chairman of the directorate of Russian Music Society he inspected the music school in Tambov, defended its superiors from slander, and thus preserved the heart of musical life and education in the city. It is natural that the centre of culture and education that has survived to this day is named after Rachmaninoff [7, p. 248-251].

The annual Rachmaninoff festivals became the hallmark of the region. As 2023 was declared the Rachmaninoff Year, many special events were timed to coincide with this festival. Rachmaninoff's theme is also presented at the annual Night of Museums and Biblionoch (Night of Libraries). It is not surprising that already during the first sightseeing tour of the city, foreign students at every step come across cultural objects associated with Rachmaninov – starting with a monument to the composer and ending with colorful posters of music concerts. At this stage they get a task to search the information about him in their native language and some additional information is given by the teacher. Naturally, acquaintance with Rachmaninov's music begins at a very early stage. When choosing musical works, we were guided by the recommendations of music teachers so that these opuses were accessible to the perception and understanding of the most part of students [8, p. 103]. Throughout the

course the students listened romances “Островок”, “Сирень”, “Здесь хорошо”, “Вокализ”, “Весенние воды” and Piano Concerto No. 2.

A number of textbooks offer students the task of finding a piece of music on the Internet and listening to it. The students are supposed to do this task individually, during homework. We consider that as soon as there is an opportunity to listen to music collectively, one must take advantage of it. Listening to music together not only allows the teacher to make sure that the task is completed. It means empathy, joint aesthetic experience, and moreover, when the teacher allocates time for this in class, awareness of the importance of this experience.

As it was mentioned above, the cultural life of Tambov offers more and more chances for all lovers of Rachmaninoff's creativity: performances of famous musicians within the framework of the Rachmaninoff Festival, concerts at the Music Institute and music schools, promenade concerts in parks, musical accompaniment of excursions in museums, etc. To this should be added the background music that sounds during breaks, and playlists that students create themselves.

Acquainted with several opuses, the students visited the picture exhibition “Sergei Rachmaninoff. Variations on a theme” where they were to choose the pictures which were consonant with their own associations to Rachmaninoff's music. They also spoke to the artists and the minimum language they owned at that time made it possible to hold a small press conference with one of the artists. Their questions concerned the details of the creative process, the duration of work on the painting, the nature of inspiration. As the interviewee inspired by the questions was carried away in his lengthy emotional answers, we had to give some translation and/or explanation required. It should be noted here that we consider communication with students, especially the newcomers, in an intermediary language (English or French) to be a necessary condition for creating a comfortable psychological environment promoting their speedy adaptation.

At the next stage, there was a combination of sound (mostly non-verbal, musical) images and visual images when watching short films about the composer. In our opinion, the most successful in this regard was the work with the film about Ivanovka (2012) shown in the programme “Perfect Pitch”, which airs on the TV Culture channel, and the film “Moments of Fate. Rachmaninov” shot in Tambov by O. Tovma (2016). The amount of cultural information that the students had already mastered by this time allowed them to understand the content of these films without translation and without comments.

Having watched the films, the students were to answer a number of questions covering the plot, such as:

1. Who was Sergey Rachmaninoff?
2. Why did he get depressed?
3. What did the doctor advise him?
4. Where did the composer decide to go?
5. What was he doing in Ivanovka, etc.

It should be noted that this rather ordinary set of questions resulted not only in simple answers, but also caused some discussion. When someone noticed that depression required more serious action by a doctor than his recommendations to leave the city, the students were asked a new question: “Your friend is depressed. What actions will you take to help him?” Needless to say, the students suggested those ways out of the situation that would be useful for themselves. Thus, the discussion became not only a speech practice, but was of great importance for team building and establishing mutual understanding in the group. It was also useful for the teacher, since it revealed the individual psychological characteristics of the students.

In addition, short extracts from the reminiscences of Rachmaninoff were suggested for the discussion. They revealed the national spirit of music: “Музыка композитора должна выражать дух страны, в которой он родился…” (The composer’s music must express the spirit of the land where he was born…) [9, p. 145], his attitude to the creative process: “Сочинять музыку для меня такая же насущная потребность, как дышать и есть…” (Composing music for me is the same urgent need as breathing or eating…) [9, p. 144], or contained a delighted description of The Bolshoy Theatre with the obligatory mention of a cat that suddenly appeared on stage during Chaliapin's performance – the only incident in the theater in Rachmaninov's memory [9, p. 57-59]. The work with these texts included traditional complex of pre-text exercises, questions to the text and could easily be supplemented with tasks for reproducing the text in a retelling, dialogue or presentation.

The next stage, the most important one, when the students were supposed to master sufficient vocabulary, was the discussion of the ideas expressed in music. At this stage, the teacher is given the opportunity to use all the educational and developmental resources of music. A powerful theoretical basis for its implementation is the principle of modeling an artistic image, developed by professor A. Pilichauskas specifically in relation to the perception of classical music. This principle is aimed at forming a culture of communication of students, their spirituality and morality, and all these goals are of great importance for teaching foreign students the Russian language, their introduction to modern Russian life, their familiarization with the world of Russian culture. The main idea of discussing a piece of music, after A. Pilichauskas, is to speak about the hero of this piece, his thoughts, his feelings, his aspiration. The teacher does not give ready-made formulations: he asks students, leads them to assumptions, provokes a discussion, makes them develop their opinion. It is not enough to say that the music is sad or cheerful, it is also not necessary to demonstrate the knowledge of musical terms. What students must do is to learn that there is a certain idea at the heart of a work of art, with a certain moral spiritual attitude, and try to hear and understand this idea.

V. Vouba, relying on A. Pilichauskas methodology, offers for discussion three ideas, the foundation of which are the basic universal values:

Hero and Society;

Artist and Nature;

Man and Homeland [8, p. 104].

First, students choose an idea related to the piece of music they have listened to. Then they find out what relationships are developing in this system of concepts and how the character of the hero is manifested in them. In this discussion, they formulate their own moral attitudes, which encourages them to search for linguistic means for an adequate and complete expression of their thoughts. It is a real challenge for them to keep on speaking Russian without switching to their native language.

Without a doubt, each stage of the work was loaded not only aesthetically, but also didactically. Students mastered new vocabulary and grammar, practiced listening and speaking. These are some of the tasks they had to do:

1. Listen to a romance and highlight words in the given list that were not in the song.

2. Read the list of words and choose those that evoke an association with the music.

3. Underline all the infinitives / nouns in genitive case / adjectives in the given text.

4. Complete the sentences from the story you have listened with proper verbs.

5. Describe the picture you liked best of all at the exhibition, etc.

Since the study of the works of great masters stimulates the creative activity of the students themselves, it is natural that many tasks are of a creative nature. For example, students had to compose and act out dialogues in the following situations: sitting at a concert, going to the theater, buying tickets, walking through the lobby during the intermission, etc. An example of a task for a more advanced level is to compose a story that could be illustrated by a certain piece of music.

As practice shows, not all students equally cope with tasks of the same level, especially with the creative ones. Since any creative attempt should be evaluated positively, it is necessary to prepare tasks in the range of complexity corresponding to the language and creative abilities of all students of the group.

Still the main idea that the teacher sought to convey to students was to show in Rachmaninov's music, on the one hand, the greatness of the Russian soul and Russian culture, and on the other hand, universal human values and, as a result, the worldwide recognition of the great composer. In working with Arab students, reading a text about an Egyptian virtuoso pianist Wael Farouk turned out to be very effective. With his “unusually small hands with very short ligaments, in addition to his poor vision”, as he says in the interview [10], Farouk started playing the piano at the age of 3, he gave a premiere of Rachmaninoff's Piano Concerto No. 3 when he was 16, and now he performs three Rachmaninoff’s concerti in a single evening. He says that it was because of Rachmaninoff’s music that he became a pianist [10]. As for African Christians, they were touched by the story that Rachmaninoff’s Vespers (Всенощное

бдение) translated into Afrikaans were performed by the Pro Cantu Youth Choir and became a real hit [11, 12].

Thus, the culturological component in language teaching introducing the culture of the country of the language being studied, fetches out the features of the national culture of the students. Together with an understanding of universal moral, spiritual, and aesthetic values, the implementation described of the cultural approach frees cultural content from the procrustean bed of formalism, creates a powerful motivation for learning and a reliable basis for students' adaptation in a new country that is accepted by them as great and hospitable.

In conclusion, it should be noted that the above content with its apparent redundancy (since it includes both realized and potential forms of tasks and activities) can serve as a practical guide that allows the teacher to choose what corresponds to a specific level of students, as well as his own artistic preferences. The latter is very important, because love can only be conveyed with love.

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ABOUT THE EXPERIENCE OF INTERACTION WITH CHATGPT ON THE EXAMPLE OF STUDYING “PROBABILITY THEORY AND MATHEMATICAL STATISTICS” COURSE

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Abstract. The paper discusses the experience of interaction with ChatGPT in solving educational problems in the “Probability Theory and Mathematical Statistics” course intended for undergraduate students majoring in Applied Computer Science and Information Security. The paper presents the results of assessing the success of ChatGPT when completing tests, solving control tasks in the programming languages R and Python, as well as answering theoretical exam questions.

Keywords: artificial intelligence, language model, ChatGPT, probability theory, mathematical statistics, R programming language, Python programming language.

ОБ ОПЫТЕ ВЗАИМОДЕЙСТВИЯ С ЯЗЫКОВОЙ МОДЕЛЬЮ CHATGPT НА ПРИМЕРЕ ИЗУЧЕНИЯ КУРСА «ТЕОРИЯ ВЕРОЯТНОСТЕЙ И МАТЕМАТИЧЕСКАЯ СТАТИСТИКА»

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Аннотация. В работе обсуждается опыт взаимодействия с ChatGPT при решении учебных задач в курсе «Теория вероятностей и математическая статистика», который предназначен для студентов бакалавриата, обучающихся по направлениям подготовки «Прикладная информатика» и «Информационная безопасность». Представлены результаты оценивания успешности ChatGPT при выполнении тестовых заданий, при решении задач контрольных работ на языках программирования R и Python, а также при ответах на теоретические вопросы экзамена.

Ключевые слова: искусственный интеллект, языковая модель, ChatGPT, теория вероятностей, математическая статистика, язык программирования R, язык программирования Python.

ChatGPT is a unique language model, a real sensation of the decade. An ordinary user cannot but rejoice at the opportunity to receive a detailed answer to any questions of interest to him. The introduction of these technologies in search engines and services could facilitate the search for information that is available on the Internet. But is this model really perfect? Why is access to OpenAI resources currently prohibited in Italy and in some states of the USA [1, 2]? According to the governments of these countries, it is dangerous to introduce such technologies, as their introduction can significantly affect the quality of education. Also, these technologies do not provide methods for maintaining the security of users' personal data. However, progress does not stand still, GPT-like technologies are released by OpenAI one after another. The recently released GPT-4 model significantly surpasses its predecessor in its functionality [3].

At the moment, there are already many studies devoted to the introduction of artificial intelligence and technologies based on language models in journalism, education, archives, political processes, as well as their use in other areas of human activity [4, 5, 6, 7, 8]. Any achievement of human thought can be used both for good and for harm. Thus, there have already been cases of leakage of personal data of ChatGPT users [9]. There are also reasons to believe that artificial intelligence systems can be used to commit cybercrime [10]. It is obvious that the further development of artificial intelligence technologies, as well as their introduction into our life, is inevitable. In order for a person to be fully prepared for inevitable changes, two important conditions for interaction with systems of language models should be considered:

1. Providing of personal data security that can be done using artificial intelligence systems [11].
2. Learning how to interact correctly with models, using them for their intended purpose with minimal risk of making mistakes.

In this article, the second point is discussed in more detail. In view of the already existing trends in the introduction of modern technologies in educational processes, as well as the inevitability of the use of these technologies by students, it is necessary to find out how such models cope with solving problems intended for students of higher educational institutions.

ChatGPT was asked to solve tasks of different formats, including both theory and practice within the framework of the course "Probability Theory and Mathematical Statistics".

The tasks given to ChatGPT were divided into three groups:

1. Test tasks, in which the quality of the solution and the final answers to the task were checked separately;
2. Theoretical questions on all the main topics of the semi-annual course "Probability Theory and Mathematical Statistics";

3. Control tasks, the main purpose of which was to test the programming skills of the model.

As part of the first group of tasks for ChatGPT, eight tests each containing five questions were used. Testing was done using LMS Moodle. Some tasks required hosting " Imgur ", which generates links to images for reading by the language model. At the end of testing, the following results were obtained:

1. Points for correct answers generated by LMS Moodle. The maximum score is 5 points for a test of five tasks;
2. Points assigned by an expert for the quality of explanation of problem solving. Expert evaluation is interval: the first boundary is a “strict” assessment, i. e. the minimum number of points received by the model, the second limit is a “non-strict” assessment, i.e. the maximum value of points for solutions. The result for the test was obtained by adding up the scores for each item in the test.

The test results are presented in Table 1.

Table 1 – Test results for ChatGPT

Test No.	*Test topic*	*Scores for correct answers*	*Interval estimation of solution quality*	
			“strict” estimate	*“non-strict” estimate*
1	Basic concepts of probability theory	2	4.2	4.7
2	Basic concepts of probability theory	1	2.7	3.7
3	Bernoulli scheme	0	3.1	4.3
4	Random variables	3	4.1	4.9
5	Random variables	3	4.6	4.9
6	Basic laws of distribution	3	4.7	5.0
7	Basic laws of distribution	2	3.8	4.6
8	Multivariate random variables	0	2.2	3.2
TOTAL:		14/40	3.675	4.4125

The ChatGPT language model found 35 % correct answers in the described testing. The interval estimation showed that the quality of the solutions provided by ChatGPT was good in many cases, despite the incorrect answers to the problems. On a five-point rating scale, the model scored an average of 4 points out of 5 on all tests, which exceeds the value obtained as a result of the LMS Moodle assessment.

During testing, the following main types of errors were identified:

- Arithmetic errors;
- Problems with rounding numbers to the desired digit;
- Logical errors;

- The use of irrelevant solution methods that allow a small but significant error;
- Errors in data recognition from images;
- The use of solution methods that do not correspond to the condition of the problem.

At the next stage of the model work, questions on probability theory were asked. The assessment was carried out by an expert. The maximum score for each question was 10 points.

The results of the theory exam for ChatGPT are presented in Table 2.

Table 2 – The results of the theory exam for ChatGPT

No.	*Brief wording of the question*	*"strict" estimate*	*"non-strict" estimate*
1	Basic concepts of algebra of random events	6/10	7/10
2	Classical probabilistic scheme	7/10	9/10
3	Probability addition formula	5/10	7/10
4	Probability multiplication formula	5/10	7/10
5	Total probability formula and Bayes formula	6/10	7/10
6	Axiomatics of probability theory	6/10	7/10
7	Bernoulli scheme	8/10	9/10
8	Random value. Distribution function and its properties	7/10	9/10
9	Probability density distribution and its properties	7/10	9/10
10	Mathematical expectation and its properties	6/10	7/10
11	Dispersion of a random variable and its properties	5/10	6/10
12	Mode, median, quantiles, moments of random variables	4/10	6/10
13	Distribution laws for discrete random variables	6/10	7/10
14	Laws of distribution of continuous random variables	5/10	7/10
15	Multivariate random variables	4/10	6/10
16	Dependent and independent random variables	4/10	6/10
17	Markov's inequality and Chebyshev's inequality	5/10	7/10
18	Law of large numbers	4/10	6/10
19	Poisson's theorem	4/10	6/10
20	De Moivre-Laplace theorems	4/10	6/10
21	Central limit theorem	5/10	7/10
TOTAL:		113/210 (53.8%)	148/210 (70.5%)

The final result is approximately 62 % of the maximum score. The main types of mistakes made by ChatGPT during the exam are presented below:
- Factual and logical errors;
- Lack of logical connections between answers;
- Poor theorem proving;
- Low quality of generated examples and tasks;
- Numerous arithmetic errors;

The next stage of the study was doing of control work by the model. The goal in this case was to check the quality of problem solving in the R and Python programming languages. In order to objectively assess the quality of the code generated by ChatGPT, it was necessary to specify the programming language before the task condition, as well as specific functions of this language that provide an effective solution. An example request is shown below:

User: *Solve a problem in R using the dbinom ( ) function. The probability of an insured event under one insurance contract is p=0.074. Find the probability that out of 110 contracts 5 contracts will be associated with the payment of the sum insured.*

ChatGPT model generated the code shown in Figure 1.

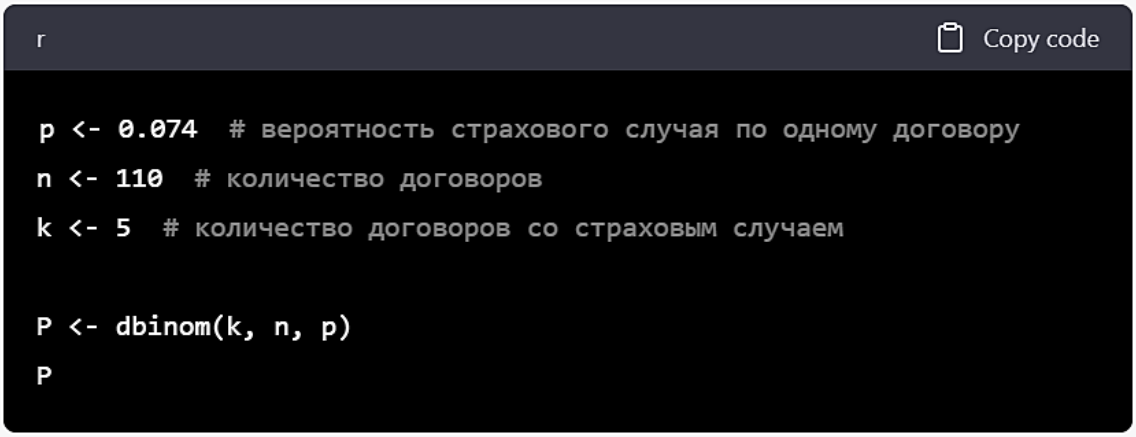


Figure 1. Code written by the ChatGPT model to solve the problem

After the output of the code, the following result was obtained:

ChatGPT: *Answer: the probability that out of 110 contracts 5 contracts will be associated with the payment of the sum insured is 0.064.*

It's important to note that the code was written correctly, but the answer given by ChatGPT is incorrect. The correct answer to the problem is approximately 0.085, as shown in Figure 2.

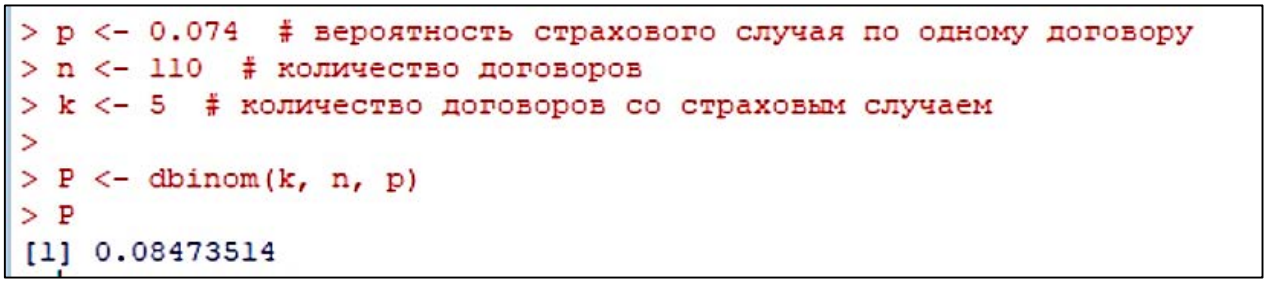


Figure 2. Checking the code written by ChatGPT in the graphical user interface of the R language

This example demonstrates an error that the model repeatedly made during the test. Most of the codes were written correctly in both R and Python, however, each time the model incorrectly calculated the result of its own solution, which could be verified by referring directly to the programming environment.

During the control work, two methods of generating queries to the model were used:

1. Using the phrase "Solve the problem by explaining step by step", which is recognized as an effective way to interact with ChatGPT;
2. Specifying the names of the functions that should be used by the model for the solution. This method simplifies the task for ChatGPT.

The results of the control work are presented in Table 3.

Table 3 – Test results for ChatGPT

No.	*The task*	*R code grades*	*Python code grades*
1	From an urn containing 48 white, 32 red and 59 black balls, one ball is drawn at random. Find the probability that it is red.	2/2	3/4
2	The batch consists of 63 products of the first class and 46 products of the second class. Randomly two items are taken. Find the probability that they are both second class.	3/4	2/2
3	A symmetrical coin is tossed 72 times. Find the probability that the "coat of arms" fell out less than 40 times.	1/2	2/2
4	The shooter can hit the target with every shot with probability p=0.46. Find the probability that the first hit will be on shot number 6.	0/1	1/1
5	The dice is rolled twice. Find the probability that the sum of the rolled points is less than the number 10.4.	1/1	1/1
6	The probability of an insured event under one insurance contract is 0.074. Find the probability that out of 110 contracts 5 contracts will be associated with the payment of the sum insured.	1/1	1/1
7	The probability of having a boy is 0.5058. Find the probability that out of 336 newborn boys there will be more than 170.	1/1	1/1
8	The artificial intelligence system incorrectly recognizes a single character with a probability of 0.048. Find the probability that out of a hundred input characters more than 4 characters will be incorrectly recognized by the system.	1/1	1/1
9	The artificial intelligence system incorrectly recognizes a single character with a probability of 0.048. Find the probability that 86 to 106 characters out of 1900 input characters will be incorrectly recognized by the system.	2/2	1/2

10	The probability of producing a defective part is 0.0038. Find the probability that in a batch of ten thousand parts there will be less than 35 defective ones.	2/2	2/2
TOTAL:		14/17	15/17

Let's make a few comments on Table 3:

- In each fraction of this table, the denominator means the number of requests to ChatGPT for this problem, the numerator is the number of correct answers received to these requests;
- The final results indicate that the quality of model coding in R and in Python is more than 80 % in both cases.

The results obtained during the study cannot but impress. However, the operation of the system is not debugged in perfect form. A model capable of writing codes in various programming languages makes gross errors in arithmetic. Also, do not forget about the factual errors that the language model frequently makes. It is impossible to train the model by an ordinary user, since for this it is necessary to use special methods and machine learning tools [12]. The ChatGPT model is an excellent tool that, at first glance, is able to speed up the routine work of a person and become his assistant. However, while the model cannot be trusted, each of its results must be checked and recalculated, which can make doing simple tasks very time-consuming.

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SECURITIES: PART OF THE GLOBAL FINANCIAL SYSTEM

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Abstract. This article is devoted to the role of securities in the global financial system, their types and classification. The article discusses such types of securities as stocks, bonds, promissory notes and others. The importance of regulating the securities market and protecting investors' rights as an integral part of the global financial system is also emphasized.

Keywords: securities, investing, stocks, bonds, money issue, trading.

ЦЕННЫЕ БУМАГИ: ЧАСТЬ МИРОВОЙ ФИНАНСОВОЙ СИСТЕМЫ

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Аннотация. Данная статья посвящена роли ценных бумаг в мировой финансовой системе, их виды и классификация. В статье рассмотрены такие типы ценных бумаг, как акции, облигации, векселя и другие. Также подчеркивается важность регулирования рынка ценных бумаг и защиты прав инвесторов как неотъемлемой части мировой финансовой системы.

Ключевые слова: ценные бумаги, инвестирование, акции, облигации, денежная эмиссия, трейдинг.

Securities play an important role in the global economy. They allow companies and states to attract additional funds for the development of their activities, which contributes to the growth of the economy as a whole. In addition, securities are a way for investors to earn income and protect their financial interests. Investing in securities can be profitable, but also involves the risk of losses, so it is important to analyze and choose securities based on your financial goals and capabilities. The stock markets, where securities are traded, form prices for many goods and services in the global economy, which makes them an important tool for regulating economic processes on the scale of not only countries, but also the whole world. In general, securities occupy an important and irreplaceable position in the economy and are an integral part of the global financial system.

A security is a document confirming, subject to the form and mandatory requisites, property or nonеproperty rights. It is a source of permanent or one-time income, as well as a financial instrument that allows companies and states to attract additional funds for the development of their activities.

Securities can be of different types. Some of them are:

- Shares: shares owned by a company that are sold to investors. Shareholders receive dividends and have the right to vote at shareholders' meetings.
- Bonds: loans that companies and governments take from investors. The bonds guarantee a fixed income and repayment of the loan upon expiration.
- Promissory notes: short-term loans that companies receive from other companies or banks.
- Investment fund units: shares in the securities portfolio, which is managed by professional managers. Investors receive income from the fund's profits.
- Certificates of deposit: banking instruments that guarantee a fixed income when investing funds for a certain period.

These are only some types of securities, there are many others. The choice of which securities best depends on the individual financial goals and capabilities of each investor. For example, if an investor wants to get a stable income, it is best to choose bonds or certificates of deposit. If an investor is willing to take risks and is looking for an opportunity to get high returns, then shares or units of investment funds may be a suitable choice. However, as mentioned in the article earlier, any securities are a risk, so it is important to analyze and choose them taking into account your position and risk tolerance. It is also recommended to seek advice from a professional financial consultant or a banking specialist who will help you choose the most suitable securities for a particular situation.

Stocks are the most wellknown securities. Despite the fact that there are many types of them, but for operations on the stock market, those that are recommended are:

- Are liquid (they are easy to purchase and also to sell);
- Issued by reliable companies;
- Passed the listing procedure (admission to stock trading).

Both ordinary shares (AO) and preferred shares (prefs, AP) are listed on the exchange. What do these securities give? JSC – the right to vote in management, according to their number. The owners of the AP are deprived of such a right, but they are guaranteed priority payment of dividends according to the shares. Although the owners of the joint-stock company can also receive dividends, but such payment is voluntary on the part of the issuing company.

Bonds are debt securities of different quality. Most often, they are assigned an indicator by special rating agencies. According to the quality, several types of bonds can be noted:

- State (OFZ). The risk on them is minimal, but the yield may be less than the level of bank deposits.

- The bonds of the subjects of the "Russian Federation" and municipalities are considered quasi-state (issued by enterprises and organizations whose controlling stake belongs to the state) securities, due to the fact that the government is de facto responsible for them. Profitability at the level of deposits.
- Blue chips are first class corporate sector bonds.

But how to distinguish a security from an ordinary one? There are many signs, but brokers, dealers, qualified investors, traders and all other professional participants distinguish three main signs:

1. A security secures the rights to a standard asset, while any other non-security secures the rights to an asset that does not belong to the standard (net).
2. The security has a value. This means that the paper has a monetary equivalent
3. The security is issued according to the requirements established by law.

Securities can be issued only by joint-stock companies (in the field of industry), the state, as well as trade: utilities and household services, credit and finance. This means that the free issue of securities that do not include mandatory information will be considered invalid.

The issue of securities is a very complex and lengthy procedure. It includes five stages and a large number of participants, and even if the Bank of Russia does not record one of the stages or at least one participant in the process is absent, the issue of assets will simply not be registered. These steps include:

1. The Issuer decides to place the securities on the stock market.
2. Approves the decision on the issue of securities in the event that shares or securities convertible into shares are subject to issue.
3. Then issues state registration for the issue of assets.
4. Securities are listed on stock exchanges, that is, the issuer places assets on them.
5. After the placement, he makes a report on the results of the issue.

Having passed the money issue, thanks to securities, the business reaches a new level. Attracting money, investments and means of payment -all this is received by the issuer at the output. Let's consider each possibility separately:

1. Raising money. Large businesses can place securities on the stock exchange without the help of others, in order not to take loans from the bank. Firms have every chance to issue shares, wanting to sell the company's share to ordinary investors and getting money for it. You can also issue loan capital and borrow funds from investors, not from a bank. For example, the EMTN program was created in order to attract borrowings for Gazprom PJSC from international capital markets and is a multi-currency revolving credit line in the amount of up to $ 40 billion.
2. Investments. The purpose of attracting investors depends on the stage of business development. For example, startups need money to develop a new product or a new service, and it takes investment and time to find potential customers and launch production. For a business that has long been established in the market, the support of a partner will expand the boundaries of influence and reach a new level of consumers.

3. Means of payment. Securities are used as a means of payment or its insurance. This way you can delay the payment, but at the same time guarantee that the counterparty will receive it. You can insure the contract with an independent guarantee, which used to be called a bank guarantee.

Separately, I would like to mention the classification and types of state (municipal) securities. In turn, municipal bonds are a financing tool at the local level and are usually used to solve current problems. The issue of government securities is associated with attracting large-scale investments for the implementation of important projects and programs, while municipal bonds are used to finance activities at the local level.

Depending on the criterion underlying the classification of state (municipal) securities, there are also the following signs:

1. By type of issuer:
   - Government securities;
   - Municipal securities.
2. According to the form of appeal:
   - Marketable securities traded on the secondary market;
   - Non-market securities that do not have a secondary market.
3. By the terms of treatment:
   - Short-term (up to 1 year);
   - Medium-term (from 1 year to 5-10 years);
   - Long-term (over 5-10 years to 30 years).
4. By the method of income generation:
   - Discounted or sold to investors at a price below par. Upon repayment, the investor receives income in the form of the difference between the nominal value and the purchase price;
   - Coupon – issued together with coupons for which coupon income is paid with a certain frequency;
   - Indexed bonds – the nominal value increases, for example, by the inflation index;
   - Winning – income is paid in the form of winnings, etc.
5. By the purpose of the issue:
   - To cover the permanent deficit of the state budget, passing from year to year. As a rule, medium-term and long-term securities are issued for this purpose and serve the systematic debt of the state;
   - To cover temporary budget deficits (cash gaps), which are formed in connection with a certain cyclical nature of tax receipts and fixed expenditures from the budget;
   - To cover the public debt of enterprises and organizations.
   - Target bonds issued for the implementation of specific projects;
6. According to the form of issue:
   - Documentary;

– Undocumented.

7. In the form of the exercise of rights:

– Bearer;
– Personal.

For example, in the Russian Federation for the entire period of issue and circulation of government securities of the Russian Federation (since 1991) there were several types. Some of them have been repaid and have long been out of circulation. Let's briefly consider some types of securities issued in Russia from 1991 to the present.

1. Government long-term bonds were put into circulation on July 1, 1991 in accordance with the "Terms of issue of the State Republican internal loan of the RSFSR 1991" It was the issue of government long-term bonds that marked the beginning of the creation of a civilized securities market.

2. Privatization receipt – intended for payment of privatized objects of state and municipal property. It has been used in Russia since January 1992 as an instrument of denationalization and transfer of state and municipal property to private ownership

3. Domestic government foreign currency loan bonds are a special class of financial instruments denominated in foreign currency and traded both within the Russian Federation and abroad. These bonds were issued by the Ministry of Finance of the Russian Federation on May 14, 1993 as part of the restructuring of Vnesheconombank's debt to resident enterprises whose foreign currency accounts in Vnesheconombank were frozen as a result of an actual default in 1991.

4. Government short–term coupon-free bonds of the Russian Federation – government securities issued by the Ministry of Finance of the Russian Federation.

5. Bonds of an external bond loan (EIA). Denominations are expressed in US dollars or euros.

6. Bonds issued by the Ministry of Finance of the Russian Federation for processing federal budget debt to the Pension Fund of the Russian Federation.

7. The bonds of the state republican internal loan (1991) were placed only among legal entities (with a limited range of circulation).

8. Bonds of the Republican domestic currency loan (1992), were issued to replace the winning loan of 1982.

9. Government savings loan bonds – buyers can be individuals and legal entities. The owner gets the opportunity to choose two types of income: a) in the form of interest accrued on their nominal value; b) the difference between the sale price and the initial purchase.

10. Eurobonds are bonds issued in foreign currency. Russia first entered the Eurobond market in 1996.

Securities are important because they provide investors with the opportunity to diversify their investments and manage risks. By investing in different securities, investors can spread their risk across different asset classes and industries, reducing the impact of any single investment on their overall portfolio. In general, securities

play an important role in the modern economy, providing access to investment opportunities and financing of companies.

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WAYS OF KEEPING ACCOUNTING FOR INDIVIDUAL ENTREPRENEURS

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Abstract. The article analyzes various methods of bookkeeping in the activities of individual entrepreneurs, including the procedure for filling the books of income and expenditure. The most optimal ones were identified and justified. Also, in the course of the study, some shortcomings of the provided methods were specified, and common errors in accounting were identified.

Keywords: accounting, individual entrepreneur, tax reporting, accounting methods, outsourced accountant, online accounting services.

СПОСОБЫ ВЕДЕНИЯ БУХГАЛТЕРСКОГО УЧЕТА ИНДИВИДУАЛЬНЫХ ПРЕДПРИНИМАТЕЛЕЙ

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Аннотация. В статье проанализированы различные способы ведения бухгалтерского учета в деятельности индивидуальных предпринимателей, включая порядок заполнения Книги учета доходов и расходов. Из них были выделены и обоснованы наиболее оптимальные. В процессе исследования также был отмечен ряд недостатков представленных способов, выявлены распространенные ошибки в ведении бухгалтерского учета.

Ключевые слова: бухгалтерский учет, индивидуальный предприниматель, налоговая отчетность, способы ведения учета, бухгалтер на аутсорсе, онлайн бухгалтерия.

The rationale of the conducted research is caused by the need to educate entrepreneurs about the specifics of small business accounting. In today's world, the number of economic players who are small businesses is increasing at an enormous rate. Small businesses and individual entrepreneurs are gradually occupying more and more market niches, but in building their businesses, entrepreneurs often make the mistake of not paying due consideration to the construction and operation of business accounting. In this paper, we investigate the accounting treatment of self-employed individuals.

The most common mistake entrepreneurs make when starting a business is misinterpretation. The Federal Law of 06.12.2011 N 402-FL “On Accounting” says: “Accounting in accordance with this Federal Law may not be kept by: an individual entrepreneur, a person engaged in private practice – in the case, if in accordance with the legislation of the Russian Federation on taxes and fees, they record income or income and expenses and (or) other objects of taxation or physical indicators characterizing a certain type of business activity” [1], based on the abovementioned, it follows that individual entrepreneurs are partially not subject to accounting. However, most entrepreneurs, seeing the first part of this paragraph, decide that they are exempt from such a burden as accounting at all.

The above discussion convinces us that good record-keeping from the outset plays a significant role, and there are a number of reasons for this:

– Choosing the right taxation system will allow to keep proper tax records and reduce tax burden.

– Persons who fail to submit their returns by the specified deadline may be penalized by the tax authorities, leading to a number of problems.

– Which tax regime (Table 1) the organization chooses will determine the deadlines for paying taxes, benefits the organization will be able to use, and the composition of its tax returns [2].

Table 1 – Tax regimes

taxation system	types of taxes	notes
general taxation system	- personal income tax (PIT) - value added tax (VAT)	
simplified taxation system	- single tax on simplified tax system (~~PIT and VAT~~)	
single tax on imputed income	- single tax on temporary income (~~PIT and VAT~~)	applies only to certain types of activities
single agricultural tax	- unified agricultural tax (~~PIT and VAT~~)	used only by persons who conduct agricultural activities
patent system of taxation	- tax in the form of a patent (~~PIT and VAT~~)	applies only to definite types of activities

A qualified person is needed to keep correct records and accounts. In the organization this role belongs to the accountant. But is it always necessary to have an accountant on staff? The answer to this question is very simple – no. Modern realities allow an individual entrepreneur to independently choose who should keep accounting: an entrepreneur can keep it himself, can entrust this activity to one of his employees, or invite an accountant as an outsourcer. [3]. If the most attractive option out of those provided is to be selected, then a specialist from an outsourcing company is the best variant for bookkeeping because:

– Outsourced accountants are more motivated to perform their duties well, as their fees depend on how well they perform their work, while an accountant working in a company may not be interested in the result of his work, because no matter how well his duties are performed he still gets paid for his work.

– An in-house accountant may be unaware of the latest changes in legislation and all possible reporting rules due to various circumstances, while outsourced accounting specialists constantly monitor all possible updates and amendments of legislation.

– If the organization has a minimum number of transactions, paying an in-house accountant may not be a rational expenditure, whereas payment for an outsourcer is much less [3].

However, despite the advantages of outsourcing accountant, there are online accountancy services for the entrepreneurs who wish to keep their own books. These services are easy to use and have a significant number of advantages:

– These services are set up to automatically tracking of all changes and amendments to legislation, which makes life much easier for the entrepreneur.

– Online accounting services use data encryption technology and storage in the cloud, which means increased data security and the ability to access accounting data from any medium, as the databases are not tied to any device.

– It also follows from the above that using online bookkeeping allows to keep records from anywhere in the world, as there are no location restrictions [2].

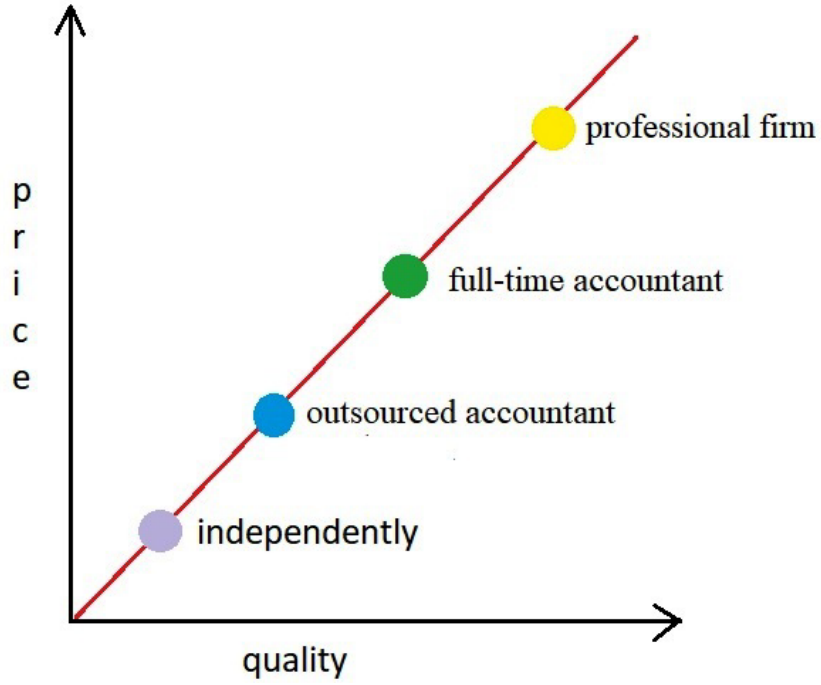


Figure. Options for supporting the accounting of an individual entrepreneur

But in spite of all the advantages, there are also a few disadvantages to this type of accounting:

– For stable operation, it is vital to have constant access to the Internet, because without it the services cannot work.

– These accounting services do not always allow customizing the software for a particular user [2].

For those who manage the accounting of an enterprise on their own, it is important not to forget the dates for filing tax returns and paying taxes for individual entrepreneurs in 2023 under different regimes. For clarity, date data were collected in a single table (Table 2) [5].

Table 2 – Dates for filing tax returns and paying taxes for individual entrepreneurs in 2023

Regime	*1st quarter*	*2nd quarter*	*3rd quarter*	*4th quarter*
simplified tax system	advance payment – 28.04	advance payment – 28.07	advance payment – 30.10	declaration – 25.04 annual tax – 28.04
single agricultural tax		advance payment – 25.07		declaration - 27.03 annual tax - 28.03
general (traditional) taxation system	VAT Return – 25.04 Payment of a tax – 28.06	VAT Return – 25.07 Payment of a tax – 28.09 Advance payments of personal income tax – 25.07	VAT Return – 25.10 Payment of a tax – 28.12 Advance payments of personal income tax – 25.10	VAT Return – 25.01 Payment of a tax – 28.03 Declaration of personal income – 02.05 Annual tax – 17.07

Obviously, in today's realities, the entrepreneur has a wide range of accounting options and how exactly to organize accounting depends only on him or her.

The individual entrepreneur keeps records of income, expenses and various business transactions in the “Income and Expenses Log Book” (IELB), which is designed to summarize, systematize and accumulate information contained in primary documents.

Accounting and business transactions are implemented in national currency – rubles [4, p. 188]. Filling in the IELB is implemented in Russian language, and if the documents are in a foreign language or other languages of the peoples of Russia, then a line-by-line translation into Russian must be presented. The IELB itself is maintained on the basis of accepted primary documents and reflects the property status of the individual entrepreneur and the results of his activities for the tax period. It can be conducted both on paper and on electronic media, but after the expiration of the tax period, the individual entrepreneur must necessarily bring it to paper [5].

The entrepreneur has the right, in view of the specifics of his activities, to draw up a different form of the Accounting Book, including in it indicators related to the characteristics of his activities. This book must be numbered and laced, and on the last page the individual entrepreneur indicates the exact number of pages contained in it, which is certified by the signature of an official of the tax authority and affixed with a seal and the beginning of its maintenance.

Corrections in the IELB must be justified and confirmed with the signature of the individual entrepreneur, indicating the date of its correction. The accounting procedure establishes a number of requirements for the individual entrepreneur according to the documentation drawn up by the individual entrepreneur himself [5]:

1. Primary accounting documents must contain the signature of the individual entrepreneur.

2. Primary accounting documents must be drawn up simultaneously with the business transaction, if this is not possible, then immediately after the end of the transaction.

3. It is not allowed to make corrections to cash and bank documents. Corrections can be made to other primary documents only upon agreement with the persons who compiled and signed these documents, which is confirmed by their signatures.

The individual entrepreneur has the right not to maintain accounting registers, but he is obliged to draw up a primary document for each fact of economic life, that is, to document information about accounting objects. Cash transactions consist of receiving and issuing cash. Incoming and outgoing cash orders are collectively referred to as primary cash documents. True, the entrepreneur does not have a cash register. The cash desk as a place for cash transactions is established only by legal entities. The entrepreneur is obliged to draw up cash orders when he makes cash settlements with other persons [5].

Thus, it can be concluded that sole proprietorship is a very complicated process and involves the highest degree of responsibility of the physical person, the founder, for the results of his own actions. He is liable for his obligations with all his property, except those, which, in accordance with the law, cannot be levied. There are many ways of doing business accounting for sole proprietors and at first, they should explore the most or even all of them – their shortcomings and strengths, and only then choose the most appropriate just for him.

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ETHICS OF APPLYING NEUROMARKETING IN SALES MANAGEMENT

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Abstract. This paper examines the ethics of neuromarketing, a field that analyzes marketing and consumer behavior using neuroscience techniques. While studies show the benefits of incorporating neuroscience into marketing and sales management, the lack of clear ethical guidelines has led to controversy and legal issues. Using a qualitative case study approach, the research aims to establish universal ethical boundaries for neuromarketing. The results offer suggestions for beneficial practices for both corporations and consumers.

Keywords: neuromarketing, marketing, sales management, ethical issues.

ЭТИКА ПРИМЕНЕНИЯ НЕЙРОМАРКЕТИНГА В УПРАВЛЕНИИ ПРОДАЖАМИ

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Аннотация. В данной статье рассматривается этика нейромаркетинга – науки, которая анализирует маркетинг и поведение потребителей с использованием методов нейронауки. Хотя исследования показывают преимущества включения нейронауки в маркетинг и управление продажами, отсутствие этического регулирования приводит к спорам и юридическим проблемам. Для установления универсальных этических границ для нейромаркетинга мы использовали качественный подход с изучением конкретных случаев. Результаты отражают предложения по полезной практике как для корпораций, так и для потребителей.

Ключевые слова: нейромаркетинг, маркетинг, управление продажами, этические проблемы.

Introduction

Ale Smidts, a professor at Erasmus University, Rotterdam, coined the phrase "neuromarketing" in 2002. He decided this word to characterise brain mapping, a commercial application of neuroscience and neuroimaging technologies. According to Smidts, the goal of neuromarketing is to "improve the efficiency of marketing

strategies by researching the brain's response" and to "better comprehend the consumer and his reaction to marketing stimuli by directly measuring processes in the brain." Attempts to comprehend consumer behaviour through the study of the human brain's work, on the other hand, were made much earlier than 2002 [1]. In general, at the beginning of the 21st century, researchers analysed the behaviour of customers through experiments, and the main task was to increase sales efficiency. However, over time, the question arose about the quality and very process of using neuromarketing agents.

Nowadays, neuromarketing is considered as a new discipline in which academic and corporate researchers analyse marketing tactics and customer behaviour using neuroscience approaches. It is believed that using neuroscience methodologies allows for a more direct knowledge of how brain states and other physiological factors affect consumer behaviour and decision-making [2]. Modern research emphasises not only the effectiveness of the use of neuroscience in marketing processes, but also the possible unpleasant consequences for the buyer, or even for the company, related to the law. Nevertheless, the majority of papers do not disclose the degree of ethics of neuromarketing agents, the difference between ethical and unethical is not always obvious, and practical applications of these agents by various companies are not described.

In contrast to traditional marketing, neuromarketing seeks to get into the subconscious aspect of decision-making, because consumers are unable to articulate the true reasons for their purchases and why they chose this particular product over others.

In terms of motivation, we are interested in learning more about practical application of neuromarketing techniques, as well as investigating consumer behaviour and existing manipulation tools employed by large corporations, and any ethical issues that may arise. It would also be beneficial for us, as ordinary customers, to be aware of such methods so that we can spend our money and time wisely. Research Problem

The ethics of neuromarketing tools and their application are raised within any Acceptance of Institutional Review Board (IRB) organization that uses advertising, develops pricing and is customer-oriented [3]. Using such tools is an effective and yet dangerous approach for marketers to implement in an ethical manner. So, every effective means of sales should be criticized and ethically acceptable. Based on this, certain principles should be developed that can potentially be applied in practice and implemented in a company, industry or economy.

Analysis of the problem will be carried out based on the collection of data from various companies (customer surveys, revenue growth rates, results of eye-tracking, etc.). However, researchers had to rely on the fact that they would be notified about a marketing message by the purchasers themselves until recently (through questionnaires, focus groups, interviews, etc.). People were assumed to be able to describe and forecast their own cognitive processes. Therefore, we can gain a more objective picture of consumer behaviour by analysing brain responses. These studies will aid in reducing risks when releasing new items or making substantial changes that may have an impact on the brand's overall perception. Companies can increase

audience segmentation and customise marketing and sales experiences at the tactical level.

Research Question

Having stated the problem for the research we can now form the research question: To what extent the application of neuromarketing tools is ethical? The main research question is connected with ethical side of neuromarketing techniques.

Naturally, neuromarketing research can assist businesses in creating a more appealing trade environment, as well as developing effective sales methods and marketing materials. Nonetheless, while the promise of combining neuroscience, virtual reality, and marketing appears to be very appealing, neuromarketing has a number of drawbacks for which it is criticised.

For the "red button" to perform properly right now, knowledge of neuromarketing is most likely insufficient. Companies may be able to establish the proper purchasing habits, but only for a limited time and without putting a person in danger. However, this does not negate the fact that the opportunity to violate this moral boundary will undoubtedly arise in the future [4]. It is all about human dignity here. Do companies treat people like living beings with hopes and dreams? Or do companies regard them as manipulable objects based on our knowledge of how the brain functions?

When there is a desire and potential to earn a lot of money, the difficulty occurs. As a result, many businesses may abuse neuromarketing in an attempt to shift from persuasion to manipulation. At this stage, it is worth evaluating all the efforts invested in the advertising campaign. Some experts believe that if the company is honest and helps the client get the best - this is not manipulation or violation of ethics. However, the concept of "best" can differ among everyone. The Association of Science and Business of Neuromarketing has also published an ethical code to preserve universal human values and avoid fraud and manipulation. During the analysis process, it can be used as a tool to answer the research question.

As for the practical side of the question being raised in the research paper, it is vital to say that there are a number of approaches when applying the theory discussed above. Due to the fact that the usage of neuromarketing is still relatively new in the majority of countries, most people, as well as the ones in the marketing industry, are unsure of the correct implementation and which techniques should be avoided, including the possible dangers that neuromarketing can provide. Furthermore, with no regulations and norms being present, it is conceivable for business employees to misuse neuromarketing data. Thus, there are some strategies that marketers may use to remain morally honest and diligent before forcing neuroscience into their businesses.

The findings of the paper and possible scientific contribution could help to correctly implement the neuroscientific approaches into business through the ethical codes. Such ethical codes and guidelines are to be regulated by the Association of Marketing Industry (AMI) Advertising Alliance that is responsible for watching over the marketing industry in Russia. The question of executing the guidelines for controlling the usage of neuromarketing is inevitable since the industry keeps evolving including more innovative ways to raise the efficiency of advertising and

customers should be protected from the overuse of such new techniques and the potential damaging effects. Therefore, companies' ethical behaviour requires ethical norms and guidelines. Companies must follow ethical codes' guidelines [5]. Neuromarketing research raises a slew of ethical challenges for marketers to consider [6]. The National Society for the Advancement of Neuroscience in Business (NMSBA) Code of Ethics for the Application of Neuroscience in Business is being used. This code ensures that the neuromarketing study adheres to the highest ethical standards. The code focuses on three key elements: establishing public trust in neuromarketers' honesty; safeguarding participants' privacy; and safeguarding neuromarketing service purchasers. The codes play a significant role in ensuring that neuroscience technologies are used correctly in marketing. Furthermore, infractions of these standards might lead to ethical crises, which may obscure the benefits of neuromarketing while embracing its drawbacks [7].

Literature Review

In the following segment, we examine the literature on our topic and research question with the purpose of further development on existing research gap. To begin with, it is needed to define the phenomenon of neuromarketing, the ways it is used and the related terminology. Secondly, we describe the ethical issues that arise from the usage of neuromarketing as well as discussing what aspects the prior studies disagree on. What else is important to point out is that the opinion on a topic expressed by different researchers varies to the extreme degree, making it difficult to follow a consistent logic while making a summary.

However, it is vital to note that there exist several limitations to our research, regarding the fact that the field of neuromarketing is relatively new, therefore, its implementation and the following effects are not fully discovered yet, and, as a result, it is difficult to single out all of the ethical concerns that arise from the use of neuromarketing techniques [8].

Theoretical foundation

All the literature analysed below was chosen with the consideration of the research question. Moreover, many of the papers describe some specific cases with no universal rules of the ethical side, providing a wider space for the analysis of the neuromarketing implementation.

Starting with the data collection and with the purpose of improving marketing theory and practice, neuromarketing seeks information and insights beyond those revealed by standard techniques such as surveys, focus groups, experiments, and ethnography [9] The last one is the systematic study of individual cultures and is a part of anthropology [10]. Ethnography investigates cultural phenomena from the perspective of the study's subject. We found this technique interesting and helpful in describing the core reason of the decision-making process.

With the purpose of improving marketing theory and practice, neuromarketing seeks information and insights beyond those revealed by standard techniques such as surveys, focus groups, experiments, and ethnography [10]. This helps to implement more precise methods in marketing, changing the traditional marketing. Some researchers, for instance, Mileti, Guido, and Prete (2016) suggest that neuromarketing has aided the change of marketing by demonstrating how unconscious reactions and

emotions may influence customer perception and decision-making. Neuroscience, applied to marketing, helps to or improve the accuracy of predictions of consumer behaviour by using the more precise methods, excluding number of biases that are unavoidable in traditional marketing research [11].

One of the main findings of prior research is neuromarketing techniques. The table below contains the tools themselves and the human factors they assess.

Table – Neuromarketing techniques

Factors	Brain imaging	Physiology	Interventions
Techniques	Functional magnetic resonance imaging (fMRI) Electroencephalography (EEG) Magnetoencephalography (MEG)	Hormones (e. g., testosterone, menstrual cycle) Eye tracking (eye-tracker, VR/AR) Electromyography (EMG)	Transcranial magnetic stimulation (TMS) Drug administration/ neurotransmitter depletion Positron emission tomography (PET)

The methods outlined above differ not only in terms of the data they provide and the brain processes they track, but also in how frequently academics and industry use them. The fundamental driver of this difference is a cost-benefit analysis [12]. The expense of conducting neuromarketing research is on average quite high. Because it directly measures what customers are looking at with great temporal resolution, eye tracking has increased in appeal in industry due to its low cost, ability to be performed in a variety of contexts, and close linkages to advertising [13]. New companies are developing low-cost neuromarketing tools for use in the industry, however the data provided by these tools is heavily reliant on the training and skill of those collecting and evaluating the data.

While electroencephalography (EEG) has been used to research marketing preferences for over 35 years [14], there is little doubt that we have entered a new era of neuromarketing in which modern technology is being utilised to explore customer preferences in novel ways. In recent years, positron emission tomography (PET), functional magnetic resonance imaging (fMRI), and quantitative EEG studies have been utilised to examine consumer behaviour in a slew of peer-reviewed academic papers [15]. Also, it is important to mention that different technologies necessitate different levels of competence; an expertise in fMRI analysis may not be an expertise in EEG analysis, and vice versa. Other neuroimaging technologies, such as magnetoencephalography and cortical manipulation with transcranial magnetic stimulation, and configurations of modalities, are expected to be adopted by "market

researchers who wish to deploy a specialised neuromarketing profile," according to the report.

Moreover, the translation of the brain's extraordinary connectivity - the human brain is arguably the most complex biological organ in the known universe, with tens of billions of cells, each of which makes thousands of connections with other cells - into the complex repertoire of behaviour exhibited by humans is a significant challenge for scientists working in the field of neurobiology. Colour-coded representations of brains in motion accompanied by neuroscientific explanations, on the other hand, are highly persuasive to the general audience [16]. As a result of this contradiction, highly knowledgeable scientists, who are vulnerable to both public adulation and commercial motives, are tempted to propose simplified answers to what are, in reality, complex concerns.

As the sphere of neuromarketing expands, ethical concerns remain, and some of them are becoming more serious. As for the result, the following is an ethical criticism of neuromarketing:

- unethical methods of research
- using technologies in an immoral manner
- consumer manipulations

It is natural to conclude that most of them are associated with violation of the rights and personal boundaries of the individual. Such violations concern both individuals and, in the long term, society as a whole. However, according to an opposite view, the majority of the modern ethical risks associated with neuromarketing are unfounded [17]. This is because they anticipate that neuromarketing has capacities that it will not be able to attain in the near future. Considering all, we will analyse the realistic ethical issues that occurs in neuromarketing techniques:

1) Fear that neuromarketing will make people's decisions perfectly predictable

It is important to mention that predictions are considered as regular practices for traditional marketing, however, they are more concentrated in neuromarketing [18]. This particular fear occurs because customers may state that neuromarketing allows to identify their decision-making before they make it.

2) Fear of treating customers as a "tool" rather than a full-fledged person with dignity

This view of consumers as predetermined machinery is humiliating, hazardous, and immoral to many people. The claim is that neuromarketers treat customers as if they are just objects to be utilised as a means to the neuromarketers' aims. Neuromarketing, on the other hand, does not rely on this skewed customer perception for at least two reasons:

- Predictions in neuromarketing are probabilistic rather than deterministic. Neuromarketing companies do not have to imply that their customers' behaviour is totally predetermined; instead, they can state that customers have the ability to refuse to buy their items. However, the field is nowhere near this degree of prediction, and it is unlikely that such confidence will ever be achieved in practice.

- Even if neuromarketing corporations can forecast consumers' choices, they don't have to consider them as mere tools. Instead, they can assist customers in obtaining the things they desire and have cause to want in a more efficient manner, which is a great practice and a common marketing goal. Because predicting conduct is not the same as coercing customers against their wills, prediction does not have to deny or diminish the reasoning or dignity of those whose behaviour is foreseen.

Another aspect of our theoretical foundation is the field of legal regulations. From a legal perspective, firms' actions are regulated internal and external codes that outline the boundaries of ethical behaviour and protect customers' rights [19]. The Human Rights Act (1998) states that one's confidentiality could only be disclosed with that individual's consent in an appropriate manner. Otherwise, the act of misuse of personal data gained through the research violates the right to respect for one's private life. The question arises: whether the usage of the data gained through neuromarketing research with the purpose of increasing sales could be considered as a disclosure of personal information and to what extent. Nowadays, the Human Rights Act (1998) does not regulate this aspect.

Secondly, as a source of external codes of ethics, controlling companies in marketing research, we could mention a number of independent organisations. One of the most often referred to is ICC/ESOMAR International Code. It is more convenient to apply to our research since it studies marketing research ethics. It covers the ethicality of gathering data from potential consumers as well as protection of data from disclosure and misuse in the way that might harm the participants of the research

Companies' internal regulations will be discussed in the Case Study section for the reason that it is easier to analyse the application of the code of ethics while reviewing the particular cases when it was used.

Having observed the literature, we can conclude that there is a gap that remains unexplored in the prior research. Firstly, a huge amount of articles only describe experiments concerning neuromarketing without analysing or hypothesising. As a result, a reader gets a detailed description of the procedures without criticism. Secondly, the exact boundaries of the use of neuromarketing tools were not legally fixed by law or ethical code. The existing codes regulate ethical aspects of marketing without considering the issue of potential violation of human rights by using neuromarketing and thus influencing the subconscious processes of an individual. The reason being, the usage of neuromarketing techniques for consumers, and the norms of the ethical code established in the community of marketers and advertising specialists were not presented.

Methodology

The research uses qualitative methods to explore the ethics of neuromarketing, focusing on the behavioral outcomes of neuromarketing techniques on consumers. A case study approach is chosen to provide an in-depth understanding of the relationship between consumers and businesses. Purposeful sampling is used to select several cases from various industries to develop a more comprehensive understanding of the topic. The goal is to create a universal ethical theory for companies to implement in their use of neuromarketing.

Case Analysis

1. McDonald's. Fast food advertising, such as those from McDonald's, are frequently more attractive than they appear. The company often use a simple visual way to attract a client, which naturally affects brain activity and causes appetite and subconscious desire in the consumer. However, there is no guarantee that the brand does not use neuromarketing tools to launch such an attractive ad.

Ethical issues. Ethics critics raise the issue of an advertisement that does not accurately depict the product picture. The images on billboards and commercials drastically differ from what customers see on their tray – the desired Big Mac seems ridiculously little and appear less tasty. As a result, the question of whether this is deemed a benevolent act has arisen. The reason for this is that firms like McDonald's manipulate and influence consumers with their highly appealing ads, even when the dishes look nothing like what they advertise [7].

Moreover, according to McDonald's Code of Ethics, they promise that before the consumers reach the restaurants, with truthful, tasteful, and befitting of one of the world's most well-known retail brands advertising and marketing. Therefore, the company violates the Code of Ethics (McDonald’s Corporation, 2017).

Results. Neuromarketing provides the growth of product popularity through efficient advertising. Such ads are not an exception. Also, consumers’ dissatisfaction with the appearance of food did not arise because most loyal customers prioritise the taste instead of the look. Hence, as long as this issue is acceptable by consumers, it can be said that no harm or malicious tactic is being practised.

2. Campbell’s Soup. From 2008 to 2010, Campbell used neuromarketing techniques to understand how product advertising and displays affected customers' perception of their products, using Innerscope Research to measure physiological changes. Based on the research, they made changes to their packaging, including adding steam imagery for a warm emotional response, and removing the red streak which made it difficult for customers to choose flavors. Despite this, Campbell was named one of the World's Most Ethical Companies for 2010 by the Ethisphere Institute for their ethical business policies and contributions to the community.

Ethical Issues. No ethical issues were identified in the study, as participants were informed and agreed to the use of their personal data. Campbell has a responsibility to protect consumer privacy and handle information honestly, according to its Code of Ethics and Personal Information Policy (Campbell’s Soup Company, 2020). Employees must follow information access rules and properly restrict access to consumer information.

3. *Pepsi vs. Coca-Cola.* PepsiCo's '80s TV campaign asked consumers to blind taste test Pepsi and Coca-Cola, with most preferring Pepsi. But a 67-person fMRI experiment by neuroscientist Dr. Read Montague found that while blind taste activated the brain's reward system, knowing the brand activated the medial prefrontal cortex, indicating emotions and memories associated with the brand influenced choice. Coca-Cola's long-established emotional connection with consumers was more powerful than taste, while Pepsi's preference was taste-dependent [17]. Coca-Cola implemented neuromarketing in ad performance programs in 2013, leveraging its brand name and emotional bonds.

Ethical issues. The Pepsi experiment was done with the volunteer will of participants, that means the study was ethical towards individuals. However, the only issue appeared is that neuromarketing of Coca-Cola compromises the quality of the product. The corporation can attract customers through its brand identity, but without making the product better in terms of increasing sales. Such actions may be considered unethical attitudes toward the consumer. In terms of the Code of Ethics of PepsiCo, the rules of marketing honesty were kept, the experiment was real (PepsiCo, 2008).

Results. Neuroscience has shown that the actual reason people prefer a certain product is not that it is actually better, but because they have certain associations with the brand. Moreover, the fact that the taste or quality are insignificant compared to the brand label shows that it is difficult for new brands to enter the market when the dominant companies already created strong associations for customers. As for the results, when participants were told whose brand they were tasting, they altered their minds, and Coca-Cola was declared the winner [18].

4. *Hyundai.* Hyundai conducted a Neuromarketing study in 2011 with the goal of testing a new sporty type car. For this study, 15 men and 15 women were asked to stare at particular segments of a car (bumper, windshield, and tires) in order to capture certain brain patterns that could lead to a purchase decision. "We want to know what consumers think of a car before we start manufacturing thousands of them," said Dean Macko, manager of brand strategy at Hyundai Motor America. The study used EEG devices to engage the primitive or reptile areas of the brain, which recognized that the subjects were looking at a car and had prior experience with cars. While men and women looked at the car, their EEG signals were recorded and analyzed in order to learn about their preferences and how they influenced decision-making [19].

Ethical Issues. Ethics issues were not discussed or raised. There were no concerns raised by any of the studied men/women or experts. Companies utilize electroencephalography to monitor test subjects' brain activity when they watch, hear, or even smell items or advertising. EEG is less expensive than fMRI and is used more often. This kind of studies are required to develop product adjustments.

Also, according to the Code of Ethics of Hyundai they must not make decisions that endanger the safety of customers at any stage of the business, including research and development, raw material procurement, manufacturing, sales and distribution, and after-sales support. Furthermore, they must refrain from engaging in any activity that would jeopardize the quality standards required to consistently supply clients with great products and services (Hyundai Motor Company, 2020).

Results. After an hour of presenting the particular design components, they used this ‘feedback’ to make improvements to the car before mass production. The study's findings revealed that the subjects' feelings from the middle brain caused the car's exterior to change [18].

Discussion

As the primary results of the research, it could be seen that not all of the cases of the implementation of the neuromarketing techniques into marketing research were unethical. Meanwhile, most of the prior studies suggest that the boundaries of ethical

usage of neuroscience in marketing research are not explored or implemented into the existing marketing code of ethics [6]. Therefore, it is reasonable that some rational questions arise.

First, the majority of real neuromarketing cases were done ethically. Does it mean that no one would choose to conduct an unethical neurostudy over an ethical one?

It means that companies are open to provide their ethical experience, however, unethical cases mentioned happen much less frequently based on reputation retention. Not any company is ready to share such practice, and services that provide neuroscience study do not disclose information about their clients due to confidentiality.

Conclusion

Creating an effective marketing strategy is essential to the success and viability of a product or service in a crowded market. The modern consumer is more interested not in the product, but in its presentation. The main aim of marketing activities is to attract buyers, which is carried out on the basis of psychological impact, and identifying consumer response to the products and services offered.

Above, we discussed the importance of effective marketing strategies to attract buyers in a crowded market. The article highlights the growing significance of neuromarketing, a method that analyses consumer behavior, and aims to differentiate between ethical and unethical usage. The study provides insights into human behavior, ethical limits, and consumer protection and privacy rights, with the goal of understanding the demands of companies, marketers, and the public.

Based on the cases, we conclude that mostly ethical concerns are put forward by experts or third parties, and not by participants in neuromarketing research. Buyers in neuromarketing research are aware of the subtleties and agree to the collection of personal data. The question is whether neuromarketing is ethical as long as there is consent and adherence to ethical policies. The study recommends setting boundaries in the consumer/company interaction to protect human health and safety, emphasizing consumers' autonomy, privacy, and secrecy. Following norms and laws and retaining consumer trust are crucial for ethical neuromarketing.

Regulatory implications

For the regulatory justification, it is reasonable to apply the results of the research to the existing rules of the International Chamber of Commerce and the European Society for Opinion and Marketing Research due to the fact that all of the companies mentioned in the cases operate within the international market and should abide by the legal framework of the region.

Now we are to dwell on the practical implementation of the results in the legal field:

1. Only one of the cases discussed above violated the first fundamental principle of the ICC/ESOMAR International Code, since the customers were not informed about being tested. All the rest of the experiments were executed under the consent of the participants.

2. None of the cases violated the second principle of the Code, since the data retrieved from the experiments was protected from unauthorised access and left participants anonymous

3. Two of the discussed cases violated the third rule of the Code by using the results of the neuromarketing research against customers' interest and increases their sales by exploiting data retrieved from the experiments

As seen above, comparing the results of neuromarketing implementation with the existing practices gives the perspective that it should be considered legal to use neuroscientific tools with the purpose of marketing research.

The results could be interpreted the following way: even though the previous researchers mainly suggest that implementation of neuromarketing tools is harmful at the core and should be avoided for the reason that it limits the free will of the consumer [18]. However, comparing the results of our research to the International Code of Marketing ethics it is clear that some of the cases could not be considered unethical since they do not violate any of existing principles.

Limitations & Future Research

As any research, this one also has biases and limitations. One of them is that there is a lack of observed unethical neuromarketing cases, therefore, the provided theory may be inappropriate. Moreover, the use of neuro-observations is new and confusing in human-participant research. Therefore, the possible bias is that ethical cases may actually be unethical and vice versa.

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THE IMPACT OF SHARING SYSTEMS IN INDUSTRIES IN THE CONTEXT OF THE DEVELOPMENT OF INDUSTRY 4.0

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Abstract. The paper considers the impact of sharing systems in industries in the context of the development of Industry 4.0. The article reflects the modern realities of existence and the development potential of a new phenomenon – sharing. The article gives an overview of modern systems that show the practical application of joint consumption in industry. The necessity of using sharing to improve business processes and increase competitiveness is shown. This increases the efficiency of consumption and production of goods and services, reduces costs, reduces waste and develops a society of conscious consumption.

Keywords: sharing economy, industry, business processes, sharing, Industry 4.0, digitalization.

ВЛИЯНИЕ СИСТЕМ СОВМЕСТНОГО ИСПОЛЬЗОВАНИЯ В ОТРАСЛЯХ ПРОМЫШЛЕННОСТИ В КОНТЕКСТЕ РАЗВИТИЯ ИНДУСТРИИ 4.0

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Аннотация. В работе рассматривается влияние систем совместного использования в отраслях промышленности в контексте развития Индустрии 4.0. Статья отражает современные реалии существования и потенциал развития нового явления – шеринга. В статье дан обзор современных систем, которые показывают практическое применение совместного потребления в промышленности. Показывается необходимость использования шеринга для улучшения бизнес-процессов и повышения конкурентоспособности. Это повышает эффективность потребления и производства товаров и услуг, приводит к снижению затрат, уменьшению отходов и развитию общества осознанного потребления.

Ключевые слова: шеринг-экономика, промышленность, бизнес-процессы, совместное использование, индустрия 4.0, цифровизация.

Relevance of using new technologies is caused by the rapid development of all spheres of life and increasing human needs. To fully meet the needs, tools are being created and improved to help cover these needs. Sharing makes the life of consumers more comfortable, and industrial sharing gives advantages to companies to increase their competitiveness in the market.

Industrial sharing is multifaceted. You can use both material (industrial) resources of enterprises and information. Two types of industrial sharing will be considered:

- Information sharing in industry in the context of Industry 4.0
- Sharing of material resources

The sharing appeared a long time ago, for example, libraries are a system of sharing books. But the beginning of the global development of the sharing economy can be called the beginning of the 2010s. The term "sharing economy" began to emerge during the economic crisis of 2008, then consumers realized that it was not always possible to cover their needs, due to global economic changes, population growth and resource depletion [1]. It was at this time that such well-known services began to be created: Airbnb, Uber, Lyft, “Yandex.Taxi”. The main purpose of these services is to provide the usual services profitably. The task of the sharing is to diversify the economic component of the state. To enable all consumers to meet their needs [2].

For industries, the arrival to industrial sharing was due to the fact that modern sales markets are dynamically developing systems. Which require frequent and rapid adaptations to modern conditions. In order to properly adjust work and business processes, companies need to analyze many different factors, such as consumer feedback, industry development trends, and innovations. New changes require new solutions.

According to Klaus Schwab, President of the World Economic Forum, a new type of industrialization is based on the mass introduction of cyber-physical systems in the production and service of human needs, including everyday life, work and leisure [3, p. 26]. The need for transition is due to new technologies that have been able to change the principles of production and consumption. And to satisfy them, you need to adhere to new rules when creating and transforming business processes.

Limited and finite resources also influenced the transition to new models of production and consumption. Joint actions make it possible to achieve greater mutual benefits for industries and consumers.

Principles and technologies of Industry 4.0. The basis of Industry 4.0 is the industrial Internet of Things and cyber-physical systems. They use computer algorithms to monitor and control physical things, including equipment, robots and vehicles [4].

The need for a common integration of all processes affects standardization and accessibility for understanding and change.

Necessary features of integration:

a) Horizontal integration. This is a type of integration that refers to information systems that are related to logistics, production and marketing within the company.

b) Vertical integration. This type of integration involves the exchange of necessary information between different hierarchical levels.

c) End-to-end integration is based on use throughout the entire value chain of the product, where the requirements of the end user are taken into account [5].

The principles used in Industry 4.0 are based on new technologies, patterns and architectures. This is necessary in order to use all production processes for market trends [5]. Data-driven process management suggests that data is the main engine of change and transition to Industry 4.0, it is information data that accelerates the processes of digital transformation of organizations. The development of digital solutions compatible with Industry 4.0 implies a high level of complexity of transition and implementation, which requires a multidimensional approach in which the exchange of valuable data in real time plays an important role. Taking into account the integrated approach to the transition to the concept of Industry 4.0 and the need for standardization of processes, scientists have come to understand the need for reference architectures for automation.

As mentioned earlier, the process of transition to Industry 4.0 should be comprehensive, which means it should make changes in all areas of production at once. For this purpose, various structures have been created to ensure the interaction of not only hardware parts, but also cloud services and data technologies. With an integrated approach, the interaction between technical and virtual production facilities is considered. The concept of Industry 4.0 is aimed at creating rules of digital description for a technical object and changing its condition throughout its life cycle in the form of a reference architecture model of Industry 4.0 “RAMI4.0” (Reference Architecture Model for Industry 4.0 – A model of reference architecture for Industry 4.0) [6].

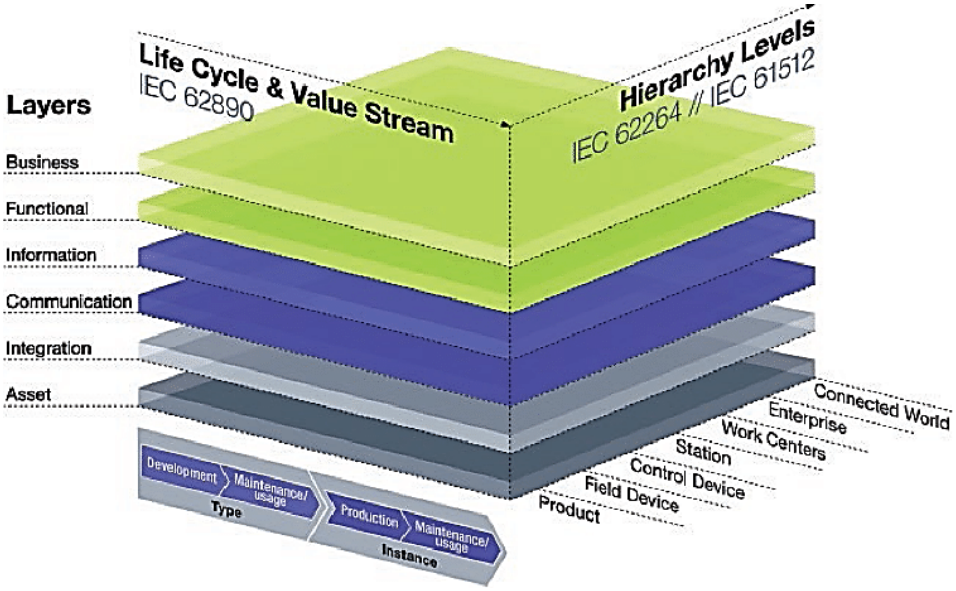


Figure. Standardized architectural model RAMI 4.0

This architectural model in Figure is a reference model, it allows you to describe the concept of Industry 4.0 in several dimensions:

hierarchy levels, interactions and life cycle stages. This allows you to create such business processes that show the relationship of the entire production as a whole.

Summing up the chapter, we can conclude that sharing information in Industry 4.0 will help companies use each other's achievements. It will be more profitable and faster for companies. The principles dictated by Industry 4.0 will allow to unify the description of processes and information, which will facilitate the “mutual understanding” of processes within the company, as well as the industry as a whole [7, p. 89].

The second type of industrial sharing is material. If we consider the example of the sharing of material (industrial) resources, then here the market is in the very initial stage of origin. At the moment, there is a small number of studies devoted to the topic of joint production.

The basic concept of material industrial sharing is very similar to the sharing of ordinary consumers. For industry, the concept is that companies can share the cost of production resources, knowledge, skills. This allows manufacturers to share their production capacity, equipment and infrastructure, and resources with the help of information technologies. We can say that this is a mutually beneficial cooperation for all participants, as they can reduce production costs and expand their own capabilities without immediately investing in new equipment or infrastructure development, as well as use shared resources more efficiently.

It can be assumed that industrial sharing can create a new production model. Joint productions can be classified into several types.

The first type of joint production is the cooperation of several companies aimed at the joint implementation of the project. In this case, each company can develop its own expertise and achieve better results together. The idea is to receive production orders from other manufacturers if this manufacturer has received too many orders and understands that it will not be able to produce all the goods on time at its production facilities.

The second type of joint production is shared access to equipment Several companies use the same equipment or part of it to perform different tasks. The production divides its own production facilities, which were originally created for industrial joint consumption. A company can have several productions and share them with everyone. Such a company may not produce anything itself, because its main task is to let others produce, to share its own production resources with other manufacturers who do not have enough production resources to expand or create their own production.

The third type is the production of shared use, which provides services. Services mean the sale of own equipment and the provision of MRO services (maintenance, repair, operation). Thus, the company buys the product, and the product gets the opportunity for its full service, modernization and expansion. For example, several companies combine to purchase services at more favorable prices.

The fourth type of sharing is the shared use of logistics. Joint logistics is the separation of delivery and storage of products. This makes it possible to speed up

deliveries, reduce transportation costs and ensure more efficient use of storage facilities.

Industrial sharing can help companies achieve economic success by improving quality and increasing production volumes, as well as reducing costs. In addition, such cooperation can reduce the impact on the environment by reducing the use of resources necessary for production.

Also, in the sharing paradigm, you can create products and projects that will benefit all participants, for example:

It is possible to develop a common database to account for the resources and equipment of all companies that participate in the resource sharing process. Sharing technologies within the same industry, which can help reduce the costs of research and development, R&D, R&D.

This was discussed in the chapter above, the use of sharing in the Industry 4.0 paradigm.

Create a waste recycling system that will help companies reduce economic costs, raise their environmental and social status.

With regard to commercial success in the application of co-production technologies, it is possible to consider the overall development of marketing strategies and improving the effectiveness of advertising campaigns by creating a marketing team that will consist of representatives of all companies involved in the sharing.

Summing up, we can conclude about the positive and negative sides of the use of sharing in industries.

The advantages of industrial sharing include the following points:

Cost reduction, reduced costs for equipment, personnel, resources and other types of costs, thanks to the sharing of resources in several companies.

Improving competitiveness. Reducing costs allows you to increase profits, which makes companies more competitive in the market.

Improving the quality of services. The use of joint resources and equipment helps companies to produce better services and products.

Synergy company. With the right and comprehensive approach, industrial sharing allows you to combine the expertise and experience of several companies, which contributes to the creation of an “ideal” production and the development of innovations.

The disadvantages of industrial sharing include the following points:

The complexity of process management. Managing industrial sharing can be difficult due to the need to coordinate the actions of several companies and coordinate the use of resources. But with the right approach and competent management specialists, it is possible to make the system trouble-free and fault-tolerant.

Confidentiality. The sharing of resources may entail a violation of confidentiality on a commercial and technical basis. This point can be leveled by using a non-disclosure agreement or an association of companies and a community.

Uncertainty. Industrial sharing may be subject to uncertainty due to changes in the needs of participants and the market situation. This risk applies to the entire

business. Both protective measures and a quick reaction to the change will help to avoid a negative outcome.

In conclusion the model of using the sharing economy will develop further in multiple steps. This is a viable and convenient idea that is currently being actively used in the consumer sphere. It can be predicted that it will soon spread to other markets and industries. Sharing will help the industry to develop in new areas, providing services for the provision of equipment at a time when it is not occupied. This will create a mutually beneficial deal for those who share the equipment and those who use it. The description of their business processes common to all industrial structures will also help industrial companies to use the sharing. This will simplify and speed up the work of the industry. The use of reference architectures for process description will be the key to a unified quality of production, both at your own enterprise and at a joint-use enterprise.

This may give an impetus to new economic phenomena, a new layer of industrial enterprises may appear, the main activity of which will be that they build factories not to produce something on them, but to provide sharing services.

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SPECIFICITY AND DYNAMICS OF BANK SETTLEMENT OPERATIONS IN THE RUSSIAN FEDERATION

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Abstract. Intermediation in the transfer of funds between accounts is one of the significant banking functions. The article explains the essence of settlement operations, and also considers their classification depending on the composition of participants, types of settlements and the purpose of operations. Relatively up-to-date statistical data related to the banking sector of the Russian Federation are given.

Keywords: banking, credit institutions, settlement operations, payment orders, financial means.

СПЕЦИФИКА И ДИНАМИКА РАСЧЕТНЫХ ОПЕРАЦИЙ БАНКА В РОССИЙСКОЙ ФЕДЕРАЦИИ

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Аннотация. Посредничество в переводе денежных средств между счетами является одной из важнейших банковских функций. В статье раскрывается сущность современных расчетных операций, а также рассматривается их классификация в зависимости от состава участников, видов расчетов и назначения операций. Приводятся актуальные статистические данные, относящиеся к банковской сфере РФ.

Ключевые слова: банковская сфера, кредитные организации, расчетные операции, платежные поручения, денежные средства.

Today, the banking sector is a rather capital-intensive industry, being one of the incentives for potential economic growth and, as a result, the growth of the welfare of the population [1]. Credit organizations perform calculations, guarantee the safety of buyers' money in bank accounts and also transform these resources into loans to the economy. It is difficult to overestimate the importance of this industry; however, its full understanding has a high threshold of entry, which implies that a person has a large number of competencies. One of these competencies is to understand the essence of settlement operations carried out by commercial banks, both domestic and foreign, crediting to the accounts of clients, operations for

conducting business activities of the bank itself and executing orders of the bank's clients.

Settlement banking transactions are operations for the implementation of cash and settlement customer services. They involve the movement of money between bank accounts.

Settlement operations are subject to a certain classification, which can be divided into determined criteria:

1. Composition of participants:

– intrabank transactions. This includes transactions carried out within the jurisdiction of one bank. For example, depositing or withdrawing cash, money transfers, transactions with fixed assets, intangible assets, materials and low-value and wear-out items; transactions on accounts of debtors and creditors; income and expenses of the bank, including labor costs; operations on the formation of profits and funds of the bank and others.

– interbank transactions. Here, transactions are carried out between different banks, and they are based on the inter-branch turnover system. The participants of interbank transactions are commercial banks and the Central Bank of the Russian Federation (CB). Interbank transfers are divided into currency and credit transactions. These are transactions that financial institutions conclude with each other. This includes both settlements with other commercial organizations and with the CB. As of November 1, 2022, the number of operating banks in Russia was 327, as well as another 34 non-bank credit organizations [2].

The latest statistics of money transfers made through the payment system of the CB is shown in Table 1 [2].

Table 1 – CB's structure of money transfers in 2020-2022

	Total money transfers		*Including*					
years	*quantity/ mln units*	*amount / bln rubles*	*credit institutions (branches)*		*clients who are not credit institutions*		*CB payments*	
			quantity/ mln units	*amount / bln rubles*	*quantity / mln units*	*amount / bln rubles*	*quantity / mln units*	*amount / bln rubles*
1	2	3	4	5	6	7	8	9
2022	4958,0	3342396,4	4521,1	2110249,0	436,7	287992,7	0,2	944154,7
2021	2643,9	2018178,6	2246,9	1647486,8	396,7	183211,6	0,3	187480,2
2020	1844,0	1657584,7	1479,4	1332393,2	364,3	169035,8	0,3	156155,7

2. Type of payments:

– cash payment – settlements between businesses or individuals in ready money. Since July 1, 1993, the maximum amount of cash settlements between legal entities has been set at 500 thousand rubles. The examples include payment of housing and public utilities, state duties and so on. Although, as it will be noted later,

the focus is now shifting towards non-cash payments, nevertheless, cash payment still occupies an important niche in the economy. As of March 1, 2022, the volume of cash in circulation reached 15.82 trillion rubles, which is 14.7% more than in February 2022 [3].

– cashless payment – settlements without cash, by moving of money through a bank from the settlement (current) account of the payer to the account of the recipient. This payment format is available to everyone - legal entities, entrepreneurs and ordinary citizens. The most common example of non-cash payment – charges with plastic cards. At the moment, it is cashless payment that prevails over ready money, this is explained by the rapid development of digitalization and, as a result, the relative simplicity and convenience of this type of payment. So, in 2021, the share of non-cash payments increased to 59.3%, and by 2026 this figure may reach 85% [4].

Below (Table 2) are statistics on the number of accounts opened by institutions of the banking system over the past few years [2]:

Table 2 – Number of accounts opened by institutions of the banking system, 2020-2023

	Total number of accounts, thousand units.	*from them, opened in credit institutions, thousand units.:*			*The number of accounts opened by institutions of the banking system per 1 resident, units.*
		in total	*from them:*		
			clients-legal entities that are not credit institutions	*clients-individuals*	
1	2	3	4	5	6
2023					
on 1.01.23	1 056 878,9	1 056 663,6	15 822,9	1 040 840,7	7,2
2022					
on 1.10.22	1 044 345,2	1 044 182,1	15 328,0	1 028 854,2	7,1
on 1.07.22	1 032 272,1	1 032 125,0	14 881,0	1 017 243,9	7,0
on 1.04.22	1 011 108,8	1 010 966,5	14 438,7	996 527,9	6,9
on 1.01.22	1 011 065,3	1 010 926,6	14 120,1	996 806,5	6,9
2021					
on 1.10.21	998 273,0	998 148,5	13 570,6	984 577,9	6,8
on 1.07.21	986 608,6	986 492,9	13 152,9	973 340,0	6,7
on 1.04.21	975 385,8	975 233,0	12 718,9	962 514,0	6,6
on 1.01.21	964 493,6	964 342,7	12 517,8	951 824,9	6,6
2020					
on 1.10.20	955 587,8	955 441,7	12 146,8	943 294,9	6,5
on 1.07.20	944 733,3	944 591,7	11 728,4	932 863,3	6,4
on 1.04.20	940 819,2	940 676,9	11 388,8	929 288,0	6,4
on 1.01.20	934 999,1	934 854,0	11 062,3	923 791,7	6,4

Table 2 shows that in 2023 the total number of accounts exceeds 2022 by 12533,7. In 2020-mid-2022, there are significantly more open accounts with clients-legal entities that are not credit institutions. Individuals occupy the first place from the middle of the 22nd year to the present. The difference between 2022 and 2023 is only 11986,5. As for the overall indicator, 2023 exceeds 2022 by 0,1.

In turn, non-cash transactions are also divided based on the payment documents according to which they are carried out. Payment documents confirm settlements and include payment orders, collection orders, letters of credit, checks, payment requirements, receipts, bank statements, receipts.

A payment order, being perhaps the most common form of non-cash payments, is an instruction from the owner of a bank account to transfer a certain amount of money to the recipient's account.

A collection order – this is a document for collecting money from the debtor through a credit institution. The recoverer must have information about the debtor and the right to make such claims, for example, under a concluded contract or by a court decision, that is imply automatic debiting of funds from the payer's account (for example, various subscription services or government agencies work on this principle to write off the amount of debt from the obligor, etc.) [5].

A letter of credit is a special settlement scheme between a seller and a buyer, in which money for goods is transferred to the seller not directly, but through the mediation of credit institutions. At the conclusion of the transaction, the buyer fills out an application for opening a letter of credit and transfers the payment to a special bank account, where the funds will remain until the seller provides the bank with proof that he has fulfilled all the terms of the contract. Also letters of credit are documents that contain an order from one credit institution to another to pay a certain amount to the recipient. There are the following types of letters of credit: covered (deposited), uncovered and revocable, irrevocable letters of credit, with a red caveat, transferable, confirmed, guaranteed (reserve), circular, cumulative and revolving (renewable).

A receipt is a document of the established sample, in which the data on the purchase is recorded. In settlements between organizations, documents confirming the transfer of goods and payment documents are divided among themselves. But, when making settlements with citizens (individuals), only one document is valid – a cash receipt. The checks contain information about the amount that the bank needs to pay to the cheque holder from the cheque holder's account.

Payment requests is a document that contains a demand from the recipient of the money to be debited from the payer's account. They are used in payments for delivered goods, performed works and services [6].

3. Assignment of operations:

– opening of accounts. The basis for opening an account is the conclusion of an account agreement and identification. Now there are three options for opening a current account: online, at a bank office and a combined method. As of October 1, 2022, the number of accounts amounted to about 1 million [7].

– account management – a separate banking transaction, for which a particular fee may be provided in accordance with the tariffs established by the bank. In its

meaning, it is not identical to the commission for the execution of the client's orders. As a rule, the amount of such a fee is fixed and it is deducted from the client's account monthly. This includes operations for charging commissions, interest, debiting and crediting funds.

– assignment of claims – a transaction as a result of which one party transfers to the other party the right to demand performance of its obligations from a third party. As a result of this transaction, the creditor is replaced in the obligation. For example, the original creditor (assignor) may cede to the new creditor (assignee) his right to demand payment from the debtor for the goods sold to him. The creditor has the right to assign the rights under the consumer loan agreement to another legal entity that carries out activities for the provision of consumer loans or the repayment of overdue debts (collection agencies) [8].

– cash transactions – transfer of funds from cash to non-cash form and back.

– acceptance operations involve obtaining the payer's consent to complete the payment.

– aval operations means transactions in which the bank acts as a guarantor that the payer will fulfill the obligations imposed on him.

The latest statistics of transactions made on the territory of Russia using payment cards issued by Russian credit institutions, the CB and non-resident banks is shown in Table 3 [2]. The data indicates that both the number of payments by credit cards and the amounts are increasing every year and almost every quarter. The acceptances are the 1st quarter of 2022, the amount of rubles in which is more than in the 2nd quarter, and the 1st quarter of 2020, where both the amount and quantity of transactions are higher than in the 2nd in the same year. This trend should continue in the future.

Table 3 – Operations carried out in Russia by payment cards in 2020-2022

		Total	*Including:*	
			cash withdrawal operations	*payment transactions for goods and services*
1	2	3	4	5
2022	**quantity, mln units**	**55 787,9**	**2 141,5**	**53 646,4**
	volume, bln rubles	**75 416,2**	**31 140,5**	**44 275,6**
IV quarter	quantity, mln units	14 740,7	543,7	14 197,0
	volume, bln rubles	20 855,8	8 632,6	12 223,2
III quarter	quantity, mln units	14 725,9	552,7	14 173,2
	volume, bln rubles	19 413,7	8 098,8	11 314,9
II quarter	quantity, mln units	13 871,2	545,5	13 325,7
	volume, bln rubles	17 502,3	7 069,4	10 432,9

I quarter	quantity, mln units	12 450,2	499,6	11 950,5
	volume, bln rubles	17 644,3	7 339,7	10 304,6
2021	**quantity, mln units**	**50 188,8**	**2 336,3**	**47 852,5**
	volume, bln rubles	**67 822,4**	**29 663,0**	**38 159,4**
IV quarter	quantity, mln units	13 252,3	567,0	12 685,4
	volume, bln rubles	18 796,0	8 005,9	10 790,0
III quarter	quantity, mln units	13 299,7	604,1	12 695,6
	volume, bln rubles	17 768,6	7 840,1	9 928,5
II quarter	quantity, mln units	12 692,6	616,8	12 075,8
	volume, bln rubles	16 697,9	7 457,1	9 240,8
I quarter	quantity, mln units	10 944,2	548,5	10 395,7
	volume, bln rubles	14 560,0	6 359,9	8 200,1
2020	**quantity, mln units**	**41 190,0**	**2 519,7**	**38 670,3**
	volume, bln rubles	**57 664,8**	**28 169,3**	**29 495,5**
IV quarter	quantity, mln units	11 295,9	631,2	10 664,7
	volume, bln rubles	16 470,4	7 776,9	8 693,5
III quarter	quantity, mln units	11 186,2	651,2	10 535,0
	volume, bln rubles	15 462,2	7 468,5	7 993,7
II quarter	quantity, mln units	9 079,8	556,6	8 523,2
	volume, bln rubles	12 422,4	6 187,9	6 234,5
I quarter	quantity, mln units	9 628,1	680,7	8 947,4
	volume, bln rubles	13 309,8	6 736,0	6 573,8

Thus, the theme of settlement operations of banks is quite extensive and it is essential to realize not only the nature of banking, but also the importance of the banking system as such. Today, the banking sector is an important and integral part of the economy, without which it cannot exist in modern world. After all, if the economy is an organism, the banking system is its circulatory system, which, with the

help of settlement operations, delivers the necessary substances from one counterparty to another.

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ETHICS OF THE DOCTRINE OF HESYCHASM IN THE FRESCOES OF THEOPHANES THE GREEK

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Abstract. The paper examines the tendencies of hesychast teaching and characteristic features in the frescoes of Theophanes the Greek, located in the Church of the Transfiguration on Ilyina Street in the city of Novgorod. As a result of the analysis of the studies of art historians, trends common to the teaching of hermits and the work of an outstanding icon painter were revealed. The article will be of interest to students of specialized areas and people interested in national art.

Keywords: Theophanes the Greek, hesychasm, Gregory Palamas, christian art, the Church of the Transfiguration on Ilyina Street, pillars, fresco.

ОТРАЖЕНИЕ ЭТИКИ УЧЕНИЯ ИСИХАЗМА ВО ФРЕСКАХ ФЕОФАНА ГРЕКА

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Аннотация. В работе рассматриваются тенденции исихастского учения и характерные его черты во фресках Феофана Грека, находящихся в Спасо-Преображенской церкви в Новгороде. В результате анализа исследований историков искусства выявлены общие тенденции для учения пустынников и творчества выдающегося иконописца. Статья будет интересна студентам профильных направлений и людям, интересующимся отечественным искусством.

Ключевые слова: Феофан Грек, исихазм, Григорий Палама, христианское искусство, церковь Спаса Преображения, столпники, фреска.

One of the most striking phenomena in the development of philosophical and religious ideas in the 14th century was the hesychast controversy in the Byzantine Empire between the supporters of Gregory Palamas and his opponents. The result of the disputes was the triumph of the Palamists, the introduction of the concepts promoted by them into the dogma of the Eastern Orthodox Church and the canonization of Gregory Palamas. The main opponent of the Palamist doctrine, the

Calabrian monk Barlaam, rejected the ethics of hesychasm, considering it blasphemous and heretical. In particular, this also applied to the doctrine of the nature of uncreated light, identified with the light revealed to the disciples of Jesus Christ during the Transfiguration on Mount Tabor, the desire to see which was the goal of the practice of hesychasm. And it was the Light of Tabor that became one of the key concepts used as a pictorial device in the work of the Byzantine and Russian icon painter Theophan the Greek.

V. N. Lazarev, in his monograph on Theophanes the Greek, admits that the icon painter could not but fall under the influence of the global ideological movement of that time. N. K. Goleizovsky also expresses a similar opinion in several articles: he is surprised by the similarities between the teachings of the Hesychasts and the works of Theophan the Greek [1, p. 190].

Hence, an important regularity arises, which is emphasized by many researchers of this art history topic (M. V. Alpatov, E. N. Trubetskoy, P. A. Florensky ...) that the course of the historical process, expressed in events and prevailing at that time philosophical ideas, has a suggestive function. Those. affects the subconscious of a person of the era and his activity, expressed in fine and literary creativity, scientific and theological research and other areas. This trend can also be traced in Russian culture, where "it is icon painting that vividly reflects in art a deep understanding of religious and philosophical Orthodox thought." Icon painting becomes not a "phenomenon of painting", but the result of a philosophical "contemplation of the Divine world" [2, p. 6]. Icons and frescoes are the comprehension of spiritual truth, therefore the great icon painters - Theophan the Greek, Andrei Rublev and Dionysius – are the bearers of the gift of both outstanding artists and theologians. Here the opinions of scientists are divided, two different points of view are revealed: E. N. Trubetskoy believes that our ancestors were "spirit seers", that is, they expressed their research not in verbal form, but in artistic form [3, p. 1]. On the other hand, N. K. Goleizovsky argues that "theology is something primary, and art is derivative" [1, p. 190]. One way or another, the frescoes of Theophanes the Greek have points of contact with the ethics of hesychasm.

Art historians became interested in the subject of hesychasm through the study of Byzantine art of the 14th century, this era is also called the Palaiologan revival, which is characterized by the revival of Hellenistic traditions. Also, the period from 1216 to 1453 is called the last rise of culture in the history of Byzantium. Then, in the second half of the 14th century, the art of the Palaiologos began to noticeably impoverish, scientists attribute this to the victory of the supporters of Gregory Palamas: the ascetic monastic view of the world suppresses the antiquities (ancient) trends of the beginning of the century. From here appeared "simplification", "academic dryness" and "inevitable screeds" in painting [1, p. 192]. In addition, the evidence of the onset of an ideological crisis was the very emergence of dogmatic disputes, various tricks that opponents used to prove their case, interference in the polemics of the authorities and the eclecticism of the teachings of the ancient desert hesychasts with the cenobitic rule. However, M. V. Alpatov is convinced that Theophanes the Greek is a follower of the traditions of the first half of the 14th

century and that the work of the icon painter "characterizes one of the most remarkable rises throughout the history of Byzantine art" [1, p. 194].

The topic of comprehension of Russian religious art, especially of hesychast icon painters, is relevant, as there are disputes around the interpretation of many plots, the assessment of Christian painting in the paradigm of world artistic culture. When will the appeal to the ethics of hesychasm, as the key idea of Orthodox monasticism, help to understand the national icon-painting heritage. Also, the prospect of further development of this topic lies in the direct study of the frescoes in the Church of the Transfiguration of the Savior in Novgorod, as the only surviving monumental creation of the icon painter.

In order to analyze the influence of the teachings of hesychasm on the work of Theophan the Greek, let's move on to a direct analysis of the artistic techniques of the icon painter based on the frescoes made in the Church of the Transfiguration of the Savior on Ilyin Street in Novgorod in 1378.

However, first it is worth noting the second controversial point that arose between scientists dealing with this topic. In his study, M. V. Alpatov states that Theophanes the Greek was “deeply dissatisfied” with the teachings and that the icon painter was only inspired by the ideas of the “silent ones” when creating some of his masterpieces [1, p. 196]. Another point of view is N. K. Goleizovsky, who claims that the worldview of the hesychasts exactly coincides with the work of Theophan. The same thought can be traced in L. F. Filindash, who in her article considers the creations of the icon painter as a literal reflection of the ideas of the hesychasts.

It is not known whether Theophanes took part in the disputes between the Palamites and the followers of Varlaam. Most likely, he was directly fascinated by the ancient phenomenon of hesychia – the original phenomenon of the religious life of the Christian East, since in the Trinity aisle of the Novgorod church he created a painting depicting pillars (Figure 1). Three of them are recognizable from inscriptions: Macarius of Egypt, John of the Ladder and young Akaki [1, p. 197].



Figure 1. Theophanes the Greek. Fresco "Stylites"

In the faces of the saints, one can see the subtlety and depth with which spiritual experiences are conveyed, which is typical for Byzantine and Russian painting and is called psychologism. The faces of the hermits reflect both kenosis (humility and obedience to God's will), and meekness, and wisdom, and excitement, and tension of will, and severity, and reproach, and detachment, and bright joy ... So, a characteristic feature of the images of Theophan – "high spiritual excitation", something intangible appears to their gaze, subjugating their being, which suggests the idea: earthly flesh is dust [1, p. 197].

The personality of the icon painter is reflected in the nature of the images and the technique of receptions: firstly, this is proved by the evidence of his contemporaries. They argue that Feofan never looked into the originals, giving himself up to some kind of "improvisation", relying on the Divine will that guides the right hand of the master. In this he differs from most Byzantine painters. Secondly, Feofan's work reflects the need to express as much as possible with the least means. He relies on the viewer's ability to unravel what is left unsaid. Silence, understatement is a feature of Theophan's pictorial poetics [1, p. 198]. Thirdly, the individuality of the icon painter is manifested in the artist's right to exaggerate: on the face of Macarius the Egyptian there are upturned eyebrows, a long snow-white beard and a falling mustache. Sharp broken lines of zigzags of folds of clothes. This method of exaggeration is used in order to "shake the soul" of the viewer with compassion [1, p. 200]. At the same time, the authoritative researcher G. I. Vzdornov emphasizes that the internal dynamics of the images is created not by impression and not by melodramatism (“emotiveness” is alien to the dogmas of hesychasm), but by the “supersensual nature of spiritual tension” [4, p. 228].

The mysticism of light is a unifying aspect of both the frescoes of the icon painter and the ideas of hesychasm associated with the doctrine of energies. Researchers compare the light of Theophanes with "lightning flashes" that arose from nowhere and disappear into nowhere. Light humiliates the flesh, cleanses it with sacred fire, and the source of light itself is located inside the depicted saint. Feofan's innovation lies in the fact that he creates a new technique: "the effect of light accumulation". Light is concentrated in the "apple of the eye", lies in the depths of the soul. The eyes of the saints are filled with light so much that their pupils become invisible. So, on the face of Macarius the Egyptian, the eyes are deliberately not spelled out. The stylite does not need a bodily organ of vision; he contemplates God with an inner spiritual gaze. In the eyes of Simeon Divnogorets, instead of pupils, only white highlights are depicted. They symbolize the uncreated Tabor light, which the saint sees.

Another technique is used by Theophanes the Greek in the image of Pantokrator, in Him a “blessed outpouring of light” is conveyed, in this case, on the contrary, “a huge Divine power comes from the figure, face and gaze of Christ” [4, p. 226]. The energy of light circles scatters from his eyes, creating the effect of the physical presence of a "light-bearing" force (Figure 2).



Figure 2. Theophanes the Greek, Fresco "Christ Pantocrator"

In the images of the pillars, there is a tendency to "candle-like", elongated figures, which thus look like a fiery flame. In a similar way, the icon painter creates an artistic metaphor of the "pillar of light" – in patristics, great saints are likened to this symbol.

Almost all icon images are shown in a pose of prayerful standing and "receiving grace" – the hands of the saints are open with their palms outward – a pose of openness.

Clothed in light, each of the ascetics retains his personality, individuality – this is one of the features of the teaching of hesychasm. I. K. Yazykova notes that the personality requires purification, but remains untouched. This symbolizes that on Mount Tabor Christ was transformed, but bodily did not change. In the same way, under the influence of the uncreated Light, human nature is also transformed – it, mortal and corruptible, becomes involved in the imperishable, eternal [5, p. 57].

A special place in the picturesque images of Theophanes is occupied by the color of the images, it was influenced primarily by the predominant importance of light: the palette is significantly narrowed. "Theophanes is limited to a cold grayish-blue background and the terracotta color of the incarnate. Colorless, whitish highlights, gaps lie on top of them, they are set off by dark contours." So, the body shell personifies something illusory, the appearance becomes more spiritualized [1, p. 199]. In general, the color can be described as almost monochrome, subordinate to one tone. The main role in the image is played by dark red-brown paint. So, asceticism, characteristic of the “silent ones”, is embodied, among other things, in a mean red-brown tone. On the other hand, shades of white, symbolizing the Light of Tabor, bring a unique feature of the color of the frescoes of Theophanes the Greek. The researchers claim that close to monochrome coloring is chosen as a

"metaphysical language". This is due to the practice of silence among the hesychasts and the concentration of thought through laconic prayer. It is also worth paying attention to the "reception of disposition": a sharp transition from dark tones to light ones. Thus, the effect of additional expressiveness was achieved [4, p. 228]. Irrationalism consists in the manner of the icon painter to place highlights and white highlights where, according to the laws of lighting, dark areas are necessary and, accordingly, vice versa. From a technical point of view, Theophan's frescoes are distinguished by the successive application of layers of paint. He began his work with a drawing and underpainting, then a solid fill was made with light paint, and he painted the contours of figures, folds, facial features with darker paint. At the very end of the work, highlights and highlights were applied [4, p. 229].

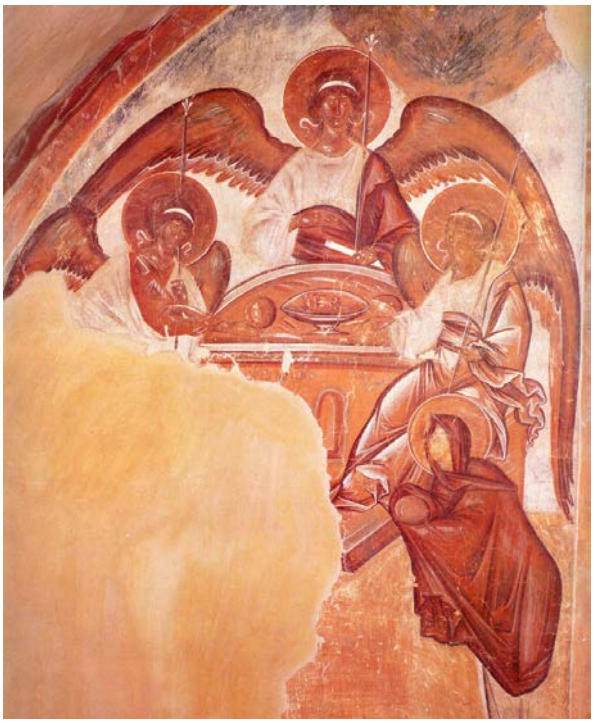


Figure 3. Theophanes the Greek, fresco Old Testament Holy Trinity "Hospitality of Abraham"

Approaching the completion of the consideration of a number of hermit icon images, one cannot fail to mention the emergence of a new interpretation of the most important themes of Sophia and the Apocalypse, which was caused by the theology of hesychasm. Christ Pantocrator, depicted in the dome of the Church of the Transfiguration of the Savior, is the Sun of Truth. The image is interpreted in the spirit of righteous and relentless service to Christian truths, following them. The look of the Lord is so deep that the viewer involuntarily looks at him with fear and trembling. In the Trinity aisle of the Church of the Transfiguration of the Savior, the Old Testament Holy Trinity – "Hospitality of Abraham" is depicted, through which the theme of the Wisdom of God and the Last Judgment is revealed. This is how the hesychast knowledge of the greatness of the universe, which is inseparable from the Wisdom of God, is manifested: the Lord is glorified in the Wisdom of His Creation

(Figure 3). Images of a host of pillars and ascetics personify the idea of the "hesychast ideal of knowledge of God": neglect of worldly temptations, avoiding an idle, vain life and repentance for sins committed. Theophanes depicted apocalyptic experiences in wall frescoes: "Theophan's attention is focused on preparation for judgment: painful reflections on the need for heroism and the impossibility of finding happiness on earth and at the same time eternal bliss in heaven" [4, p. 227].

Reliable information about how Theophan's passion for ancient Hesychia was met in Rus' was not preserved. Likewise, the very fact that he managed to glorify the representatives of hesychasm in the Church of the Transfiguration of the Savior defies explanation. In Novgorod and Moscow, Theophanes had many followers, but none of them created monastic images of similar grandeur. It is not known whether Feofan had philosophical disputes with Andrei Rublev. But in their work, they had a wordless conversation. For each creation of the senior master, Rublev "answered" his own creation.

"To Theophanes' Trinity in the Trinity chapel he answered with his "Trinity" in the Trinity Monastery, to his "Assumption" – with his "Assumption", to which, apparently, the icon from the St. Cyril Monastery ascends, to his "Transfiguration" from Pereslavl – with his "Transfiguration" in the Cathedral of the Annunciation, and finally, to his deesis rite in the Kremlin – his deesis rite in Vladimir" [1, p. 201].

Thus, the article analyzes the available studies of authoritative art historians, synthesizes the knowledge gained and displays several trends in the contact between the frescoes of the Church of the Transfiguration of the Savior on Ilyin Street by the outstanding 14th-century icon painter Theophanes the Greek and the teachings of the Hesychasts. When studying the work of the great icon painter, new aspects of the creator's personality are revealed: the passionate temperament of the artist and the insight of the mind. The artist appears before the viewer as a philosopher, reflecting on the theological significance of the teachings of the hermits, striving in a unique manner to display the complex ideological aspects of the life of the pillars. A strict classification by styles and periods of civil history is not applicable to Theophan's work, since the genius of the artist lies in originality and paradox: Theophan the Greek was a contemporary of the beginning of the decline of Byzantine art, but at the same time his work is the "greatest rise" in the world of Christian art.

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THE PROSPECTS FOR USING LIPASE IN CELLULOSE BLEACHING

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Abstract. This paper discusses advantages of using lipase to make cellulose bleaching more effective. As a result of the analysis, lipase treatment allows to achieve lower Kappa number with same amount of bleaching reagents, which means that the effectiveness of bleaching increases.

Keywords: cellulose, lipase, bleaching, Kappa number.

ПЕРСПЕКТИВЫ ИСПОЛЬЗОВАНИЯ ЛИПАЗЫ В ОТБЕЛКЕ ЦЕЛЛЮЛОЗЫ

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Аннотация. В статье отражены преимущества использования липазы для повышения эффективности отбеливания целлюлозы. В результате анализа отмечено, что обработка липазой позволяет добиться более низкого числа Каппа при том же количестве отбеливающих реагентов, что говорит о повышении эффективности отбелки.

Ключевые слова: целлюлоза, липаза, отбелка, число Каппа.

The relevance of research and development related to the pulp and paper production is beyond doubt. Currently, the global industry produces about 400 million tons of paper and cardboard per year. Consumption of products made out of cellulose, such as sanitary and hygienic products, different types of packaging, printed products, documents, etc., is estimated in hundreds of kilograms per capita per year. Before cellulose pulp gets to the consumer in the form of a finished product, it must achieve certain characteristics such as mechanical strength, density, roughness, etc. One of the most important characteristics of pulp and paper is brightness and whiteness, high levels of these properties are required for high-quality paper and cellulose for production of hygienic and sanitary products and food packaging [1]. High level of whiteness is achieved by the course of chemical reaction

in which various bleaching reagents destroy bonds between lignin and cellulose or remove chromophoric groups of lignin, giving pulp a characteristic brownish color. The most inexpensive and highly selective bleaching reagent is elemental chlorine, but its use has a list of disadvantages. Firstly, elemental chlorine mixtures with air are explosive thus it is required to produce it at the direct place of use, secondly, the use of chlorine compounds leads to contamination of wastewater and lastly there is a decrease in the quality of the final product due to the content of AOH (Adsorbed Organic Halogenides) in it. The enterprises of the timber industry and the pulp and paper industry are faced with the necessity to find a compromise option combining the affordability of elemental chlorine with the absence of undesirable consequences of its use. Because of this, TCF (total chlorine free) and ECF (elemental chlorine free) bleaching schemes found application all over the world. TCF-technologies apply ozone, hydrogen peroxide, oxygen and some of the other compounds as bleaching reagents. This approach takes roughly 10 % of the total bleached pulp production and completely eliminates the undesirable consequences of elemental chlorine use. As for ECF-technologies, chlorine dioxide, sodium hypochlorite or other chlorine compounds are used as bleaching reagents. About half of the paper mills in the world use such technologies which makes them the most popular ones despite the fact that they are not completely devoid of the disadvantages of chlorine compounds use. One of the possible ways to solve this problem is to lower the consumption of bleaching reagents, which will not only reduce the harmful impact on the environment, but will also have the economic effect of reducing the cost of the final product without loss of its quality.

In our study, enzymatic treatment was used as a method of reducing the consumption of bleaching reagents. The world produces 65 thousand tons of enzymes per year, most of which are used in the production of food, making enzymes a common and affordable raw material. Enzymes are promising reagents in all areas of the chemical industry owing to the fact that they are biodegradable, have high selectivity and efficiency, are used in relatively small amounts and can be produced microbiologically, which makes them available at any time of the year unlike raw materials obtained from plants or animals [2]. Nowadays, enzymes are the objects of many research and developments since their properties drawing attention to them. Today in the pulp and paper industry, multiple classes of enzymes, such as xylanases, cellulases, laccases, pectinases and others, are already applied for versatile purposes from the deinking of waste paper to increasing the efficiency of refining. Lipase, which is traditionally used in pulp production for deresination of the pulp, was chosen as the object of the study. Lipase can catalyze the hydrolytic cleavage of ester bonds, which can contribute to better penetration of bleaching reagents to the reaction centers in the cellulose [3]. Sulfate Kraft pulp was used as a raw material since the sulfate process is the most common type of wood cooking in pulp production. Samples of this cellulose were treated with an enzymatic preparation of various concentrations from 1 to 10 % with a different reaction time from 0.5 to 2 hours at an optimal temperature of 80 °C. Further, the obtained samples were bleached according to the TCF bleaching scheme using hydrogen peroxide in an alkaline medium [4]. Therefore, the conditions of modern pulp and paper production were modeled using

the most common type of cellulose, the most eco-friendly bleaching scheme and the innovative type of treatment using enzymes [5]. The samples, which were washed with distilled water and air-dried, were further used to determine the Kappa numbers of the obtained samples.

The Kappa number is a parameter widely used in pulp and paper industry that characterizes the content of residual lignin in pulp. The Kappa number is one of the many properties that characterize the quality of cellulose as a final product or raw material. This value is dimensionless and varies in the range from 0 to 100. The lower the Kappa number, the lower the content of residual lignin in pulp. This parameter can be used to estimate the whiteness of cellulose pulp, since cellulose pulp with the lowest lignin content is the whitest. Kappa numbers were determined according to the international standard methodology ISO 302:2005, which is based on the iodometric determination of the consumption of sodium thiosulfate spent on the reduction of potassium permanganate reacted with cellulose pulp.

According to the data obtained, a graphical dependence of the Kappa number on the reaction time and concentration of the enzymatic preparation was plotted (Figure).

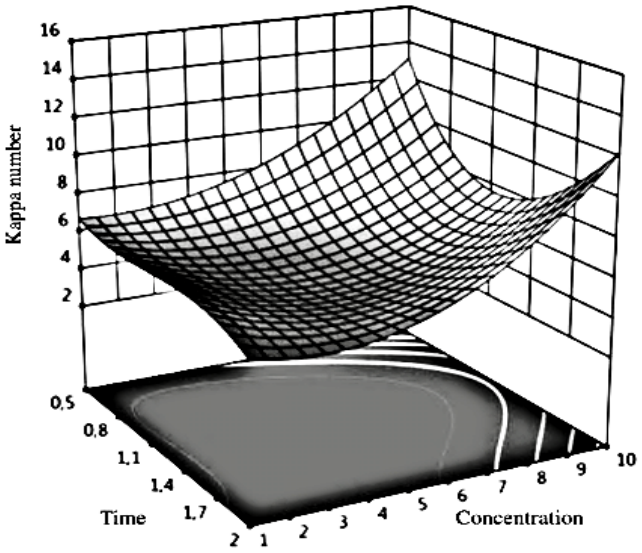


Figure. Graphical dependence of the Kappa number on reaction time and enzymatic preparation concentration

All cellulose samples were bleached in the same conditions with the same amounts of hydrogen peroxide, but enzymatic treatment provided various values of the Kappa number of the samples. All of the samples bleached after enzymatic treatment have lower Kappa numbers than the Kappa number of the sample bleached without enzymatic treatment beforehand. It means that enzymatic treatment significantly affected the process of bleaching resulting in the improvement of whiteness of the samples. The lowest Kappa number was observed under the time conditions of 1 hour 20 minutes and a concentration of the enzymatic preparation of 5%. These conditions are taken as optimal on account of achieving the highest process efficiency which is expressed in the maximum degree of delignification or

the minimum content of residual lignin in cellulose pulp and the highest level of whiteness. Since the enzymatic treatment provided reaching lower Kappa numbers with the same amounts of bleaching reagents, we can say that the use of enzymatic treatment before the bleaching stage can reduce the consumption of bleaching reagents with reaching the same level of cellulose whiteness. Depending on the bleaching scheme used, the consumption of bleaching reagents is reduced by approximately 20-30 % when applying enzymatic treatment before bleaching stage [6].

Therefore, the advantages of enzymatic treatment before bleaching include the following:

- stage of the enzymatic treatment can be included in any existing pulp and paper production since it uses equipment employed in crucial parts of pulp production mills such as jacketed digester with washing sprays which means there is no need to purchase and install new equipment to include the enzymatic treatment stage in the technological process;
- reduced consumption of bleaching reagents leads to reduction of the final product cost without quality loss;
- improvement of the environmental condition of the pulp and paper enterprise region due to lowered contamination of wastewater, which also reduces recycling water treatment cost; improvement of safety of the final product, such as food packaging, sanitary and hygienic products as a result of reduction of the content of AOH.

Modern standards require the production of high-quality items for daily use with maximum economic benefit and minimal damage to the environment. This goal leads to the concept of sustainable development, eco-friendly approaches as known as green technologies and improvment of life quality. Thus, using lipase in cellulose bleaching meets the requirements of applying modern technologies to solve the problems of priority areas of industry.

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A COMPARATIVE ANALYSIS OF THE NOVELS “A CHRONICLE OF THE REIGN OF CHARLES IX” BY P. MÉRIMÉE, “QUEEN MARGOT” BY A. DUMAS AND “YOUNG HENRY OF NAVARRE” BY H. MANN

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Abstract. The article examines a comparative analysis of the novels “A Chronicle of the Reign of Charles IX” by P. Mérimée, “Queen Margot” by A. Dumas and “Young Henry of Navarre” by H. Mann. In order to identify the universal and the individual aspects in the depiction of the events relating to the period of the religious wars in France in the XVIth century, the types and the functions of the titles of these works, the specific features of the novel form, the authors’ intentions, the narrative manners, the character systems, as well as the compositional structures are determined, analysed and compared.

Keywords: French literature, German literature, Prosper Mérimée, Alexandre Dumas, Henry Mann, “A Chronicle of the Reign of Charles IX”, “Queen Margot”, “Young Henry of Navarre”, a comparative analysis.

СОПОСТАВИТЕЛЬНЫЙ АНАЛИЗ РОМАНОВ П. МЕРИМЕ «ХРОНИКА ЦАРСТВОВАНИЯ КАРЛА IX», А. ДЮМА «КОРОЛЕВА МАРГО» И Г. МАННА «МОЛОДЫЕ ГОДЫ КОРОЛЯ ГЕНРИХА IV»

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Аннотация. В статье проводится сопоставительный анализ романов П. Мериме «Хроника царствования Карла IX», А. Дюма «Королева Марго» и Г. Манна «Молодые годы короля Генриха IV». С целью выявления универсального и индивидуального в изображении событий, относящихся к периоду религиозных войн во Франции XVI века, определяются, анализируются и сравниваются виды и функции заглавий данных произведений, специфические черты романной формы, авторские интенции, манеры повествования, системы персонажей, а также композиционное построение.

Ключевые слова: французская литература, немецкая литература, Проспер Мериме, Александр Дюма, Генрих Манн, «Хроника царствования

Карла IX», «Королева Марго», «Молодые годы короля Генриха IV», сопоставительный анализ.

The genre of the historical novel begins to take shape during the Romantic era. The French Revolution (1789-1792), the Napoleonic Wars (1803-1815) and a number of other major upheavals in Europe in the late XVIIIth and early XIXth centuries led to the unification of the nation in the face of common danger. Cohesion was sustained through the reflection on the national past. The society turned to history, which began to be perceived as a force influencing everyone's life, becoming, as A. L. Vyshkin argues, a mass experience. Such sentiments led to the emergence of the historical novel, a hybrid genre that combines historical and literary principles. Relying on documents, the author of such a work creates his own artistic universe with a specific view on the real events. While the historian restores the past with the help of preserved documents, the writer has the additional task of filling in the blanks which cannot be recovered [1].

“A Chronicle of the Reign of Charles IX” (1829) by P. Mérimée and “Queen Margot” (1845) by A. Dumas were the inevitable consequences of the trends in European literature, described above. Despite the superficial similarity (both works, only 16 years apart, were written by French authors about the same historical period), each of the novels, of course, has a distinctly expressed artistic originality of the form and the content, which allows us to conduct a comparative analysis in order to identify the individual and the universal aspects in the depiction of a particular historical period. The novel “Young Henry of Navarre” (1935) differs significantly from the two previously mentioned works. H. Mann, a German writer, created it at a time when the literature of his country was dominated by Realism, a century after Mérimée and Dumas. His historical novel already has a completely new appearance, it was formed in a different environment under the influence of specific extra-literary circumstances. Moreover, the literary process at that time had already seen the evolution of the genre for decades.

The names of all the literary works mention the royal personage. However, in each case the types and main functions of the title have their own peculiarities [2]. In the novels of Mérimée and Dumas, for example, the persons stated in the titles are not the main characters. The titles “A Chronicle of the Reign of Charles IX” and “Young Henry of Navarre” express a chronotope, which corresponds to the authors' intentions to create a historical novel. The titles of Dumas and Mann are personified, writers use anthroponyms, but Marguerite is only a connecting link between the political and the love lines of the story and is not the main protagonist, while Henry IV is the central character of the novel. However, we should not ignore the fact that the proper names analysed are all widely known; they become, to some extent, symbols of certain qualities, destinies and events.

First of all, we would like to draw attention to the specificity of each work in consideration as a historical novel.

The debate on the historicism of Dumas' works is still going on among researchers. Many scholars do not recognize the historicity of the novels of the “cloak and dagger”, and it is difficult to disagree with this opinion when the subject is the

classic, exemplary works of this type, such as the trilogy about the Musketeers, in which the adventure elements clearly come to the fore. Besides, Dumas himself noted: “What is history? <…> It is the nail on which I hang my novels” (Our translation. – A. T.) [3, p. 208]. However, the serious novels of the 1950s and 1960s about the French Revolution, which are confidently identified as historical ones, show that Dumas' work is by no means unambiguous. The trilogy, formed by the novels “Queen Margot”, “The Countess De Monsoreau” and “The Forty-Five Guardsmen”, created in 1845-1848, was published after the publication of works close to the genre of “roman populaire” [4], which brought the author world fame, – “The Three Musketeers” (1844) and “The Count of Monte Cristo” (1844-1846), – but before the appearance of the novels of a later period. The books of this trilogy are in a kind of a transitional position, combining the features of both the historical novel and the adventure novel in roughly equal measure. This fact has prompted literary critics to use the term “historical adventure” in relation to them [1].

Although “A Chronicle of the Reign of Charles IX” was written during the Romantic period, Mérimée does not fully follow the tendencies of this movement that T. V. Nuzhnaia and S. G. Gorbovskaya wrote about [5]. His reference to an important moment in national history in this work is not associated with romantic ideas about the glorious past, helping to bring people together after the major upheavals in Europe. The preface to the novel is polemically pointed and sharply directed against the Romantics [6]. Mérimée claims historicism strongly. He calls his work a “chronicle”, thus expressing his intention to present authentically the events described. The author sees his main task as creating “…a true picture of manners and characters at a given time” [7, p. 1], relying on documentary evidence from people who lived at the period and who captured the image of the era. Such a conception of the author determines the principles of a realistic portrayal of characters and the selection of historical material.

In an article entitled “Decoration of the Age” (1969), B. M. Eichenbaum writes: “Modernity is characterised by the development of the biographical chronicle, which centres on the question of human destiny. The predominant material is not historical events, but prominent people building their own destiny, <...> entire series of such biographical historical novels are now appearing both in France and in Germany” (Our translation. – A. T.) [8, p. 450-451]. Mann's “Young Henry of Navarre” (1935) and “Henry, King of France” (1938) constitute a dilogy in the form of a biography of the protagonist. In these works, Mann develops his new concept, the essence of which he expressed in the following words: “Humanists have to be implacable and take up arms every time when hostile forces want to obstruct human purpose” (Our translation. – A. T.) [9, p. 566-567]. However, only the first part of the dilogy is used for comparison, as the events of this particular work overlap with the historical episodes described by Dumas and Mérimée.

Therefore, the authors of the analysed novels use historical material in different ways. Dumas chooses a historical background for the adventurous plot, meanwhile allowing some inaccuracies in dates and distances from real prototypes for the sake of the intrigue of the roman-feuilleton. By contrast, Mérimée draws his chronotope from a documentary basis and concentrates on the manners and on the character of the

epoch. Mann creates a mature biographical historical novel, paints detailed psychological portraits of his heroes, colourful scenes of the past, and raises social, political, philosophical and moral issues.

Speaking of the author's intention, we can highlight the following theses.

Mérimée writes a novel about the nation. He takes a well-known event as the foundation in order to explain historical shifts not by the will of a limited group of people, but by the mindset of every segment of the population. It is in the moral life of the French, brought up in the spirit of religious fanaticism, in their spiritual decay, Merimée sees the reasons that led to The Saint Bartholomew's Day massacre and to the civil wars. The author is also interested in comparing the XVIth century with his present to see if people have become better. He comes to the conclusion that it is difficult to judge the actions of the ancestors, as views on the same things change over time: “What is criminal in a state of advanced civilization is only a bold in a state more backward, and in a state of barbarism may perhaps be a laudable action” [7, p. 3]. It should be noted that in Mérimée's conception, in his attitude to Charles IX and in the statements of the characters expressing the main ideas of the work, one can discern a rather negative attitude of the author to the described events. For example, the writer puts progressive thoughts into the lips of George de Mergy. His statements become some of the most laconic and emotional in the entire work: “Ah! when shall I be able to quit this country of crime and murder? <...> I would rather live among wild beasts than among Frenchmen” [7, p. 254], “Papists? <...> Huguenots? What is there on either side but superstition? I cannot believe what reason shows me to be absurd. Our litanies and your psalms are both nonsense; one as bad as the other” [7, p. 66].

The connection and the comparison with reality can also be traced in Mann's dilogy, or rather, these works are largely the result of the author's protest against the fascist regime: “The idea of writing a historical work about Renaissance France appeared to me as early as 1925 during a visit to the ruins of an ancient royal castle in Navarre. But the idea of the novel could not be fully realised until 10 years later, amid the turbulent and threatening events of the fascist dictatorship in Germany” (Our translation. – A. T.) [10, p. 15]. The writer wanted not only to tell his readers about the life of Henry of Navarre, later the founder of the Bourbon dynasty, but he was inspired by the task of creating a hero who represented the power of good, a wise statesman who cared about the well-being of people – the author intended to create the image of a Man [11]. In this character, readers had to see the exact opposite of those politicians, who were so hated by the writer's compatriots. Mann uses satire to expose the vices of his modern social order. The dilogy about the king of France was the main result of all Mann's work, as the author also believed himself: “Sometimes, however rare, the author combines what he has learned throughout his life and what was given to him by nature in the same work. You have to be old enough and still stay young enough to implement the kind of work that “Young Henry of Navarre” became or aspired to become” [11]. In addition, one of the key images in Mann's work, like in Mérimée's one, is the nation, but the authors introduce it into their works for different reasons. In the novel about Henry IV, the writer draws his attention to the historical and philosophical problem of the relationships between the state power and the inhabitants of the country. Despite the fact that the German

writer, like Mérimée, allowed some moral decline of the suffering people, who could succumb to pernicious influences, there are many episodes in the dilogy, which reveal the spiritual strength of the French, their enthusiasm. Mann noted: "... the moral law of the novel should be to accompany everywhere a man who speaks on behalf of the vast majority, further in his errors and weaknesses as doing the will of the age**"** (Our translation. – A. T.) [11].

According to A. Maurois, Dumas had the idea of resurrecting the history of France in a series of novels. The natural inspiration and a sense of the dramatic helped the author to bring his ideas to life under certain circumstances masterfully. Young French writers of the 1820s followed in the footsteps of W. Scott, who created colourful works on historical themes. "But in order to interest the crowd in the life of kings and queens, favourites and ministers, it was necessary to show them that under the court clothes the same passions as those of ordinary mortals lurk. In this Dumas was unrivalled" – writes A. Maurois (Our translation. – A. T.) [3, p. 208]. Dumas loved history, but he did not aspire to the title of a scholar or a researcher. His tender feelings were not matched by his respect, which was reflected in his freewheeling interpretation and depiction of historical events. He needed the material that he could recycle to showcase his talent for creating vivid, easily captivating works. He knew what the public needed and he satisfied their interest. The popularity and the slight disregard for the historical material are the main differences between Dumas' novel and the works compared.

To sum up, each of the authors pursues completely different aims, while using the same chronotope. Mérimée writes about the people, Dumas writes for the people. They both expose the mores of the people of a bygone era and look for the interesting episodes in the annals, but for different reasons. For Mérimée the levers of movement of history are in the people's minds, and Dumas is looking for something that can interest contemporaries in the real life characters. Mann's novel stands apart from their literary works because of the serious philosophy and personal experience invested in the "Young Henry of Navarre", it stands out for its monumental semantic content and the depth of the social problems addressed.

In all the analysed novels, the subject is an impersonal narrator who is neither a participant in the events, nor an object of the world depicted. Mann, in his novel about Henry IV often uses an internal monologue to portray the mental mood and feelings of his characters and he introduces an omniscient narrator who predicts the future and assesses the past, whose voice merges with the author's one. This is noticeable not only in the "Young Henry of Navarre", in the short "moralité" which concludes some chapters, but also in the second part of the dilogy, where the author's reasoning synthesises the most important ideological issues of the novel [11]. Dumas maintains the contact with the implied reader throughout the narrative by means of such indications: "But as we have said…" (Our translation. – A. T.) [12, p. 17], "Our readers have not forgotten that in the previous chapter we mentioned…" (Our translation. – A. T.) [12, p. 94], "Now if the reader is curious to know…" (Our translation. – A. T.) [12, p. 137], "As we already know…" (Our translation. – A. T.) [12, p. 519]. In this way, the author establishes equality with the reader and expresses his intention to listen to his wishes and interests. In other words, the narrative in

“Queen Margot” is of a playful type, where the narrator, while remaining omniscient and all-knowing, describes all important episodes in detail, but at the same time he tries to hide his own dominance in the favour of his addressee, through “incomplete knowledge” getting closer to him. One may also note Dumas' maxims on various topics, often of a moral sort: “Indeed, an observer privileged to be present at this festival, endowed with the knowledge of the future which is fortunately hidden from men, and with that power of reading men's hearts which unfortunately belongs only to God, would have certainly enjoyed the strangest spectacle to be found in all the annals of the melancholy human comedy” (Our translation. – A. T.) [12, p. 17]. The structure of the “A Chronicle of the Reign of Charles IX” includes a chapter with the eloquent title “Conversation between reader and author”, in which the author answers the questions of his addressee, cutting off his attempts to reduce the narrative to a description of the lives of royalty and courtiers. Mérimée is ironic about the demands of the modern reader and the peculiarities of the author's presence in nineteenth-century novels, so vividly reflected in the work of Dumas. The writer seems to make contact with the interlocutor and partly complies with his requests, but his answers are brief, disingenuous and often mocking: “But the Duke of Anjou, and Condé, and Guise, and Tavannes, Retz, La Rochefoucauld, Téligny, Thoré, Méru, and the rest? // You seem to know more about them than I do. I am going to talk about my friend Mergy. // Sir, I am sorry to perceive that I shell not find what I sought in this story of yours // Really, I am very much afraid you will not” [7, p. 105].

We would like to draw attention to a specificity of the system of characters in each novel and conduct an analysis, following Nuzhnaia's example [13]. Mérimée does not place influential political figures at the centre of the narrative. The focus of the author's attention shifts to the citizens, especially the youth. The author moves away from a romantic interpretation of manners in his thoughts and observations. Bernard de Mergy, a Huguenot, is the protagonist, and the love line between him and Diane de Turgis can be traced. His brother, the atheist George de Mergy, a secondary character who is closer to Catholics and has a progressive opinion, does not find his place in the society he is describing and dies in the finale through Bernard's fault. In this episode the inhumanity and cruelty of the civil strife finds its ultimate expression. George’s friends are episodic characters and they become this morally decadent youth, they lead an idle life, discuss women, duels and make jokes about religions. Within the plot, the author creates only one image of a historical figure: Charles IX takes part in the events described. Although he is only mentioned in a few episodes, his portrait is quite evocative. The author shows him as a hypocritical, cynical monarch. Vice versa, Dumas chooses real persons as the main characters in his work. As it was indicated above, two main storylines can be distinguished in “Queen Margot” – a love story, involving two couples, La Mole (who in reality was neither a young, count, nor Huguenot) with Marguerite and Coconas with Henriette, and a political one which is largely developed through the conspiracies of Catherine de Medici. In addition to The Queen Mother, the second line of the narrative features the significant presence of Henry of Navarre and Marguerite, Charles IX. It is difficult to distinguish clearly between major and minor characters. The author often shifts from one character to another, vividly painting each of them and closely intertwining their

destinies. Mann, like Dumas, creates the images of famous historical figures. The protagonist is undoubtedly Henry IV, the reader traces his spiritual development, the hard way of life learning. One may note the extremely extended system of characters – Mann draws many images in order to show the fullest picture of life. At the same time, no one is lost in the crowd; each personage, on the contrary, contributes to this panorama of society. Many significant episodic characters appear. Secondary characters include Henry of Navarre's mother, Jeanne d'Albret, who is an example to her son; Catherine de Medici, who, as in Dumas's novel, is a conspirator, her children.

The most prominent historical event in each of the works is The Saint Bartholomew's Day massacre. Although Mérimée depicts several important episodes at the time (the murder of Coligny, the massacre, the siege of La Rochelle), the massacre becomes the central one. It is during the massacre that all the most vicious aspects of the souls of the people of the time are most vividly revealed. In contrast, it is not the climax of the “Queen Margot” and it takes place at the beginning of the work, compositionally it is a rise of action that follows the inciting incident of Marguerite Valois' marriage to Henry of Navarre. This suggests that the author's emphasis in terms of the plot is still not on historical events. In Mann's novel, the massacre is the point of the highest emotional tension, serving as a turning point for the protagonist, when, in a seemingly stalemate situation, having lost many associates and being “trapped”, he decides that he will definitely defeat his enemies.

To summarise, we have three literary works that cover much the same time and space (the period of the religious wars in France) and include the confrontation between Catholics and Huguenots, the death of Admiral Coligny and The Saint Bartholomew's Day massacre. Certainly, this historical background is the main link between the novels analysed. Also, the same historical figures are mentioned in the works in greater or lesser numbers. However, each of the authors pursues different goals, their intentions, which are very different from each other, affect all the layers of the form and the content of their works, which creates the individual features of the depiction and of the processing of the same historical material.

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IMPLEMENTATION AND USE OF NEURAL NETWORKS IN DAILY LIFE

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Abstract. This article discusses the principles of building and training neural networks, as well as the operation algorithms and key features of the most popular and promising neural networks currently used by people.

Keywords: neural network, artificial intelligence, search systems, Google, Yandex, OpenAI.

ВНЕДРЕНИЕ И ИСПОЛЬЗОВАНИЕ НЕЙРОННЫХ СЕТЕЙ В ПОВСЕДНЕВНОЙ ЖИЗНИ

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Аннотация. В данной статье рассматриваются принципы построения и обучения нейронных сетей, а также алгоритмы работы и ключевые особенности наиболее популярных и многообещающих нейронных сетей, используемых людьми на данный момент.

Ключевые слова: нейронная сеть, искусственный интеллект, поисковые системы, Google, Yandex, OpenAI.

Today, artificial intelligence is actively used in our lives and helps in solving many problems in a wide variety of fields. One of the most promising areas for the development of artificial intelligence is neural networks, which are a mathematical model built on the principle of organization and functioning of biological neural networks, that is, networks of nerve cells of a living organism. They are already widely used in marketing, security and entertainment, and a variety of other industries. The most advanced companies, such as, for example, Google, Yandex and Microsoft, are conducting research in this area, which also contributes to the development and emergence of new discoveries in this area.

As previously mentioned, the very principle of constructing artificial neural networks is extremely similar to the structure of biological ones, that is, biological principles were used with a number of certain assumptions. Artificial neural networks are made up of many interconnected simple processes and can be trained just like the human brain. The training of a neural network is understood as the process of setting up its architecture (the structure of neural connections) and the weights of synaptic connections to effectively solve a specific problem. As a rule, the learning process of a neural network is carried out on some data sample, which is a training example. It is also important to note that neural network learning algorithms are divided into two types: supervised and unsupervised. The following is a brief description of each of the algorithms:

1. The process of training a neural network with a teacher consists in presenting a network of a sample of training examples, and each of the examples is fed to the inputs of the network, is processed within its structure, then the output signal of the network is calculated, compared with the corresponding values of the target vectors, which are the required output values. Then the error is calculated and the weight coefficients of connections within the neural network change, this process also depends on the chosen algorithm. This process is carried out with each of the vectors until the minimum acceptable result is reached (Figure 1).
2. In unsupervised learning, the learning set consists only of input vectors. The algorithm changes the weight coefficients so that when sufficiently close input vectors are presented, the same outputs are obtained. In the learning process, similar vectors are combined according to statistical properties and form classes, so the presentation of a vector from this class to the input gives a certain output vector at the output (Figure 2).

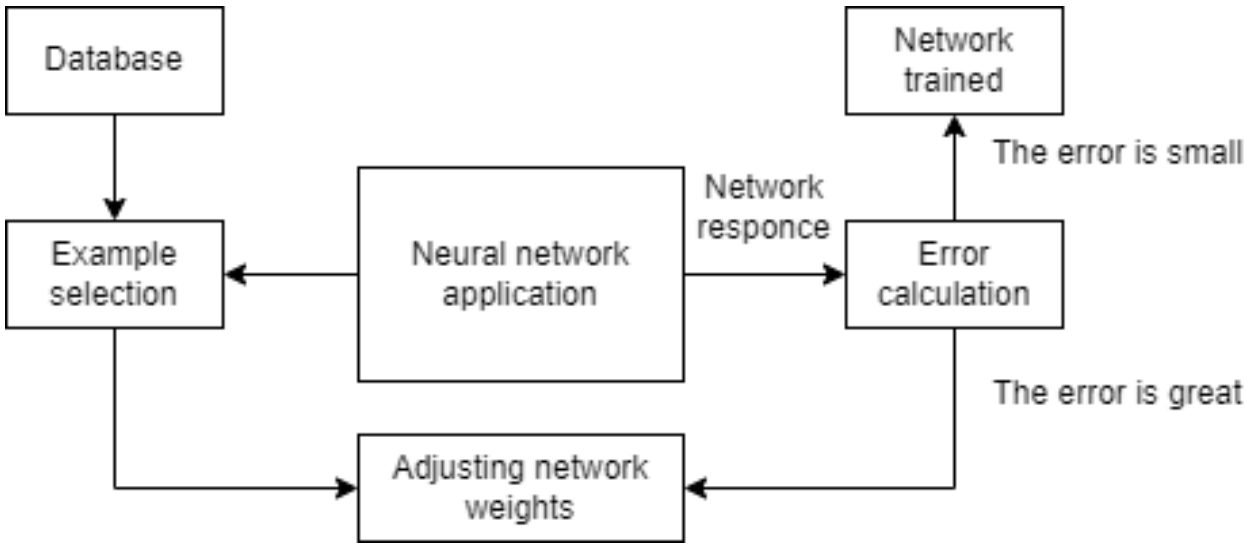


Figure 1. Scheme of the learning process of a neural network with a teacher

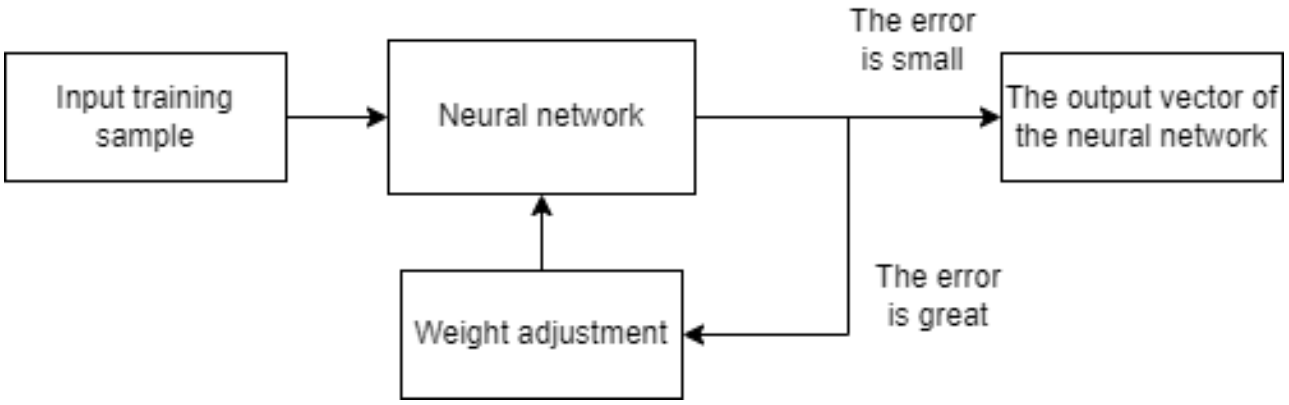


Figure 2. Scheme of the learning process of a neural network without a teacher

Turning to examples of neural networks that are most popular, it is important to note ChatGPT, a chat bot developed by OpenAI that can work in a conversational mode. Its advantage lies in the ability to both solve many tasks of the user's daily life, such as, for example, writing an essay for a schoolboy, and creating code for a programmer. The latter becomes especially relevant, since many IT professionals' resort to its help, connecting to their code the ability to access this neural network using a bot.

Next, we will consider significant algorithms and methods in the operation of a neural network using ChatGPT as an example. A distinctive feature is ease of use: the neural network does not require a specific question, but easily understands natural language when receiving a task. This is due to the work of the Prompt Engineering method. The generation of text in response to a question occurs through a technique called autoregression, which involves predicting the most likely next word in a sequence based on previous words.

Also, an important attribute of the ChatGPT neural network is its transformer architecture, which was developed by Google Research and Google Brain. Unlike the recurrent neural network architecture, which performs calculations sequentially, the transformer performs them in parallel, which significantly reduces the task execution time. In addition, an important advantage is long-term memory, which was achieved using a new approach to remembering the previous text, so that we get a contextually sustained text as an output. Transformer is a neural network architecture with a complex structure, without which the functioning of modern neural networks using various media resources is indispensable.

Machine learning does a better job with numbers than with text, so we need a tokenization procedure – converting text into a sequence of numbers.

The easiest way to do this is to assign each unique word its own number - a token, and then replace all the words in the text with these numbers. But there is a problem: there are a lot of words and their forms (millions) and therefore the dictionary of such words – numbers will turn out to be too large, and this will make it difficult to train the model. You can split the text not into words, but into individual letters (char-level tokenization), then there will be only a few dozen tokens in the dictionary, but in this case the text itself after tokenization will be too long, and this also makes learning difficult.

Not so long ago, the programmer's toolkit, whose algorithms simplify the creation of neural networks for recognizing various objects, included the Yolo convolutional neural network. Its algorithms allow you to quickly process the received image, due to the fact that this neural network does not need to repeatedly view the image, as happens with other CNNs, the name speaks for itself – “It's worth just looking at it.”

Working with an image in Yolo is carried out as follows: the resulting image is raised to a matrix consisting of image fragments, the next step is to raise objects into bounding boxes, after which the parameters of this image are calculated. The necessary parameters in this case are the coordinates of the frame (along the coordinate axis specified from the upper left edge) and its objectivity index, which serves as the center of the object, expresses the probability of successful detection of the object in the bounding box.

Thus, working with Yolo and its fast algorithm of work tell us that this tool is an excellent assistant in creating neural networks of computer vision, and that is why it has recently been widely used by programmers in projects where speed in object detection is required.

It is also important to touch upon the generative language neural network, an excellent example of which is YaLM (Yet another Language Model), developed by Yandex in 2021, it recognizes and determines the construction principle, taking into account knowledge about the world and the norms of the Russian and English languages, taking into account existing rules.

Like many other large language models from the world's leading companies (BERT, GPT, LaMDA), it is based on the Transformer architecture. Such a model has exactly one task – to generate each subsequent word in a sentence. To make the text coherent and grammatically correct, during training, the model evaluates each predicted word: for example, it decides whether the word “run” or the word “red” can go after “Roses are ...”.

The considered neural network can have from 1 to 100 billion parameters, it was tested on Yandex supercomputers and processed several terabytes of texts during the training process. YaLM is used in more than 20 projects by Yandex, which certainly makes it quite popular: the neural network helps Alice better communicate with the user, and Search generates cards for quick answers. You can also use YaLM to generate an advertisement or site description.

The above lists only the most popular and sought-after neural networks in their fields of activity. Thanks to neural networks, the annual volume of investments in the field of AI has grown 15 times since 2011, however, this is only the beginning, since the number of startups developing in this area is already in the tens of thousands and, according to analysts, there will be hundreds of them in a few years. develop into quite large-scale projects. The active development of neural networks brings improvement and relief in many areas and aspects of human life.

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VIBRODIAGNOSTICS OF THE LATHE WITH THE SD-21 DEVICE WITH THE DREAM E SOFTWARE PACKAGE

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Abstract. An important problem of cutting, which is of great practical importance, is the vibration of the technological system of the machine (MFTP – Machine Fixture Tool Part). The slightest defect or rarefaction of a part or assembly leads to the appearance of additional vibrations and, therefore, affects the quality of the machined surface. With the help of vibration diagnostics, it is possible to detect and predict defects, wear, rarefaction, etc. In the research, a three-axis sensor SD-21 with software for diagnosing a 1K62 lathe was used. In the course of the research, three main nodes for control were experimentally determined – the spindle assembly, the tool holder and the quill. The research data made it possible to identify the existing wear in the nodes, predict their service life and develop a preventive maintenance schedule.

Keywords: vibrodiagnostics, vibrations, spindle assembly, noise spectrum, diagnostics.

ВИБРОДИАГНОСТИКА ТОКАРНОГО СТАНКА ПРИБОРОМ СД-21 С ПРОГРАММНЫМ КОМПЛЕКСОМ DREAM E

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Аннотация. Важной проблемой обработки резанием, имеющей большое практическое значение, является вибрация технологической системы станка (СПИД – станок, приспособление, инструмент, деталь). Малейший дефект, разрежение детали или узла приводит к появлению дополнительных вибраций и, следовательно, влияет на качество обработанной поверхности. С помощью вибрадиагностики можно обнаружить и прогнозировать дефекты, износ, разрежения и т. д. В исследованиях применялся трехосевой датчик СД-21 с программным обеспечением для диагностики токарного станка 1К62. В ходе исследований были экспериментально определены три основных узла для контроля: шпиндельный узел, резцедержатель и пиноль. Данные исследований

позволили выявить существующий износ в узлах, спрогнозировать срок их службы и разработать график профилактических работ.

Ключевые слова: вибродиагностика, вибрации, шпиндельный узел, спектр шума, диагностика.

The automated system of vibration diagnostics is the most advanced and complex method for monitoring and diagnosing various defects. Such a system is based on the simultaneous analysis of time signals and vibration spectra. As a characteristic of the overall vibration level of the element, the RMS value of vibration acceleration, vibration velocity or vibration displacement, which are directly proportional to the destructive force, can be used. In the course of diagnostics according to the developed methodology, three indicators can be determined: the level of technical condition of the; the lubricating ability of the oil; the possibility of destruction.

The machine itself is a vibration system. Vibrations arise from the operation of engines, from coupling couplings, from the contact of gears, from high-speed processing modes, etc. [1, 2, 3].

Changes in speeds, distortion of the allowance, displacement of the cutter relative to the part occur due to the occurrence of vibrations.

It is logical that in a rigid, not loosened system, there is less chance of unnecessary vibrations. The vibration level is influenced by many factors – the cast of the spindle, pinole or cutter. These vibrations can be classified as visible. In addition to visible vibrations, there are invisible vibrations (vibrations inside components and mechanisms).

Vibration is a consequence of the action of vibrational forces of various origins, which, in turn, are caused by the dynamic interaction of nodes, parts and components of parts of working equipment. Vibration diagnostics of the equipment makes it possible to identify a wide variety of defects, such as imbalance, misalignment and non-parallelism of shafts, various types of mechanical loosening, breakage of anchor bolts, bending of shafts, electromagnetic defects of drives, as well as most defects of rolling and sliding bearings.

Our task was to develop a method for vibration diagnostics of lathes using the SD-21 vibration analyzer and the Dream E software package.

The noise spectrum of metal–cutting equipment consists of different sound frequencies: when parts (wheels, couplings, etc.) come into contact; due to friction in various joints. For example, when diagnosing guide bearings, the sound level changes if damage occurs in them.

Consequently, each defect – damage corresponds to its own sound wave. The principle of detecting defects is to compare the noise spectra of a serviceable machine with the sound signals of the machine being diagnosed.

The vibration sound level is measured and displayed in the noise spectrogram. In Figure 1, a spectrogram of the noise of the spindle assembly bearing during

operation is shown. The basis for constructing a spectrogram is the diameter of the bearing and the rotational speed.

To study the features of vibration diagnostics with the SD – 21 device, various tests were carried out. So, the influence of tool wear was controlled. The information spectrum of frequencies in the range of 4-5 kHz was obtained when working with a sharpened tool.

When working with a blunted instrument, the level of sound strength from vibrations was in the range of 10-11kHz. The main advantages of vibration diagnostics are the relatively short time for diagnostics and the absence of the need to stop and disassemble the equipment.

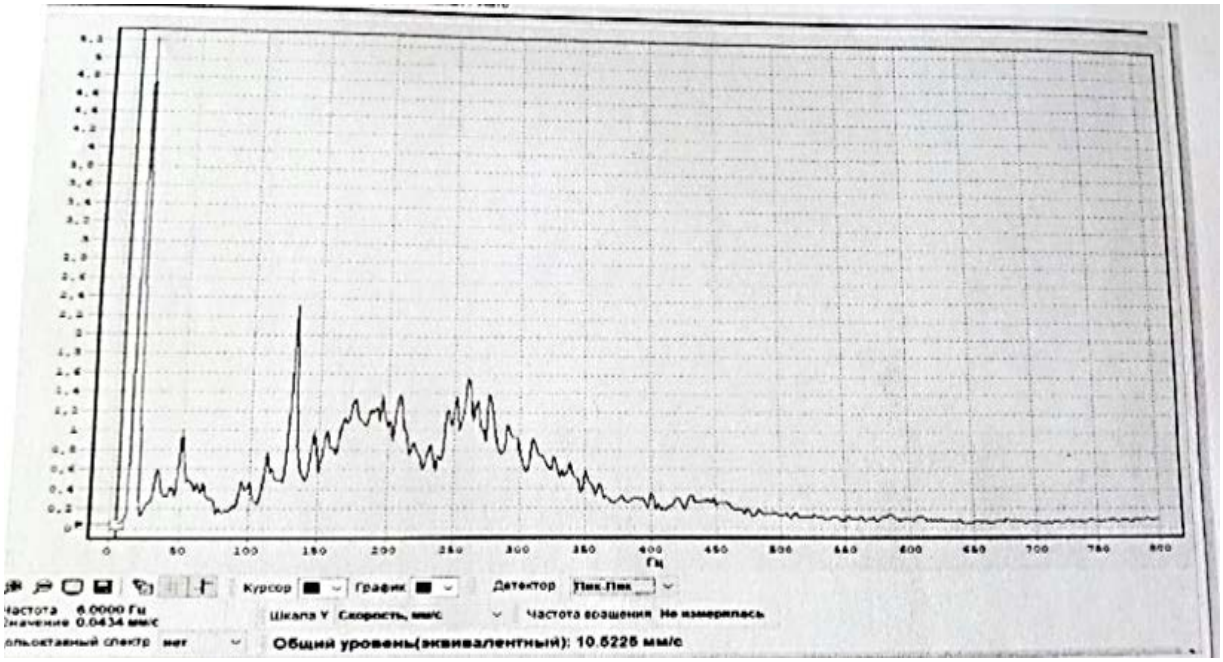


Figure 1. Bearing noise spectrogram

In general, the vibration spectrum contains eigenfrequency harmonics of vibrations and created by other elements.

Therefore, when solving a multifactorial problem with a large number of indicators, a special program is used that takes into account each factor in the total vibration, as well as interconnections between vibration characteristics [4].

Before starting the measurements, all the necessary data of bearings, gears and belt gears, ball-screw pairs and dynamic performance indicators of machine components and parts are entered into the program.

The Dream E program identifies components related to the part under study in the general vibration signal and compares them with the characteristics of the defect-free part from the program database.

CL-21 is a new platform of two-channel VAST analyzers. It supports the possibility of expanding the functions and upgrading the devices by updating the software. The Dream software package is integrated into this vibration analyzer.

With the help of a microphone and sensors, individual units of the unit were checked in 2-3 planes. It is preferable to check on three planes, but this is not possible in all nodes.

Having analyzed the nodes that maximally affect the processing process, the main ones for diagnostics were selected – a spindle node, a tool holder and a pinole (Figure 2). Measurements were carried out in the vertical, horizontal – transverse and axial directions.

Measurements were carried out every 3 days for 30 days. Based on statistical data, it was assumed that 10 % wear (deviation from the normal spectrum) was acceptable, and with wear exceeding 10 %, the node requires repair.

Vibration diagnostics with the help of the above-mentioned program made it possible to identify 12 types of defects, spindle assembly bearings, among which: wear of the separator and rings of rolling bodies, damage to raceways, etc. [5].

Based on testing, it can be concluded that vibration diagnostics of the machine must be carried out once in three days. In the event of damage site and defects, diagnostics is carried out once a day.



Figure 2. Control points

This allows you to extend the life of the nodes, and reduce the number of scheduled repairs.

Thus, vibrodiagnostics of machines allows you to switch from scheduled preventive maintenance to maintenance according to the actual technical condition without disassembling the machines, which allows you to reduce the cost of their maintenance by 40-50 %.

Also, vibration diagnostics of machines provides a higher quality of service, determine not only the defects of machine parts, but also the presence of distortions when installing parts and tools, runout in nodes, friction in pairs.

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ENERGY-SAVING MEASURES IN THE CONSTRUCTION AND DESIGN OF RESIDENTIAL BUILDINGS

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Abstract. Efficient use of electricity is one of the main challenges in the design of energy-efficient residential buildings. This article examines a number of factors that contribute to improving the energy efficiency of buildings.

Keywords: energy efficiency, energy conservation, assessment, buildings, indicators, energy consumption, engineering systems.

ЭНЕРГОСБЕРЕГАЮЩИЕ МЕРОПРИЯТИЯ ПРИ СТРОИТЕЛЬСТВЕ И ПРОЕКТИРОВАНИИ ЖИЛЫХ ЗДАНИЙ

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Аннотация. Эффективное использование электроэнергии является одной из основных задач, решаемых при проектировании энергоэффективных жилых домов. В статье рассматривается ряд факторов, способствующих повышению энергоэффективности зданий.

Ключевые слова: энергоэффективность, энергосбережение, оценка, здания, показатели, энергопотребление, инженерные системы.

This situation can be addressed through a number of measures, including the modernization of industrial enterprises, the improvement of production technologies and the introduction of energy-efficient technologies in the housing and communal sector.

In addition, it is important to stimulate the transition to the use of renewable energy sources, such as solar and wind energy, which will reduce dependence on oil, gas and coal [1, p. 248]. The development of electric mobility and the use of electricity in transport is also one of the important directions in the field of energy efficiency.

Besides saving energy resources, efficient use of energy is of great importance for environmental protection. Reducing energy consumption means reducing emissions of pollutants such as carbon oxides, sulfur dioxide and others that harm human health and the natural environment. Moreover, the use of renewable energy sources, such as solar and wind energy, reduces dependence on oil, gas and coal, which reduces the risks of environmental disasters associated with their extraction and transportation [2, p. 236]. The use of efficient technologies and the installation of energy-saving equipment in the housing and communal sector also significantly reduce the negative impact on the environment and improve the quality of life of citizens. In general, the efficient use of energy resources allows not only to save energy costs, but also to reduce the negative impact on the environment and improve people's living conditions.

Thus, the creation of an energy-efficient economy is a prerequisite for the sustainable development of Russia. Efficient use of energy will reduce energy costs, increase energy independence and increase the competitiveness of the country in the world market. In addition, energy efficiency will lead to an improvement in the environmental situation, which will reduce the risks of environmental accidents and improve the quality of life of citizens. An important aspect is also the creation of new jobs and the development of innovative technologies, which contributes to the growth of the economy as a whole [3, p. 56]. In addition, the use of renewable energy sources allows not only to reduce dependence on oil, gas and coal, but also to create new sectors of the economy and companies operating in them. In general, energy efficiency is a key element of sustainable development that can provide more favorable conditions for people's lives and the future development of Russia.

According to statistics, the consumption of thermal energy by buildings in Russia is about 45% of the total amount of energy consumed. Most of this volume is accounted for by the operation of buildings – about 90 % of the energy consumed, while the production of building materials consumes about 8 % of energy resources and the construction process – about 2 %. The volume of energy consumption for lighting, household and industrial needs also accounts for a significant share of total energy consumption in Russia. In this regard, the introduction of energy-efficient technologies and structures in the construction and reconstruction of existing buildings is an important task to reduce energy consumption and increase economic efficiency.

Analysis of the structure of energy consumption by buildings of different periods of development (Figure) shows the difference in energy consumption for various needs, structures of different periods of development. The graph clearly demonstrates the reduction of energy consumption for heating and the almost equalization of energy needs for electricity, hot water, ventilation and heating in modern passive houses fully focused on energy consumption [3, p. 55]. But since the majority of houses in modern Russia are still buildings from the 50s and 70s, the problem of energy consumption is still very relevant.

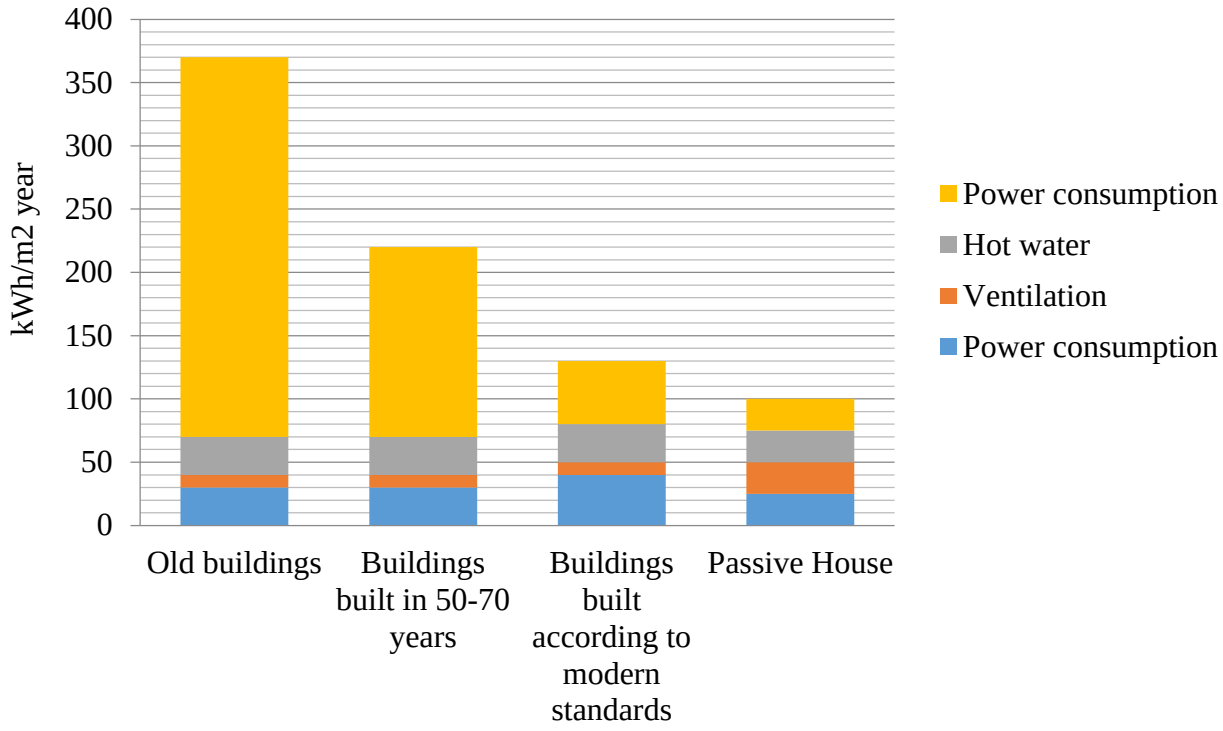


Figure. Structure of energy consumption in buildings

Buildings built with energy efficiency in mind may be more expensive than conventional buildings, but they lead to savings in energy costs, which can recoup costs over time. However, in order to increase the share of energy-efficient buildings, it is necessary to carry out promotional activities and support their construction with state support and tax benefits. At the same time, a necessary condition is to reduce the costs of designing and building such facilities, which should be achieved by optimizing technological processes and introducing new materials. In addition, it is necessary to conduct training and advanced training of workers in the construction sector in order to ensure the high quality of the work performed [4, p. 20]. In general, energy efficiency of buildings can become one of the priorities in the field of residential and commercial real estate, including in the regions.

The implementation of energy-saving programs can significantly reduce the need for new energy capacities at lower capital costs. According to the data of PJSC UES of Russia, the realization of even 1/5 of the potential of electricity and heat saving among consumers can reduce the need for new capacities by 5-6 %.

The purpose of this work is to select optimal solutions for energy-efficient residential buildings based on comprehensive studies of space-planning, structural and engineering systems.

To achieve this goal, the following tasks were set: choosing the type of mass-construction building to create an energy-efficient residential building, substantiating space-planning and design solutions, conducting research on technical systems, conducting experimental studies of the effectiveness of decisions taken and systematizing energy-saving measures for the technical and economic evaluation of the results.

The scientific novelty of the work lies in the fact that the possibility of creating an energy-efficient residential building was theoretically substantiated and experimentally confirmed, space-planning and design solutions were justified, energy saving conditions were selected, and technical solutions for use in the design and construction of residential buildings with reduced energy consumption during their operation were systematized.

The object of the study is the energy consumption of residential buildings during operation, and the subject of the study is the spatial planning and structural solutions of buildings, as well as technical solutions of engineering systems and equipment used for their device, contributing to the reduction of energy consumption during their operation.

The theoretical and methodological foundations of research are the achievements of domestic and foreign science in the field of energy conservation.

The value of this work lies in the fact that it helps to choose the optimal energy-saving measures and technical solutions for the mass construction of residential buildings. The results and conclusions of the study are reliable and are based on a comparison of theoretical studies with real data on energy consumption of residential buildings and other studies. The paper presents the relevance, purpose and objectives of the study, as well as the main results and content of the work.

To begin with, we will analyze the regulatory framework for energy saving in Russia.

The works of Averyanov, Bogoslovsky, Boguslavsky, Butovsky, Vasiliev, Gagarin, Dmitriev, Ivanov, Lykov, Matrosov, Mogutov, Tabunshchikov, Tyutyunnikov, Fokin, Chistovich and other authors consider the issues of creating energy-efficient buildings.

If we examine the situation more closely, it is necessary to ensure a more active role of the state in regulating energy conservation and setting appropriate quality standards. In addition, it is necessary to develop mechanisms to encourage companies and organizations to reduce energy consumption and improve economic efficiency.

It is also important to promote a culture of energy conservation among the population and the business sector, showing that saving resources can be not only environmentally beneficial, but also economically beneficial. For example, investments in energy efficiency often pay off in a few years due to lower electricity or heat costs.

In general, energy conservation is one of the most important aspects of sustainable development, which can contribute to economic growth, improve the environmental situation and improve the quality of life of people. Therefore, it is necessary to pay enough attention to this issue and take active measures to develop energy-saving technologies and practices.

The main role of the state is to create conditions that will stimulate the subjects of the state to increase the efficiency of energy-consuming facilities. Increasing energy efficiency will save the state from having to subsidize energy costs, especially through low heat and gas prices, improve energy security and competitiveness of Russian goods, and reduce the negative impact on the environment. Regional and

industry standards on thermal protection and energy efficiency of buildings have been developed and put into effect in more than 50 subjects of the Russian Federation. These regulations encourage the design of buildings with lower energy consumption. One of the main requirements for consumers is to set standards for the specific energy consumption for heating buildings during the heating period, provided that comfortable conditions for people to stay in the building are provided. The key idea of the text: The implementation of energy-saving measures is possible only with an integrated approach that includes various measures, such as architectural and planning solutions of the building and engineering systems.

The main directions that determine the solution of complex interrelated tasks:

1. Organization of indoor microclimate.

2. Minimization of energy costs.

3. The economy of the building and the rational use of material resources.

Achieving optimal results is possible if the following conditions are met:

1. Assignment of design internal conditions, including air quality in the premises of the building.

2. Selection of design parameters of outdoor air with different availability of probabilities of meteorological elements.

3. Selection of architectural and planning solutions.

4. Temperature and humidity regime and air exchange regime in the building. The use of energy-efficient designs of self-ventilated windows with increased tightness or window blocks with specially designed valves.

To achieve maximum energy efficiency in residential buildings, it is possible to use a heating system with horizontal wiring of highways apartment-by-apartment and control of thermohydraulic modes in each room. A heat meter, a balance valve and thermostatic valves on the devices must be installed on each branch. This will save up to 30% by taking into account heat emissions, solar radiation, program control of air temperature in rooms and elimination of excessive ventilation [5, p. 102].

For hot water supply, it is recommended to use local decentralized water preparation using steam compression heat pumps. Heat pump evaporators should use a combination of heat from the ground through wells, conditionally clean sewage water and exhaust air heat from ventilation systems as a low-potential heat source.

To reduce the design capacity of heat pumps, it is necessary to install accumulator tanks and pumps for circulation and supply of hot water to the hot water supply system of the whole house. It is also advisable to switch to a two- or three-tariff system of payment for electricity and to carry out water heating by electric heaters at night.

This study continues in the direction of introducing factors that contribute to reducing the energy efficiency of the methods used and eliminating the identified shortcomings.

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DEVELOPMENT OF THE CORPORATE IDENTITY OF A CONSTRUCTION COMPANY

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Abstract. The article considers the role of corporate identity application for creating a bright and reliable image in the market of construction services. The basic aspects of a properly designed corporate identity are presented, which allows the company to emphasize its individuality, to stand out in the market and strengthen ties with customers, increase brand recognition and the level of consumer confidence in the company and its products.

Keywords: construction company, corporate identity, printed matter, graphic elements.

РАЗРАБОТКА ФИРМЕННОГО СТИЛЯ СТРОИТЕЛЬНОЙ КОМПАНИИ

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Аннотация. В статье рассмотрена роль применения фирменного стиля для создания яркого и надежного образа на рынке строительных услуг. Представлены основные аспекты правильно разработанного фирменного стиля, что позволяет компании подчеркнуть ее индивидуальность, выделяться на рынке и укреплять связи с клиентами, повысить узнаваемость бренда и уровень доверия потребителей к компании и ее продукции.

Ключевые слова: строительная компания, фирменный стиль, печатная продукция, графические элементы.

Human needs have always been and will continue to be the main driver of development. At the present time, the consumer society wants a constant upswing in supply, which is why there has been a dramatic increase in the number of different companies with the ability to satisfy every human desire. Oddly enough, even the most successful products and services do not serve as a one hundred percent guarantee that this or that firm will achieve its goal. There is no doubt that the fastest effective solution to this difficulty is considered a competent drafting of corporate identity and advertising and graphic complex [1].

Corporate identity is the set of graphic elements and the rules for their use that create a recognisable brand image. Corporate identity includes elements that help to identify the brand, such as the logo, colour palette, typography, style of photographs and images, as well as the structure and design of the website and other elements. The purpose of corporate identity is to create a unified visual language for the brand and to use it consistently to increase user recognition and trust in the brand. Corporate identity and RGK – the company's image, allowing it to stand out from the variety of its competitors. The uniqueness and originality, the sensuous expressiveness of the moment serves as a powerful marketing move, which makes any company recognizable. Considered as one of the most effective advertising tools, the brandbook can tell the consumer about the features of the company, its activities, its position towards the consumer, acting as a concluding argument in the choice of products. These days in marketing has formed and is rapidly growing such a trend of interaction as the formation of corporate identity, which is a beautiful picture of the company. That is, it collects a "holistic" representation of the brand on behalf of the client, increasing prominence in the eyes of the market segment and helping to create the initial impression [2].

Some of the main functions of an identity include:

1)Identity brand identity helps consumers effortlessly recognize the company they want.

2)Trust. If the consumer is once convinced of the quality of the product or service provided, this trust will extend to a greater extent to the rest of the company's products.

3)Advertising. The visual part of image promotion.

4)Image Creation.

The goals of corporate identity are:

1)Brand recognition through the application of developed corporate identity components on the surface of media.

2)Distinguish the company from competitive offerings through distinctive creative solutions.

3)Development of the company's image and image.

Advantages of corporate identity:

1)Growth of corporate spirit and integrity of employee relations.

2)Positive effect on the aesthetic index, as well as on the outer shell of the goods and the firm.

3)Helps the customer to understand the lightning-fast movement of advertising information.

4) Directs the customer to the firm's responsibility for the product or service.

5)Directs the public to the stability and reliability of the firm.

6)Reduces the cost of marketing and RR while increasing its effect and projecting a strong and recognizable brand in a segmented market [3].

The design concept of the Build Camp construction firm's identity acted as the beginning of the logo. The dynamics of the bands of bright blue color entering the distance under the action of perspective is used in corporate styles and advertising art complexes as the nuances of the enterprise. A common graphic element such as a

brick allows everyone to recognize a company's construction sector without error. Such elements are symbolic, as each evokes the consumer's association with the concepts of "construction," "housing," and "construction." The initial challenge was to develop a clear, recognizable image, using a basic compositional element that evokes an intertwining with the firm's activities.



Figure 1. Development of corporate identity



Figure 2. Development of corporate identity. Abridged version

The construction company brand picks up the English name "BC," which acts as an abbreviation for "Build Company," which exactly means "to build a company. As such a combination of words undoubtedly names the company's field of work and helps the client gain a correct understanding of it. Foreign interpretation unambiguously gives seriousness, perspective style and reliability of the firm, based on the European level, and also gives an opportunity to a copywriter or designer to choose a huge number of fonts to develop a high-quality text.

Colours play an important role in our lives and have a great influence on our emotions and moods. That's why the choice of colour for a logo can be crucial to the success of a brand.

So how do you choose a colour for your logo so that it best captures the essence of your company and attracts the attention of potential customers? For

starters, it's important to understand the emotions that different colours evoke. Red, for example, is associated with brightness, energy and passion. Orange is associated with warmth, friendliness and a sense of comfort. Yellow is associated with joy, optimism and creativity. And so on. However, you must not forget the context in which the logo will be used. For example, if the logo is for a spa, overly bright and active colours are inappropriate. In this case, choose calmer and softer shades such as light blue or lavender.

It is also worth considering the target audience and their preferences. If you want to attract the attention of young people, bright and unusual colours are a better choice. But it's important to remember that choosing colours for a logo is an individual process that must reflect the uniqueness of your company. The ideal is to create a logo that beautifully and harmoniously combines several colours, reflecting all aspects of the brand.

The psychology of colour allows you to choose colour schemes that are not only beautiful but also effective. The right choice of colour can greatly increase brand recognition and success [4].

The key corporate colors of the company are considered azure, white and dark. All tones without exception are the embodiment of a certain independence, purity, and clear ideas.

For this reason, one can rely on this company. Furthermore, the impression they create is also diverse: sophistication and strength, wealth and conservatism, peacefulness and eccentricity, sustainability and reliability. Everyone will psychologically subconsciously trust this company more than a company with other opposing colours.



Figure 3. The psychology of colour in marketing

The emblem is the most important component of a company's face. It is intended primarily for the purpose of identifying the firm in bidding. Logos have emerged in order to stand out among the products of different companies within the same field. In the customer's perception, the presence of a logo or a trader's symbol is a guarantee of a product's success [5].

Already after studying numerous analogues of competitors' logos, and in addition and consideration of colors, graphics and text, there was an understanding of what to focus interest in creating the most famous and more high-quality logo. Exactly as the most optimal concept of building-firm "Build Camp", and its specificity, compliance with stereotypes and psycho-physiological basis of perception of the components of the icon, and the philosophy of the company, with a large number of sketches was selected the final icon. The main compositional element of the logo of the company "Build Camp" includes a stylized representation of the building. Transformation is made by means of elementary geometric configurations and perspective lines. Oblique primitive elements in the graphic area of the logo give it a final and convincing look. The stylized image of the building clearly indicates the industry of the company, and corporate colors attract interest and indicate the professionalism of the construction company "Build Camp".

In conclusion it should be said that corporate identity is a set of color, graphic, verbal, typographic, design elements (constants), reflecting visual and semantic unity of goods and services, all the information coming from the company, its internal and external design. A good identity attracts consumers, allowing the company to make a profit and attract loyal customers, on whom the long-term prosperity of the firm is built.

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SUSTAINABLE DEVELOPMENT IN SUPPLY CHAIN MANAGEMENT

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Abstract. The article provides a justification for the need to implement ESG principles in the activities of logistics companies. The author analyzes modern international initiatives of companies in the field of sustainable development of supply chains. The article describes the experience of Norilsk Nickel and X5 Retail Group in implementing the requirements in the field of sustainable development to suppliers. Further, the level of state support for initiatives in supply chain management and the current development of legislative requirements are investigated.

Keywords: sustainable development, supply chain, logistics, ESG, non-financial information.

УСТОЙЧИВОЕ РАЗВИТИЕ В УПРАВЛЕНИИ ЦЕПЯМИ ПОСТАВОК

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Аннотация. В статье приводится обоснование необходимости внедрения ESG-принципов в деятельность логистических компаний. Автором анализируются современные международные инициативы компаний в сфере устойчивого развития цепей поставок. Описывается опыт внедрения компаниями «Норильский никель» и «X5 RetailGroup» требований в области устойчивого развития к поставщикам. Исследуется уровень поддержки государством инициатив в управлении цепями поставок, степень развития законодательных требований.

Ключевые слова: устойчивое развитие, цепь поставок, логистика, ESG, нефинансовый отчет.

In 2020, due to the COVID-19 pandemic, borders were closed and some businesses stopped. A new challenge emerged for logistics companies. Logistics operators needed to meet both the needs of consumers and the new requirements of the state. In 2022, there was a break in international cooperation between the

companies. Russian logistics companies had to adapt to the changes – to significantly change or rebuild logistics routes and look for new contractors. Along with these events, the competitive advantages of companies in the market have also been changing.

Nowadays economic development is impossible without compliance with the principles of sustainable development. ESG is an acronym for “Environment, Social, Governance”. This is the company's development strategy which provides for transparency in management, concern for the environment and the people with whom the company comes into contact. ESG agendas significantly affect the country's economy. Therefore, the number of large business initiatives in the field of ESG is also growing: many enterprises have begun to integrate ESG factors not only into their activities, but also into the entire supply chains. Accordingly, when choosing a logistics operator and concluding a cooperation agreement with him, companies pay attention to whether the contractor integrates the principles of sustainable development into its activities.

An Edelman Trust Barometer research conducted in 2020 indicates that 71% of consumers are ready to abandon a brand that only works for the sake of money, and does not care about customers and environmental impact (Figure 1).



Figure 1. Edelman Trust Barometer research

In addition, now consumers pay special attention not only to the reputation of the company itself in the market, but also to its counterparties, both contractors and suppliers. It is important for large companies that their contractors have a good reputation in their segment. Therefore, there is a growing discussion around transparency, the "sustainability" of supply chains and the responsibility of procurement.

Despite the fact that one of the important tasks of business is compliance with ethical and environmental principles within the supply chain, the standards and regulatory requirements regarding this aspect on all levels, the international one included, are not that many. However, the increasing number of countries is beginning to take measures to develop its own legislative requirements for supply chains and to enhance responsibility and transparency. One of these countries is India. According to the draft, large companies in this country may be required to provide ESG reporting and disclose information at the level of the supply chain and its certification with a verifier is mandatory [1, 2]. In addition, the Indian representative office submitted for consideration ESG parameters that can be included in at least one of the ESG ratings for Indian companies, as they are specific to the "Indian context". For example, the growing dependence on renewable energy sources can only worsen problems with energy supply and lead to greater social problems. India is facing a shortage of base load capacity, so it would be wrong to insist too much on renewable energy sources and thus penalize existing coal-fired power plants. Therefore, the strengthened control over the "sustainability" of not only Indian companies themselves, but also of supply chain participants means that measures taken for formation and reporting will affect all companies participating in this chain to one extent or another. For Russia, which is increasing trade turnover with India, this means that the requirements for ESG transparency in interaction with large Indian companies will increase in the future.

Russia does not yet have a comprehensive regulation of the "sustainability" of supply chains and their transparency. As for non-financial information, Russia currently has no requirements for companies to disclose it, which means it is extremely difficult to collect data on the entire supply chain. Currently the Central Bank is actively working on a set of recommendations on the disclosure of ESG data for the financial sector. However, there is no data on the development of recommendations for the real sector yet. Thus, if we do not develop requirements in the field of sustainable development, Russian companies which participate in the supply chain may face considerable challenges in the future with meeting the requirements of other countries, what with taking into consideration a further increase in trade turnover with India in particular.

However, the introduction of ESG practices can result in high risks for suppliers of large companies. Firstly, it means the growth of material costs. The introduction of technologies and environmental management systems, a change in the approach to interaction with suppliers and consumers along with the transformation of corporate governance all require large investments. Secondly, ESG for the field of supply chain management is a fairly new concept, and therefore most companies have a shortage of skills needed in this area [3]. However, there are also less costly requirements and to meet those suppliers need, for example, to increase transparency, adopt a code of ethics, anti-corruption policy, and so on.

It is worth noting that a significant share of the requirements for suppliers are the same for various large companies. The desire to conform to modern requirements will allow suppliers to expand their customer base and increase their competitiveness. Gartner, Inc. has published the results of its annual ranking of the best supply chains in the world, identifying supply chain leaders and highlighting their best practices (Figure 2). For the second year in a row, Cisco Systems becomes the leader of the rating [4]. Cisco has adopted the Responsible Business Alliance (RBA) Code of Conduct as their code of conduct for supply chain vendors. It is an evolving document that incorporates the feedback on Cisco, its peers, suppliers, customers, and outside stakeholders. Cisco expects its suppliers to operate in accordance with the RBA Code of Conduct, which includes provisions covering responsible management in labor, health & safety, environment, and ethics [5].



The Gartner Supply Chain Top 25 for 2021

Rank/Company	Composite Score*	Rank/Company	Composite Score*
1. Cisco Systems	6.37	14. Dell Technologies	3.47
2. Colgate-Palmolive	5.58	15. HP Inc.	3.46
3. Johnson & Johnson	5.22	16. Lenovo	3.40
4. Schneider Electric	5.07	17. Diageo	3.36
5. Nestlé	4.41	18. The Coca-Cola Company	3.34
6. Intel	4.40	19. British American Tobacco	3.13
7. PepsiCo	4.37	20. BMW	3.13
8. Walmart	4.23	21. Pfizer	2.97
9. L'Oréal	4.05	22. Starbucks	2.87
10. Alibaba	3.90	23. General Mills	2.83
11. AbbVie	3.78	24. Bristol Myers Squibb	2.80
12. Nike	3.60	25. 3M	2.78
13. Inditex	3.51		

gartner.com

*Composite Score: (Peer Opinion*25%) + (Gartner Research Opinion*25%) + (ROPA*20%) + (Inventory Turns*5%) + (Revenue Growth*10%) + (ESG Component Score*15%).
2020 data used where available. Where unavailable, latest available full-year data used. All raw data normalized to a 10-point scale prior to composite calculation. "Ranks" for tied composite scores are determined using next decimal point comparison.
Source: Gartner (May 2021)
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Gartner

Figure 2. Gartner's rating

In the Russian market, the Nornickel company is one of the leaders of the ESG rating. It is a champion both in terms of ESG requirements and recommendations to its suppliers. The company has developed a Supplier Code of Corporate Conduct. It describes what procedures for responsible selection of suppliers Nornickel implements in its supply chains and what principles for responsible selection of suppliers it adheres to.

The code describes in detail what criteria a logistics operator must meet in order to conclude a mutually beneficial contract. Among the many conditions are: respect for human rights, responsible management of water resources, minimization of negative impacts on biological diversity, energy efficiency of the supply chain and many more. For example, suppliers are required to efficiently and responsibly manage energy consumption at their facilities, to collect and provide information and report on electricity consumption in accordance with the requirements of the regulatory framework, as well as to provide the necessary information to Nornickel upon request to meet the reporting requirements of the company [6].

Another example of a company successfully implementing the principles of sustainable development in its supply chain is the X5 Retail Group. This company has the largest number of requirements and recommendations among retailers. It should be noted that the company pays special attention to the sustainability of supplies, especially in terms of packaging, and that all requirements are structured and clearly spelled out in the documents.

Despite a significant number of ESG requirements, the policies of large companies remain largely advisory in nature. Nevertheless, over time, the competitive conditions for suppliers will become tougher [3]. Based on the above, it can be concluded that considering the ESG policies of the largest companies is becoming an important factor of competitiveness among their suppliers and contractors.

Summing up, it is important to mention that there is currently no single reporting standard, so different companies can determine the ESG performance indicators themselves in order to increase the sustainability and social responsibility rating. But the operational activities of almost every company are supported by a global supply chain that includes employees, information and resources. To accurately assess ESG risks, a company needs to consider its end-to-end supply chain operations. There is a tendency to tighten the ESG component in the interaction of large businesses with counterparties. Also, enterprises are giving an increasing share of their business, as well as their areas of responsibility, to partners, which increases the requirements for their sustainability. The increasing number of companies requires suppliers to be sustainable, not because it carries some abstract mission to the world, but because it creates sustainability for itself. It is always a win-win between the enterprise and the supplier.

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ANALYSIS OF GASTRONOMIC TRENDS OF THE PAST AND DEFINITION OF THE RESULTS EXPECTED

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Abstract. This article is a kind of tool for people working in the field of catering. Its goal is to identify trends in gastronomy for the next few years. To do this, we need to identify patterns in the development of trends. According to the forecasts received, people will be able to build the concepts of their establishments so that their activities are carried out most effective.

Keywords: gastronomy, gastronomic trends, forecasts of gastronomic trends, food trends, food fashion, food.

АНАЛИЗ ГАСТРОНОМИЧЕСКИХ ТЕНДЕНЦИЙ ПРОШЛОГО И ОПРЕДЕЛЕНИЕ ОЖИДАЕМЫХ РЕЗУЛЬТАТОВ

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Аннотация. Статья является своеобразным пособием для людей, работающих в сфере общественного питания. Цель статьи – определить тенденции в гастрономии на ближайшие несколько лет. Для этого нами были выявлены закономерности в развитии трендов. По полученным прогнозам люди смогут строить концепции своих заведений так, чтобы их деятельность осуществлялась наиболее эффективно.

Ключевые слова: гастрономия, гастрономические тренды, прогнозы гастрономических трендов, тренды в еде, мода в еде, еда.

The object of the research is the trends of Russian gastronomy. The purpose of the study is to determine the gastronomic trends in Russia for the next couple of years. In order to derive them, we need to collect information about the trends in the gastronomic world in the past, conduct an analysis, identify patterns and, finally, based on the result, make an assumption about what trends await us in the future. This article can be an effective tool for a restaurant manager or chef, as following the trends can lead to an increase in the restaurant's popularity.

First, by analyzing Internet resources that deal with gastronomic trends, we conduct the database. All the necessary information is presented in the tables below (Table 1), (Table 2).

Table 1 – Main gastronomic trends in 2012 [1], 2014 [2] and 2016 [3]

2012	*2014*	*2016*
Fusion cuisine	Asian cuisine and its flavors	Fast food delivery
Use of by-products	Tasting menu	Purchased meal kits in containers
Using homemade pickles	Chicken dishes	Healthy diet
Korean cuisine	Fish dishes	Zero waste production
Unusual tastes and experiments	Focus on low-alcohol, non-alcoholic drinks	Growing popularity of vegetables in the daily human diet
Beer bars	Healthy food and special menus	Useful "fastfood"
Burgers as haute cuisine	One Meal Restaurants	The use of raw foods in the diet

Table 2 – Main gastronomic trends in 2018 [4], 2020 [5] and 2022 [6]

2018	*2020*	*2022*
Healthy diet	Healthy diet	Healthy diet
Soft drinks	Soft drinks	Soft drinks
Tea drinks	Zero waste production	Zero waste production
Use of local products	Development of regional and local cuisines	Local and seasonal products
Use of edible flowers and microgreens	The use of a large number of vegetables in the diet	Tastes familiar from childhood
Eastern cuisine	Smoking dishes	Alternative protein
Using a lot of spices	Passion for haute cuisine	Reducing the consumption of animal products

Healthy eating, giving up alcohol, searching for new unusual tastes, experimenting with ways of preparing a product are trends in the gastronomic world that have been actively developing lately. A person has realized that his health largely depends on his nutrition, so today we see an active study of products and their effect on the human body. Many restaurants have already presented a vegetarian menu.

The world is changing, now a person eats take away food as well as visits food establishments, because in a post-industrial society people work more. For this reason, the popularity of fast food is growing very fast. There were people who did not think about how to satisfy their hunger, but now we began to monitor what we

eat. So fast food has changed too. Even a separate category of the market - healthy fast food has appeared.

We should talk about non-waste production. There are more people in the world every year. Already now there is a problem associated with world hunger and lack of food. Therefore, the trend towards zero-waste production will become widespread in the future. If we use products irrationally, then the problem associated with world hunger will only intensify. Already today we can see many solutions, such as potato peel chips or a salad with trout skin chips. These innovations naturally stir up interest in your establishment among potential visitors. An example of such an institution is the «Biology» restaurant (Moscow region). This restaurant not only takes care of food but also sorts waste. They also give a second life to some items. For example, flower vases are made from glass bottles. The concept of caring for nature will also actively develop and take the main positions in world trends, because man has already caused great damage to nature. All this is connected with the irrational use of the gifts of nature, and this is also due to the fact that a person does not think about the future.

Refusal of alcohol is another trend that is rapidly developing in our country. People increasingly prefer low-alcohol cocktails to strong alcohol. Add to this the trend of healthy eating and we get the need to revise the restaurant's bar list. Now the guest should be surprised with low-alcohol or non-alcoholic drinks. If you think that there is nothing to surprise a guest with, then you are mistaken. There are a huge number of interesting cocktail recipes with an unusual set of ingredients. Green smoothies are also actively gaining popularity. The main thing is not to be afraid to experiment with the combination of ingredients. We can combine vegetables and fruits and add different herbs there, the main thing is to get a pleasant taste that guests will like.

Starting from the era of great geographical discoveries, world cuisine began to take shape: there was an exchange of products, new cooking technologies, new dishes appeared everywhere. Now the situation in the world is unstable. Countries are gradually moving away from each other. Let’s remember the period of coronavirus infection. Most countries have been closed. There was also no exchange of goods or it was difficult. It was hard to prepare meals without the missing ingredients. Today the situation is even more complicated. Political conflicts led to distrust between countries, and relations deteriorated. Therefore, we see the active development of local cuisines within countries. Now chefs are increasingly talking about the need to grow their own products and work with them, because we can easily control their quality within our country. Russia has a huge amount of cultivated area, a varied climate, and fertile soils. We ourselves can grow raw materials to create unique dishes. Some big restaurants can already afford it. For example, «Twins Garden» (Moscow) produces its own cheese. The restaurant also has its own farm. We see an example of some restaurants becoming more independent of some factors in the external business environment. Also, staff works with the fermentation of products and the printing of squid from alternative protein in this restaurant.

Now we should consider the issue related to the directions of cuisines in restaurants. Until now, we see a lot of fusion restaurants. But in recent years, single-cuisine restaurants have begun to appear more and more often. This is due to the desire to specialize in one thing. If you work with only one kitchen, then it is easier to control the turnover of raw materials, you need fewer cooks. And the biggest advantage is that the quality of the dishes is improved.

Getting new impressions is now one of the main goals of visiting a restaurant. A person wants to enjoy not only delicious food, but also get some new positive emotions. Restaurants just have to figure out how they will meet the new demand. Some do it with the help of information technology: robotic waiters, interactive menus and more. Some approach from a different angle: they organize museums with exhibits right in the restaurant or an exhibition of paintings. There are many new ways to attract the visitor’s attention and satisfy their needs for new emotions.

Analyzing the success of some establishments and the work of well-known chefs who adhere to these trends, we will study people's attitude based on reviews. The first example is the restaurant «Coco couture», which is located in the city of St. Petersburg. This restaurant promotes the idea of «new Russian cuisine». The meaning of this idea lies in the fact that the dishes of Russian cuisine that have long been known to us acquire a new restaurant taste and restaurant serving. Also, this restaurant works mainly only with farm products that are mined within our large country. The main ideologist of this restaurant is the world-famous chef – Igor Grishechkin. You can learn more about the chef and the restaurant «Coco couture» by watching the episode on the channel TV «EDA» [7]. This restaurant is at the origins of the trend for Russian cuisine. It is considered that this restaurant started the development of this trend. Having studied the reviews about this institution on the Internet, we can conclude that most people like this concept of the establishments. A lot of people note an interesting concept, a wide range of dishes and an exciting atmosphere. When studying «Ikra» restaurant, which is located in the town of Plyos, it is interesting to note that it is a part of "White Rabbit Family" holding under the supervision of the brand chef Vladimir Mukhin. This restaurant also promotes the idea of Russian cuisine. The institution has an unusual concept of an old Russian house on the Volga River. Such an authentic atmosphere attracts and gives new emotions, because it is something new and unusual, and old Russian dishes, converted to a new restaurant motif, give visitors an unforgettable experience. Most visitors note the exciting atmosphere, the indescribable taste of the dishes and the positive impressions of visiting this establishment.

Summing up, we would like to highlight several main areas for restaurants in which to develop. If you are the owner of a fast-food establishment, then you should consider the concept of healthy fast food. Think about how to make your products more useful, but not lose the rich taste, for which we all love fast food so much. It is also worth remembering the environment: make all packaging eco-friendly and remember the concept of waste-free production. If you are a restaurant owner, then you should also keep the environment in mind. But you have a new task: you need to surprise the guest with something. Think about restaurants-museums and more. Best of all, come up with something new. If we talk about cuisine, our national cuisine is

now actively developing. Old dishes are being finalized, a beautiful restaurant serving is being invented. At the very end, I want to talk about raw materials. Pay maximum attention to what you prepare your dishes from, because their quality begins to form even from the sowing of the seed and its initial watering.

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PHRASEOLOGY WITH THE STOMACH COMPONENT

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Abstract. The article discusses phraseological units with the stomach component on the example of German and Russian. As the material shows, the required phraseological units are a translator of how much cultural information native speakers mean by using the belly component in stable language turns. The stomach is hunger, insatiability, and saturation of a person, in which a well-fed person can relax and not pay attention to the world. And, also, the stomach can carry the thought of excessive eating, that is, gluttony.

Keywords: phraseology, stomach component, meaning, association, evaluation.

ФРАЗЕОЛОГИЗМ С КОМПОНЕНТОМ «ЖИВОТ»

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Аннотация. В статье рассмотрены фразеологизмы с компонентом *живот* на примере немецкого и русского языков. Как показывает материал, искомые фразеологизмы являются транслятором того, какой объем культурной информации носители языка подразумевают, используя компонент *живот* в устойчивых оборотах языка. *Живот* – голод, ненасытность, так и насыщение человека, при котором сытый человек может расслабиться и не обращать на мир своего внимания. А также *живот* может нести мысль чрезмерного употребления пищи, то есть – чревоугодие.

Ключевые слова: фразеологизм, компонент *живот*, значение, ассоциация, оценка.

The word belly has existed since ancient times in many languages. In Latin vita (lit.: life), and it is also worth mentioning Old Russian, where it has hardly changed outwardly and has survived to this day. This word in the meaning of “part of the body” arose as a result of a semantic transfer from the noun belly in the meaning of “life” [1]. “The abdomen is a part of the body, which is the abdominal cavity and its walls” [1].

German phraseological unit Voller Bauch studiert nicht gern (lit.: A full belly does not like to study) [1]. It is important to note that in PU, life and study are interconnected. Under the stomach, you can understand the abdominal cavity, and by learning - the brain. Most of the abdominal cavity of the human body is occupied by the intestine, which is associated with the digestive system. It affects mood, health, and also the brain. Even Hippocrates spoke about this organ in ancient times, that all diseases begin in the intestines.

Psychiatrist George Porter Phillips also noted that patients with metabolic disorders were depressed. Then he changed the diet and as a result, most of the patients recovered. It follows from this that a person must eat in order for the brain to function well. This idea can be found in German phraseology, as well as in Russian The hungry belly is deaf to the teachings [2].

In Russian, food is associated with The belly is full, and the eyes are hungry [2]. German Die Augen sind grösser als der Bauch (lit.: eyes bigger than belly) [2]. It's about filling the stomach. Even when the stomach is full, a person looks at any food. In phraseological logicism, a trait of a person's character is condemned - gluttony or gluttony. Gluttony refers to one of the deadly sins in Christianity. It represents "an excessive predilection for the pleasing of the flesh, which becomes higher for a person than God" [2]. In Russian and German, one can notice in phraseological units the use of the belly component with the eye lexeme.

It is worth noting that "belly" is also used in Russian. This word at first glance may seem to be Old Russian, but it was borrowed from the Old German language from the word brust – "chest" [3]. Also, the belly in dictionaries has several meanings, firstly, it is the belly of an animal, and secondly, it is the belly of a person. Moreover, in relation to people, the belly has a negative character, in contrast to the neutral word belly. In German, the word Bauch is used more often in the meaning of the stomach. It is also worth noting that this word can also be translated as a belly. In Russian phraseological units, the component sat is originally Russian and the first mention can be found in the 11th century, where "sat" was used – saturation, as well as the verb "satity" – to be saturated [3]. In Russian one can see a clear desire for hunger, but in German it is implied by the comparative construction "grösser als - more than". I would like to note that both Russian and German phraseology are very similar, and also convey the idea that a person can be subjected to gluttony. Therefore, when a person has eaten, he should no longer look at food so as not to overeat.

The idea of hunger is also found in German and Russian phraseological units. German Dem hungrigen Bauch schmeckt alles wohl (lit.: Everything tastes good to a hungry stomach) [4]. Russian phraseological unit Brings the belly and Presses the stomach [4]. These phraseological units show the idea of hunger. However, each of the phraseological units shows it in different ways. For example, the Russian phraseological unit Pressing the stomach means that a person lives poorly, indulges himself in many ways, but can still be selective in food. After all, he has the opportunity to choose what he wants to eat, and at the same time he is not yet on the verge of starvation.

However, the German phraseological unit Dem hungrigen Bauch schmeckt alles wohl (lit.: Everything tastes good to a hungry stomach). A person is ready to eat anything, just to satisfy his need and not die.

Of course, the problem of hunger has been relevant at all times. The first mention can be found in the Bible, but it is worth remembering that this problem exists in our time.

One of the first records is connected with Joseph and Pharaoh. The ruler turned to the character of the Bible for the interpretation of dreams. Joseph predicted 7 years of good harvest and then 7 years of crop failure and famine. Thanks to Joseph, in the years of abundance, it was possible to accumulate a large amount of grain, and with the onset of famine, they were able to correctly distribute it, selling it. Also, the acute problem of hunger was in Europe in the Middle Ages.

It is worth noting that the meaning of famine comes from the common Slavic word goldъ, which later, with a change in consonant and vowel, was transformed into the word Old Slavonic zhldti – 'to desire'. From which it can be assumed that the original meaning of the noun hunger is 'desire' [5]. Famine occurred everywhere at different time intervals and in different countries. After all, the desire to satisfy your needs is natural and not paramount for any person. That is why these phraseological units exist in the German and Russian people.

German Der Bauch ist ein böser Ratgeber (literally: the stomach is a bad adviser) [5, 6]. The stomach should not influence a person's thoughts. If a person is hungry, then he can make many mistakes and thoughtless actions. However, if a person is full, then he will be able to act rationally and make decisions thoughtfully. A lot depends on the state of the person. You should not listen to your stomach, because it can lead a person to the wrong decision as an adviser.

Russian phraseological unit The belly has no ear [5] and German phraseological unit Der Bauch hat keine Ohren (lit.: the belly has no ears) [5]. Phraseologisms carry the idea that a well-fed person does not hear anything. He relaxes and loses concentration. A person becomes so inattentive that he may not hear what is being said to him.

With the belly component in the German and Russian peoples, one can see the use of the lexeme heart. The Russian phraseological unit "The belly is stronger – the heart is lighter" [6] and the German phraseological unit Ist der Bauch satt, so ist das Herz froh (lit.: if the stomach is full, then the heart is joyful) [6]. When the body is sated, the heart can rejoice. In German, you can see that the heart shows an emotion - joy. And in Russian, it carries the idea of relief. It is important to note that both peoples believe that it becomes easier on the soul when a person was able to eat. After all, the state of satisfaction is very important for a person.

Phraseologisms with the lexeme belly are also found with the idea of fun in German and Russian phraseological units. German Über dem vollen Bauch lächelt ein fröhliches Haupt (literally: a cheerful head smiles over a full belly) [6]. When you are full, then you are happy. Indeed, when a person is able to feed himself - this is happiness. When hungry, a person definitely does not want to smile, because then he is unhappy and experiences many troubles and negative consequences for his body. In the German people, a person is simply satisfied that he has eaten. However, in

Russian the association of fun and laughter is something more. We can laugh until our stomachs hurt.

It is worth noting that this has nothing to do with food saturation. Russian Grab the bellies [6]. Laugh very hard. The verb “grab” is borrowed from the Old Slavonic “grab”, which was used in the 8th century. It is worth noting that the Indo-European stem with the general lexical meaning ‘to make one’s own’ was taken to form this word. Currently, the verb is used with the meaning ‘quickly take something’ [6]. That is, this verb was not chosen by chance. When a person laughs hard, then various muscle groups work, and his breathing also changes.

Scientists have proven that laughter is a kind of internal run. This process can cause pain, as a result of which a person quickly grabs his stomach. There is a stereotype in our consciousness: if you laugh, then people can prolong their lives. This theory has its justification. It was the English philosopher and physician William Osler who suggested that you need to laugh for about 17 minutes a day to prolong life. Thus, laughter has a beneficial effect on the body. It is also worth noting that in German joy is caused precisely by satisfaction with food, but in Russian this emotion can be caused by anything.

Russian Keep your head cold, your belly hungry, and your feet warm. One of the brightest stable expressions in the Russian people with the lexeme belly. The author is the Russian military leader Alexander Vasilyevich Suvorov. However, presumably in the Swiss campaign. He used it in relation to his soldiers. Phraseologism is advice from superiors to subordinates. Keep your head in the cold - remain cool and impartial, reason calmly and soberly assess the situation. The stomach is hungry – a well-fed person is prone to drowsiness and laziness. Therefore, it is worth a little undereating, but not starving. A man dying of hunger will not be able to fight. That is, a soldier should moderately eat and go to war. Warm feet - it is important that a person does not get sick and stays warm all the time. During the battle in the Alps, it was very cold, because there is snow and frost, which could lead to many diseases. Therefore, it was important to wear warm shoes and stay healthy.

Phraseologisms of the language are an integral part of the culture and national character of peoples. They convey information about the habits, traditions and way of life of people. Phraseologisms are the result of the development of the language and its use in folk speech.

In this case, phraseological units containing the belly component reflect the peculiarities of nutrition and the national features of the Russian and German language communities associated with it. In Russian phraseology, you can find such phraseological units as “lose weight on hot water and on husks”, “hungry like a wolf”, “get better, fill your stomach”, “the stomach of the mind will not overshadow”. In German, phraseological units such as “Hunger ist der beste Koch”, which means “hunger is the best cook”, “Hunger und Durst treiben den Wolf aus dem Wald", which translates as "hunger and thirst lead the wolf out of the forest" and many others.

Shades of meanings in these phraseological units can also vary depending on the specific situation and context of use. For example, the expression "lose weight on hot water and husks" may indicate a starvation diet without enough vitamins and

other nutrients, which will lead to undesirable health consequences. On the other hand, the idiom “hungry like a wolf” may indicate a state when a person really feels hungry and needs food.

Also, in Russian and German, the belly component can convey the idea of joy and satisfaction from food. For example, the German phrase "Hunger ist der beste Koch" can mean that hunger allows you to enjoy the taste of food to the fullest. In Russian, the expression "eat to laugh" means a pleasant pastime at the table with acquaintances or friends, when a person is not only satisfied with food, but also enjoys a good mood and communication.

Thus, the phraseological units of the language are important features of the national culture and character of the people. They allow you to transfer information and experiences of a person at the level of language and way of thinking.

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COMPUTER MODELING OF AN INDUSTRIAL PRODUCT

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Abstract. This article considers the necessity of using computer modeling of an industrial product in special programs; important elements on how to properly create a 3D model in SketchUp program, as well as features of an ergonomic computer table. Working in such programs allows you to create a design of future furniture, select textures, colors, location of elements and drawing documentation, conduct a virtual assembly, check all measurements, which allows you to avoid mistakes and significantly reduce production time.

Keywords: computer table, 3D model creation, SketchUp table, industrial product, computer modeling.

КОМПЬЮТЕРНОЕ МОДЕЛИРОВАНИЕ ПРОМЫШЛЕННОГО ИЗДЕЛИЯ

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Аннотация. В данной статье рассмотрена необходимость применения компьютерного моделирования промышленного изделия в специальных программах. Представлены важные элементы по правильному созданию 3D-модели в программе SketchUp, а также особенности эргономичного компьютерного стола. Работа в таких программах позволяет создавать дизайн будущей мебели, подбирать текстуры, цвета, расположение элементов и чертежную документацию, проводить виртуальную сборку, проверять все мерки, что позволяет избежать ошибок и значительно сократить время производства.

Ключевые слова: компьютерный стол, создание 3D-модели, стол SketchUp, промышленное изделие, компьютерное моделирование.

Today, more and more people prefer bespoke furniture because it best suits the customer's requirements. Typical furniture may not fit in terms of size, colour, material or other parameters, leading to consumer dissatisfaction and dissatisfaction with the furniture market as a whole.

In the past, furniture designs were created by "hand". However, this approach was ineffective because it was not always possible to meet the needs of customers. This is because the designer on a piece of paper could not always visualise the final appearance of an industrial product.

Today, with the help of advanced technology, we can create a detailed furniture design project in 3D programs. This method makes the designer's task much easier, because by using this technology, it is possible to select the right colours and textures, choose the right dimensions for the furniture and create a complete design, documentation and set of drawings. The advantages of this method are obvious. The client can see the furniture model in three dimensions, which allows them to visualise the future result more clearly. For the designer, this is also a big plus, as they can show all the possibilities and features to the customer, offering them as accurate a version as possible to suit their tastes and needs.

People can order furniture for any room, from bedroom to office, and get the desired result without too much headache. The bespoke furniture market is growing every year, responding to customer needs and creating work for many professionals in the field.

Industrial product model description

As an industrial product, a three-dimensional model of a desk was created to ensure comfortable work with documents and computers in homes and offices. The desk is ergonomic: it has a sufficiently large surface for working, provides a separate box for the system unit, a drawer for a keyboard, open shelves for documents and accessories, and four closed drawers for left and right handers. A right-handed model is created in the design stages, but the drawers and system unit can be swapped during assembly. The computer desk has no back walls for the monitor and system unit for easy connection and cable management.



Figure 1. Desk model

In order for the table to be robust, reliable and long-lasting, it is recommended to be made of high-quality laminated chipboard and MDF with metal elements. This guarantees resistance to mechanical damage as well as resistance to harmful environmental influences.

The desk is a great choice for people who spend a lot of time working at the computer and need a comfortable and functional desk. Thanks to its features and possibilities, this desk creates a comfortable and efficient working area.

It is a visual representation of a desk with the possibility of transformation, moving, changing colour, texture and basic model parameters. Superfluous details have been removed to reduce the cost of serial production.

Creating a 3D model in SketchUp

SketchUp is a popular and handy program for creating 3D furniture models. It is actively used by planners, designers and carpenters. Before putting a table into production, it is necessary to create a 3D model after the sketch.

1. The first thing to do is to decide on the working area, to do this choose 'architectural-millimetre'.

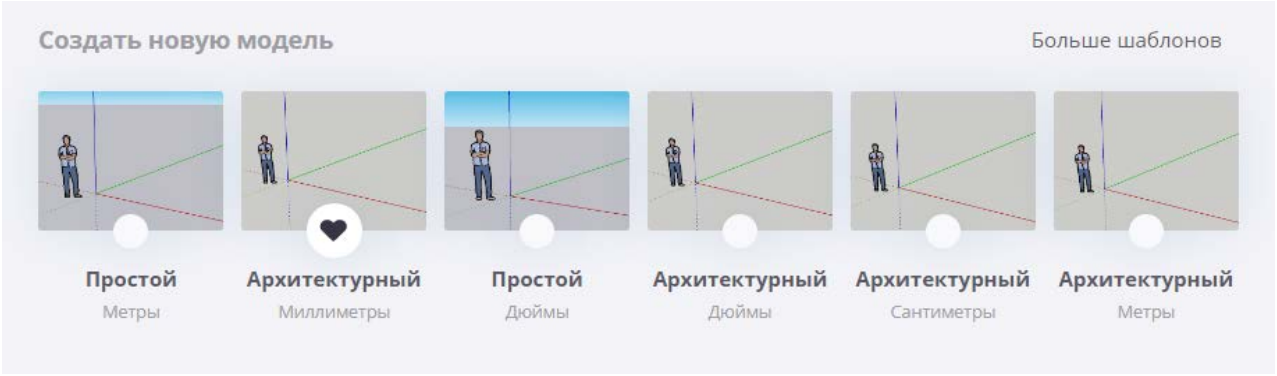


Figure 2. Selecting a working area

2. The table base is done as follows: Draw a rectangle of a given size using the shape tool. Without releasing the key, the size is set using the keyboard. Then the pull-push tool is used and raised by 20mm (wall thickness). Rectangles, which are the same size, are drawn one at first, then copy-paste. To move the object, select it, right-click on it and click on "create component". Now you can move it with the move tool. The required distance is set with a tape measure, notches are put and table walls are moved to the required marked distance. Next, the bottom base is made, following the same principle. After measuring the distance with a tape measure (making it a little longer, since the bottom base should protrude in the sketch), a rectangle is drawn separately, pulled out through a "pull-push". The object is selected, then the component is moved with the move tool, then placed in the desired location.

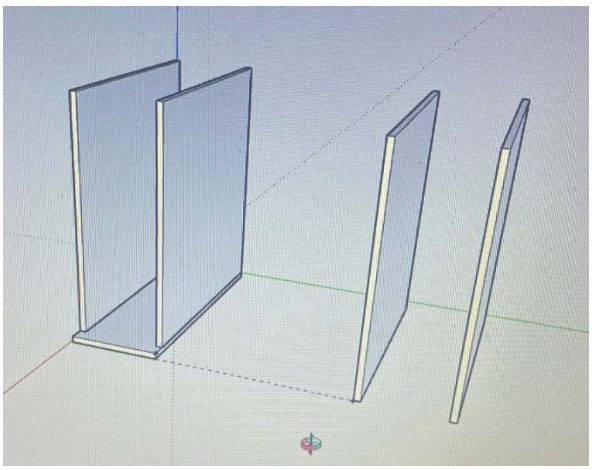


Figure 3. Creating a bottom table base

3. The next step is to draw the work surface of the table. Before doing this, measure everything with a tape measure and compare it with the given sketch to make sure everything matches. The worktop is drawn in the same way as the other walls and the base. The shape tool is used to create a rectangle of the required size and dimensions, then the pull tool is used to create a thickness. The object is then selected and moved to the desired location.

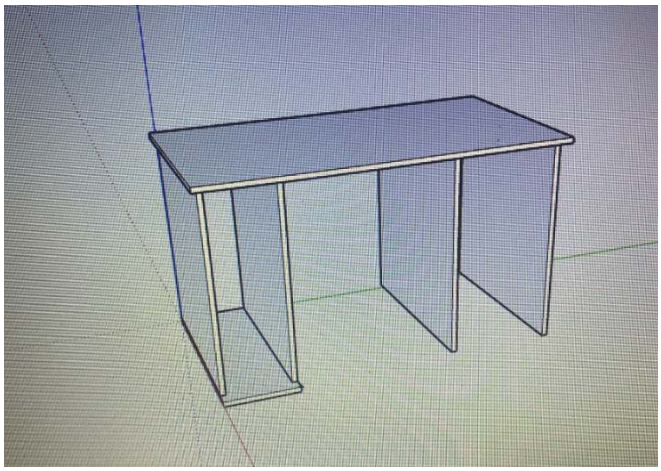


Figure 4. Creating a desk work surface

4. The bottom base of the table is made in the same way.

5. Now start making the drawer on the left side. To do this, use the "tape measure" tool to measure the required size, then make a notch so that it is clear where to put the drawer. To make a drawer, a rectangle is drawn with the Shapes tool and then raised to the desired height (height of the drawer). Then use "displacement" tool and move outline of cube rib inwards to make a frame. The pull-push tool is now used to push it all the way in. Next, the base is drawn separately, in the same principle as for the table, and moved. Then proceed to the second front wall of the drawer (to which the handles are attached). It is made larger, so that the drawer can be comfortably pulled out without handles. We make it in the same way as the wall of the table, then attach it to the drawer.

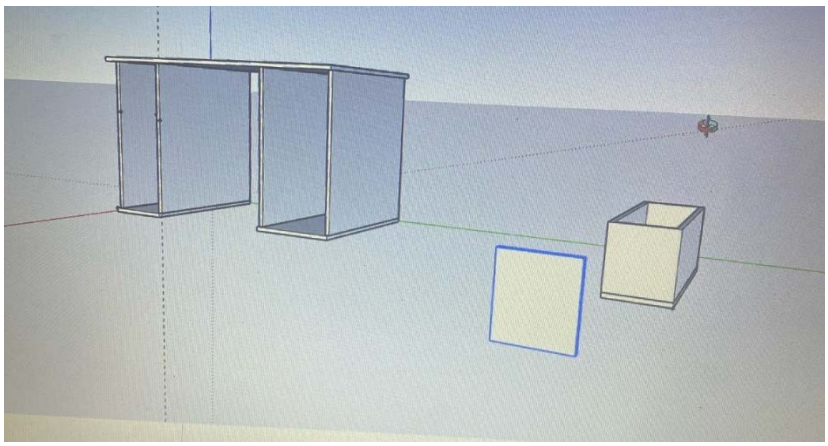


Figure 5. Creating a box

6. All drawer elements are selected and a single component is created, which is moved to the desired location and inserted.

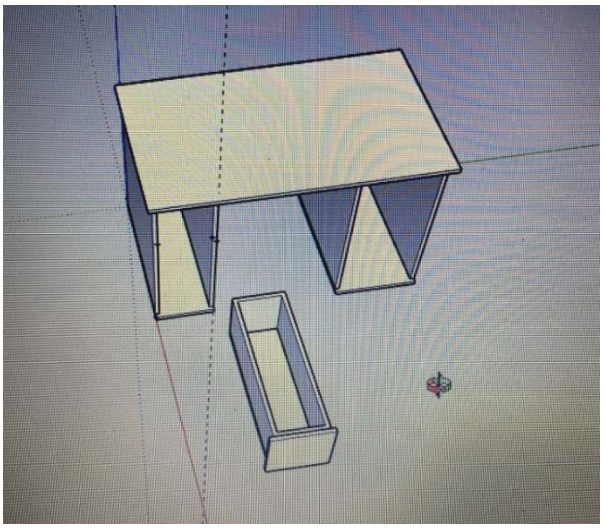


Figure 6. Installing the box

7. This is what you get at this stage. You can rotate the object using the 'rotate' tool.

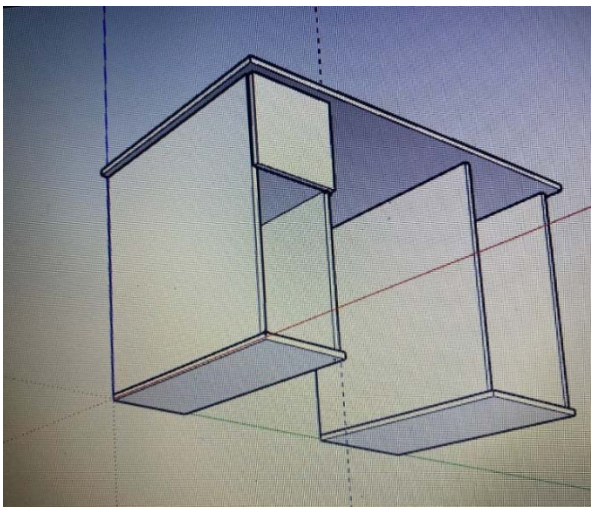


Figure 7. Intermediate result

8. Now create the other drawers on the right-hand side, of the required size, in the same way.

9. When one of the three boxes of the required size is made, select and press "copy-paste". In this way 3 drawers are created. Then they are moved to the desired location.

10. Now we need to make a notch in the table. To do this, select and right-click, select "change component", find the "arc" tool in the toolbar and use it to draw the notch.

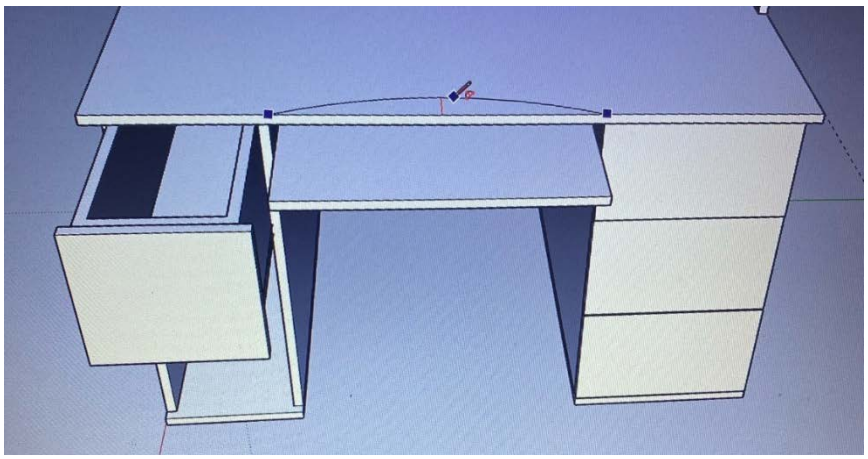


Figure 8. Creating an arc

11. Next, an arc is created.

12. The next step is to create two walls on the top base of the table.

13. Next comes the conversion into wavy table sides. This will be done using an arc. To do this, the same principle is repeated for the top cover of the table, only the arc must be used 3 times on the same piece. To make them even and identical, one is created, then copied and pasted.

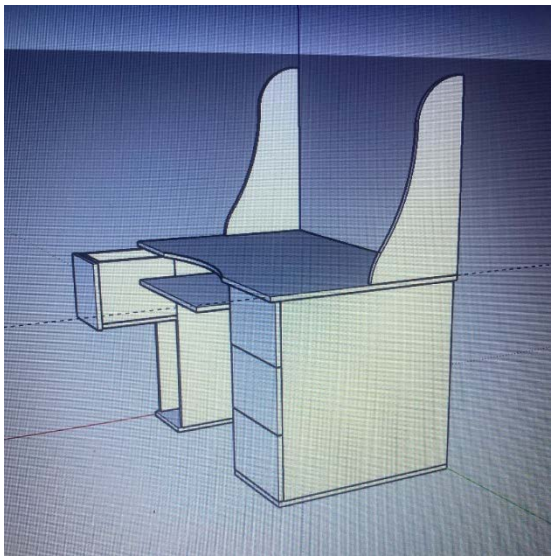


Figure 9. Creating table arcs

14. Now another piece is made which will be at the very top of the table. To do this, a rectangle of given dimensions is drawn next to it. Then the same steps are repeated (push it 20 mm thick). Then a wave is drawn at the top, using the arc tool. Next it is drawn from the bottom.

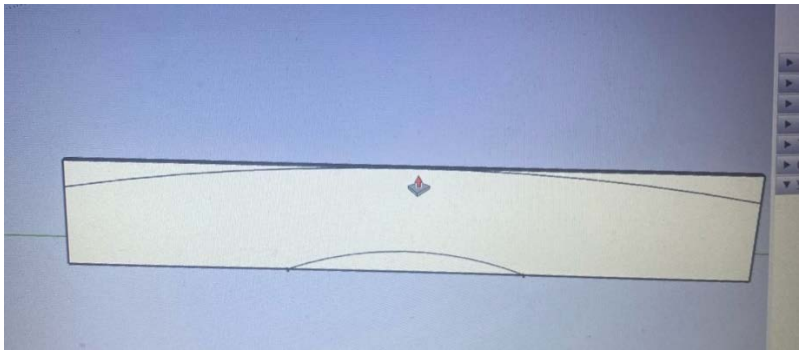


Figure 10. Creating an element using an arc

15. Next, use the push-pull tool to press out the excess parts, thereby producing this piece.

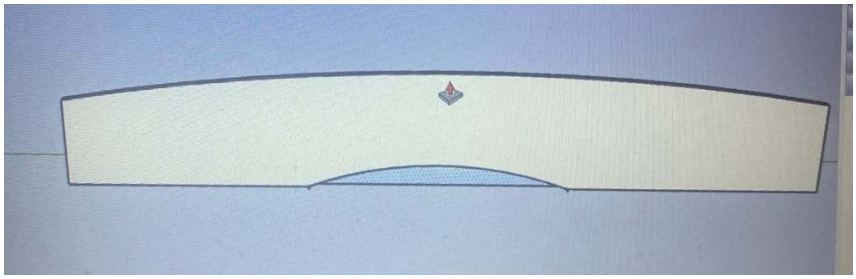


Figure 11. Finished element

16. Now you need to attach this component to the table. Select it, press "create component" and use the "move" tool to move it.

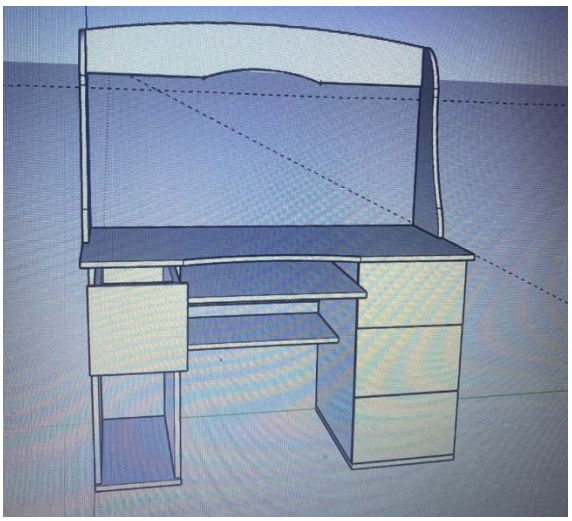


Figure 12. Result transferred to the table

17. The next step is to create another table piece that will lie perpendicular to the last one. To do this, a bar is drawn in a similar way and then the edges are

rounded using an arc. Then a pull-push tool is used and the corners are pressed through. The component is then repositioned to the required position.

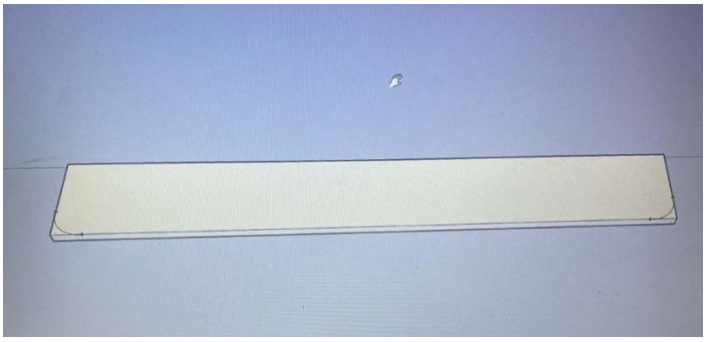


Figure 13. Smoothing corners

18. The next step is to create the shelves on the table. Measure the height, depth and length of the shelves, then divide the height by 3 to find out how far apart the shelves will be. A notch is established with a tape measure to ensure that the shelves are conveniently positioned. Next, a single shelf bar is drawn and a component is created which is copied and pasted into place.

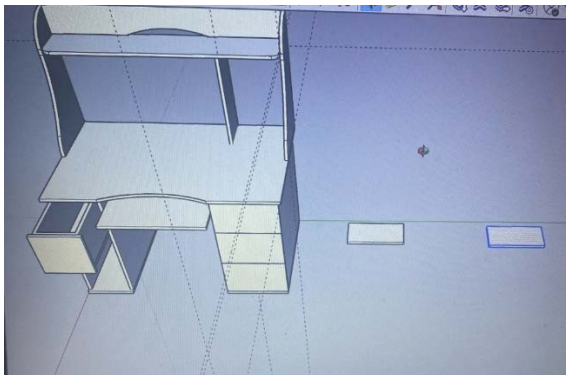


Figure 14. Creating shelves

19. Use the move tool to put the shelves in their places according to the measurements. You get a table like this. You need to move around its axis and make sure that all the elements of the product are in place.

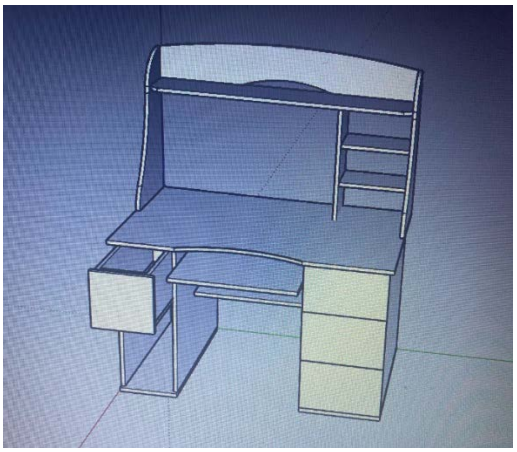


Figure 15. Finished sketch without filling

20. A table fill is created. Select the entire object and use the Fill Tool to fill the table in the desired texture. The product is finished.

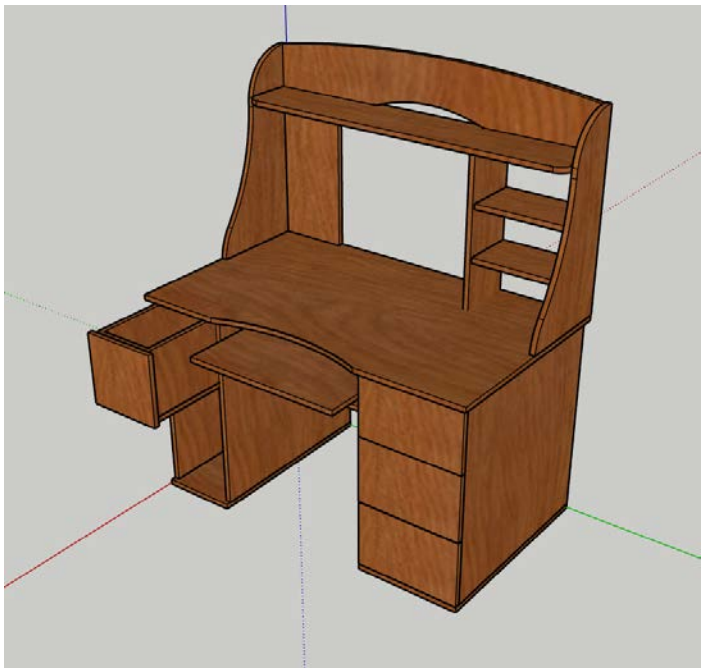


Figure 16. Finished table sketch

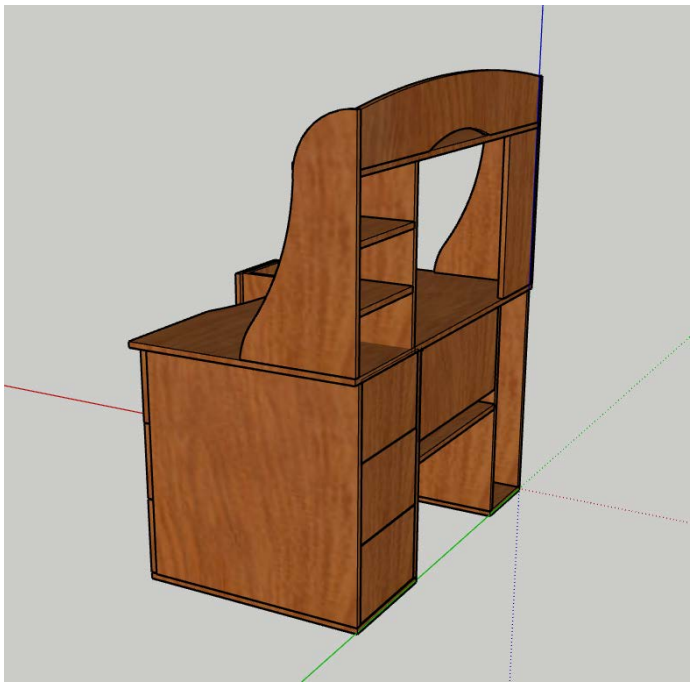


Figure 17. Finished sketch of table 2

To create beautiful and functional cabinet furniture, you don't just have to sketch it out, you have to think carefully about every detail [1, 2, 3, 4, 5]. This is why designing furniture is a demanding and time-consuming process. Using special software and computer technology allows you to create a design of future furniture, choose textures, colours and location of elements, as well as conduct a virtual

assembly and check all measurements. This avoids errors and reduces production time considerably.

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УДК 620

PROSPECTS AND CONDITIONS FOR ENERGY AUDIT FOR OBJECTS OF DIFFERENT FEDERAL PURPOSE

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Abstract. In this paper, the principles of conducting energy audits and energy surveys, their impact on the work of legal entities and individuals were considered. The analysis of proposals on the market was carried out and a list of conditions for an independent energy assessment of the object was described. Recommendations are given for ordering an energy audit, based on the experience of conducting this type of service at public, industrial, and private facilities.

Keywords: energy audit, energy saving, energy passport, reduction of consumed resources, federal law № 261-FL.

ПЕРСПЕКТИВЫ И УСЛОВИЯ ПРОВЕДЕНИЯ ЭНЕРГОАУДИТА ДЛЯ ОБЪЕКТОВ РАЗНОГО ФЕДЕРАЛЬНОГО НАЗНАЧЕНИЯ

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Аннотация. В данной работе были рассмотрены принципы проведения энергоаудита и энергообследований, их влияние на работу юридических и физических лиц. Проведен анализ предложений на рынке и описан перечень условий для самостоятельной энергетической оценки объекта. Даны рекомендации для заказа энергетического обследования, основываясь на опыте проведения данного рода услуг на государственных, промышленных, а также частных объектах.

Ключевые слова: энергоаудит, энергосбережение, энергетический паспорт, снижение потребляемых ресурсов, Федеральный закон № 261-ФЗ.

At present, the question of the need for energy audits in order to improve the energy efficiency of buildings or technological processes in production is increasingly raised and highlighted. Energy audits and energy surveys (Figure 1), close to each other, but still different in meaning procedures for checking and fixing the energy efficiency of an object. Energy inspection is a mandatory procedure

carried out in accordance with Article 10 of the Federal Law on Energy Saving for enterprises and organizations consuming more than 6 thousand tons of equivalent fuel per year (or 1 thousand tons of equivalent motor fuel). Energy inspection is carried out by the bodies of the State Energy Supervision Service with issuance of the corresponding prescription, execution of decisions of which is strictly obligatory. According to the results the energy passport is issued. Energy audit - on the basis of voluntary application energy inspection of the organization is carried out for rational and effective use of energy resources with drawing up of energy passport and issuance of appropriate recommendations. In practice, most often customers wishing to receive state subsidies or actually engaged in energy saving.

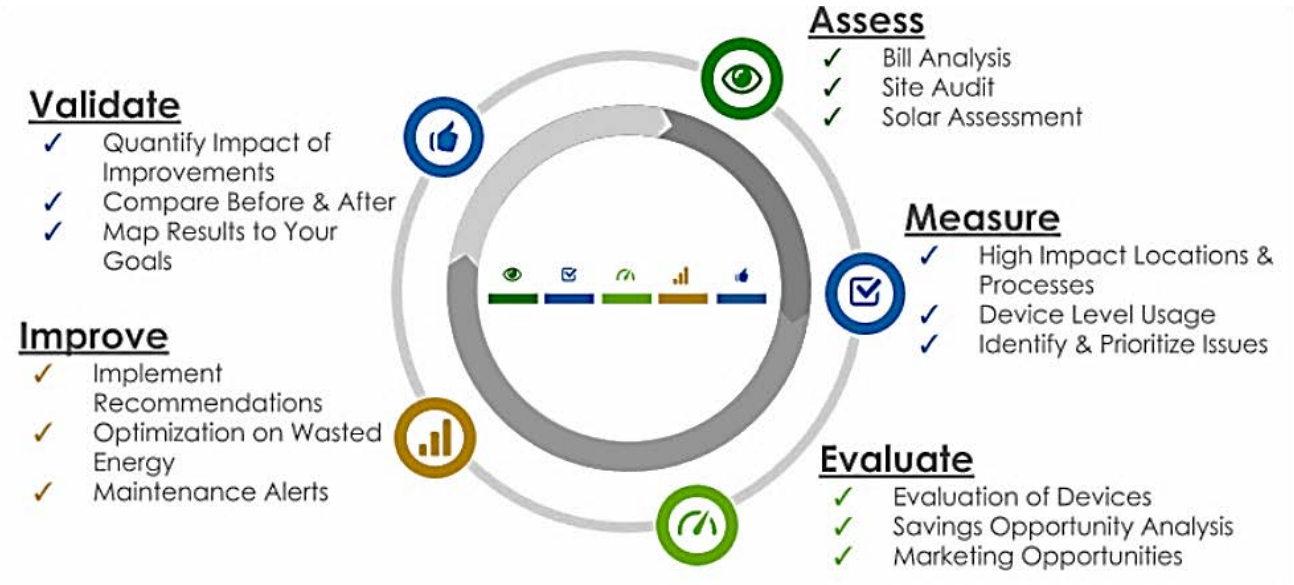


Figure 1. Energy audits

Voluntary inspection can also be performed independently by the management of the object – if there are appropriate permits, equipment, trained personnel, desire and of course free time. To perform this work in accordance with the requirements of Part 4 of Art. 15 of Federal Law № 261-FL must be a member of self-regulatory organizations in the field of energy inspection, which requires meeting a number of obligations [1]:

1. To have at least four employees trained in authorized training centers. The cost of training for one person is approximately 15 thousand rubles.

2. To purchase or rent a set of special technical equipment. The cost of the minimal necessary set is about 400000 rubles; renting also is not cheap and carries many risks.

3. Payment of a fee to the compensation fund of self-regulatory organizations, the amount is about 5000 rubles. Some of the self-regulating organizations also require civil liability insurance policy, which is about 15000 for 1 year.

4. Payment of the entrance fee to self-regulating organizations, the total cost is about 20000 rubles.

5. Payment of a monthly membership fee (from 7000 to 15000 rubles).

6. Payment of expertise of energy passport.

7. Organization of appropriate working conditions for the working staff.

As you can see, an independent survey will be a more time-consuming process, for which the company will need to spend a lot of effort and time. The payback on this work will be relatively small compared to a custom-made survey, and sometimes even more expensive for the company.

All prescriptive requirements for independent work, as well as the obligation of a custom inspection for public authorities, local authorities (vested with the rights of legal entities), as well as organizations with state or municipal participation are determined and regulated by Federal Law No. 261-FL. Federal Law "On Energy Saving and Increasing Energy Efficiency and on Amendments to Certain Legislative Acts of the Russian Federation" regulates relations on energy saving and increasing energy efficiency by establishing legal, economic and organizational basis for stimulating energy saving and increasing energy efficiency. Provisions of Law No. 261-FL established in relation to energy resources (nuclear, thermal, electric, electromagnetic energy, energy of other types) are applied in relation to water supplied, transmitted consumed using centralized water supply systems [2].

The task of the energy audit is to make an energy passport of the object under study: preparing this document for the customer, so that the passport meets all legal requirements, passed the examination of the self-regulatory organization with the assignment of a registry number and was accepted by the Ministry of Energy of Russia. The report itself must include an informational and analytical overview of all types of energy activities of the company. The attached explanatory note reflects the information about the object under study, which is relevant to the issues of energy use, as well as its general characteristics. The analytical part provides a physical and financial and economic analysis of the efficiency of energy use, substantiates energy saving recommendations and the order of their implementation. The summary table of energy saving recommendations is brought in the beginning or the end of the report and is executed as the general conclusions (summary) [3].

Also, energy audit performs other tasks, which are formed depending on the technical task, in particular:

1. Creation of energy-saving measures aimed at a particular object ("different from the typical" measures in the interpretation of Federal Law № 261;
2. Avoidance of penalties as the head of the facility, and the organization itself;
3. Reduction of consumed resources;

Execution of a previously approved energy program.

In order to fulfill all of these tasks, a set of appropriate methodological measures must be carried out (Figure 2):

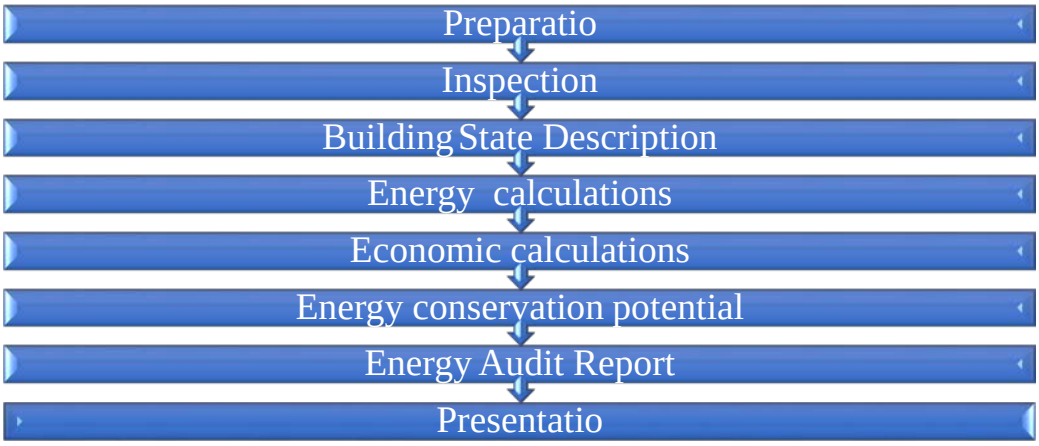


Figure 2. The Energy Audit Process

Preparation: analysis and collection of all available information on the facility's energy activities, namely technical, statistical and documentary information.

Inspection; Building State Description: instrumental and thermographic inspections of all heat and power consumers.

Energy calculations; Economic calculations:

1. Energy balance of the company is studied.
2. Economic calculations are made .
3. Processing of the obtained data is carried out.

Energy conservation potential: energy efficiency of heating and power equipment, heat generating units, heating and ventilation systems, hot water supply, steam supply, condensate collection and return, refrigeration, power supply, use of secondary energy resources is assessed.

Energy Audit Report: necessary recommendations on energy supply, fuel, water, electricity and heat metering are developed.

Presentatio: a report is drawn up and energy passport is drawn up.

The cost of this kind of survey depends on the object of the customer, a certain methodology of calculation on the cost at the moment does not exist, there are only recommendations for this kind of activity, which are not obligatory to their execution. The scatter of cost of inspections lies in the field from 10000 to 5000000 rubles [4]. It is connected with that the cost of energy audits of the regulated organizations, the industrial enterprises and other objects with considerable volumes of consumption of resources can reach several million rubles. However, the given investment pays off for very short terms as the share of losses on objects leads to essential economic losses. But the cost of inspection of budgetary institution for the purpose of drawing up an energy passport, required by the legislation of the Russian Federation, can be quite inexpensive.

In the system of public utilities energy audit takes place according to the following scheme. The energy costs incurred are compared with those nominally necessary to ensure normal living conditions [5]. In general, the energy audit of public utilities is conducted according to a standard methodology and consists of an analysis of energy consumption and the operating conditions of the main life-support systems:

1. Water supply system consisting of water intake points, main water pipelines and a ring system of water distribution through the micro-districts, and the distribution system inside the buildings.

2. Heat supply system consisting of a boiler plant or a combined heat and power plant generating heat, main heating mains, central heating units with a system for preparation of water for hot water supply and heating, heating units of individual houses.

3. Water disposal systems with sewage pumping stations and treatment facilities.

4. Power supply systems.

Although energy audits and energy surveys are mandatory for some types of facilities, indicating their necessity for a qualitative assessment of energy efficiency, but still remain unnoticed by many private firms and individuals. Economic efficiency from carrying out this kind of inspections consists in drawing up of actions for energy saving on the termination of inspection. Exactly economy from rational use of energy resources and reduction of losses on object will help not only to recoup cost of services of power audit, but also to reduce expenses on more distant horizon. By analyzing the cost of this kind of services, as well as the market of their proposals and the possibility of self-inspection, we can conclude that there is a wide variety and availability of these works, which will help to competently and effectively make a unique project depending on the technical task of the customer.

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FORMATION OF THE DEVELOPMENT STRATEGY OF THE ORGANIZATION (FIRM) BASED ON INNOVATIONS

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Abstract. The purpose of the study presented in the article is to analyze the formation of an organization's development strategy based on innovation. Innovation is a key factor that can determine the success or failure of a company. In today's increasingly competitive world, organizations must continually evolve and improve in order to remain competitive.

Keywords: innovation, strategy formation, company development, market competition, innovative strategies.

ФОРМИРОВАНИЕ СТРАТЕГИИ РАЗВИТИЯ ОРГАНИЗАЦИИ (ФИРМЫ) НА ОСНОВЕ ИННОВАЦИЙ

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Аннотация. Целью представленного в статье исследования является анализ формирования стратегии развития организации на основе инноваций. Инновации – это ключевой фактор, который может определять успех или неудачу компании. В современном мире, где конкуренция становится все более жесткой, организации должны непрерывно развиваться и совершенствоваться, чтобы оставаться конкурентоспособными.

Ключевые слова: инновации, формирование стратегии, развитие компании, конкуренция на рынке, инновационные стратегии.

In the modern world, where competition in the market is becoming increasingly fierce, developing a strategy for organizational development based on innovation is becoming one of the key tasks. Innovation is the driving force behind the development of any organization, allowing it to outpace competitors and create new markets.

In the rapidly developing world of technology and increasing competition in the market, developing an effective organizational development strategy has become

a key factor in success. One of the key elements of such a strategy is innovation - new ideas, products, processes, or services that can give a company a competitive advantage and ensure its growth. This article will examine how an organization can develop its development strategy based on innovation, as well as what tools and methods can help it in this.

The modern world requires companies not only to meet the needs of customers but also to constantly develop and take an innovative approach to business. Developing a development strategy based on innovation becomes an important factor in achieving success in the market. This article discusses the key aspects of forming and implementing an innovation strategy that will allow companies to operate in the rapidly changing conditions of modern business and lead to organizational growth.

Companies that choose an innovative or organic path of development over time will be able to create and constantly develop unique competitive advantages that are difficult for competitors to reproduce due to the fact that the innovation process is a complex and lengthy process of transforming innovative ideas into goods that is influenced by numerous external and internal factors that can stimulate or hinder the innovative development of enterprises [1].

First, it is necessary to define what is meant by an innovation strategy. It is a plan of action aimed at creating and implementing new products, services, technologies, or business models that can improve the processes and results of a company.

One of the key elements of a successful innovation strategy is a constant search for new opportunities and ideas. To do this, a company must monitor market trends, analyze customer and competitor needs, as well as conduct research and development.

Another important aspect is readiness for change and risk. An innovative approach involves not only creating new products but also changing existing business processes and models. The company must be prepared for changes within the organization and in the external market, as well as financial risks associated with the implementation of new products or technologies.

Another important aspect is a team of professionals capable of implementing an innovation strategy. The company must have specialists who have the necessary knowledge and experience in innovation and are willing to work in conditions of uncertainty and risk.

Implementing an innovation strategy requires not only investments but also proper management of the process. It is important to define clear goals and performance indicators, as well as create mechanisms for monitoring and evaluating results [2].

Constant changes in the business environment (changes in industry logic) and inevitable competitive pressure on a company's position (industry structure) necessitate the organization of a company's activities based on the principles of strategic management in general and strategic innovation management in particular. The strategic planning of a firm's innovations is the process of forming long-term goals, tasks, and measures aimed at creating and implementing new products,

technologies, and services, as well as optimizing existing business processes. It includes the following stages:

1. Analysis of the external and internal environment. At this stage, the firm studies market trends, competitors, consumers, as well as its strengths and weaknesses, opportunities, and threats.

2. Determination of strategic goals. The firm defines what goals it wants to achieve through innovation – increasing market share, increasing profits, improving product quality, etc.

3. Development of a strategic plan. Based on the analysis of the external and internal environment and the determination of goals, the firm develops an action plan that will allow it to achieve its objectives.

4. Implementation of the strategic plan. The firm begins to implement the plan by developing new products, technologies, and services, optimizing business processes, etc.

5. Monitoring and control. The firm monitors the results of the implementation of the strategic plan and adjusts it if necessary.

To successfully implement a development strategy based on innovation, the firm can use the following tools and methods:

1. Research and development. The firm can create research departments that search for new ideas, technologies, and products.

2. Innovation management. The firm can appoint a special manager who will be responsible for managing the innovation process in the organization.

3. Open innovation. The firm can attract external experts and partners for joint development of new products and technologies.

4. Investment in innovation. The firm can allocate significant resources for research and development, as well as for acquiring new technologies and patents.

5. Innovation culture. The firm can create conditions for the development of an innovation culture in the organization, for example, by encouraging employees to engage in innovative activities.

The process of forming a development strategy based on innovation begins with an analysis of the internal and external environment. The internal environment includes the resources available to the organization, its structure, production capacity, and personnel. The external environment is the market, competitors, consumers, and legislation [3].

Based on the analysis of the internal and external environment of the organization, directions for innovative development can be identified. For example, if a company has technical resources, it should focus on developing new technologies. If an organization has a high level of employee qualifications, it should implement innovations in the field of training and personnel development.

The next stage in forming a development strategy based on innovation is to determine goals and objectives. Goals should be specific, measurable, and achievable. Objectives should be oriented towards achieving the set goals.

An important stage is the selection of innovative projects that will allow the organization to achieve its goals. To select projects, they need to be evaluated in

terms of goals, resources, and risks. Project evaluation will help determine which innovations will have the greatest impact for the organization.

The next stage is to develop a plan for implementing innovative projects. The plan should contain information about the budget, deadlines, resources, and those responsible for project implementation. Implementation of the plan should be carried out in accordance with the principles of flexible management, which will allow for quick adaptation to a changing environment.

Finally, the last stage in forming a development strategy based on innovation is monitoring and evaluating results. Evaluation of results will help determine how effectively the development strategy was implemented and what adjustments need to be made in the future.

When forming a development strategy based on innovation, it is necessary to take into account the size of the market and its dynamics, analyze competitors' behavior, and consider consumer needs. It is also important to consider changes in legislation and the economic situation.

Special attention should be paid to the selection of innovative projects, which should be aimed at creating competitive advantages, improving productivity and product quality, as well as developing new markets and processes.

To successfully implement a development strategy based on innovation, it is necessary to create a favorable environment for innovation within the organization, attract highly qualified specialists, and provide sufficient funding.

It is also important to consider the risks associated with implementing innovative projects and conduct systematic monitoring and evaluation of results. This will help adjust the development strategy in accordance with a changing environment and achieve set goals [4].

Thus, developing an innovation-based organizational development strategy is a complex process that requires analyzing the internal and external environment, defining goals and objectives, selecting innovative projects, developing an implementation plan, and monitoring results. However, successful implementation of such a strategy allows the organization to outpace competitors and create new markets, ensuring its long-term development and prosperity.

Innovations are a newly introduced or significantly improved product (good, service) or process, which can be a new sales method or a changed method of organizing business practices, workplaces, or external relations. Innovations are a key factor in the development of modern organizations. However, when implementing innovative projects, organizations often face uncertainty, which can affect project effectiveness.

The analysis of the effectiveness of innovative projects is the process of evaluating project results to determine its effectiveness. To conduct an analysis of the effectiveness of innovative projects in conditions of uncertainty, the following factors should be considered:

1. Uncertainty. Innovative projects are associated with a high degree of uncertainty because they are based on new ideas and technologies that have not yet been tested in practice.

2. Risks. Innovative projects are also associated with high risks as they may not bring expected results.

3. Financial costs. Innovative projects require significant financial costs, which can also affect their effectiveness.

To conduct an analysis of the effectiveness of innovative projects in conditions of uncertainty, the following methods can be used:

1. Scenario analysis. This method involves evaluating possible scenarios for project development depending on various factors.

2. Sensitivity analysis. This method allows determining how changes in one or several factors can affect project results.

3. Multiple criteria decision-making method. This method allows evaluating project effectiveness based on several criteria, such as financial stability, social responsibility, etc.

4. Stochastic optimization methods. This method involves using mathematical models to determine optimal project development strategies in conditions of uncertainty.

The assessment of an innovation-driven business is the process of determining the value of a company based on its financial performance and potential for further development. To conduct an assessment of an innovation-driven business, the following factors should be considered:

1. Innovations. Innovation-driven businesses are characterized by a high degree of innovativeness, which can affect their value.

2. Growth potential. Innovation-driven businesses may have significant growth potential, which can also affect their value.

3. Financial performance. The financial performance of the company is a key factor in assessing its value.

To conduct an assessment of an innovation-driven business, the following methods can be used:

1. Income approach. This method involves evaluating the company's future income based on its financial performance.

2. Market approach. This method involves comparing the company with similar businesses in the market.

3. Asset-based approach. This method involves evaluating the value of the company's assets based on their current market value.

4. Balance sheet approach. This method involves evaluating the value of the company based on its balance sheet value.

Assessing the business of an innovatively developing enterprise is a crucial factor for its further growth. To conduct a business evaluation, it is necessary to consider the degree of innovation of the company, its potential for growth, and financial indicators. Various methods can be used to achieve the best results, such as the income approach, market approach, asset-based approach, and balance sheet approach [5].

Thus, forming a development strategy based on innovation is an important factor for a company's success in the modern world. The need for constant development and change requires organizational leadership to actively seek new

ideas and technologies, as well as be prepared for risk and experimentation. With the right innovation strategy, a company can become a leader in its industry and ensure long-term success in the market.

To successfully form and implement an innovation strategy, sufficient resources are required, both financial and human. This may include investment in research and development, training and support for staff, acquisition of new technologies and equipment, as well as increased marketing and sales expenses. Additionally, it is essential to consider the specific characteristics of the industry, market, and consumer demand to compete successfully and meet customer needs. It is also important to communicate new ideas and technologies effectively both internally and externally to attract new customers and partners. Overall, the innovation strategy should be dynamic and adaptive to successfully operate in the rapidly changing conditions of modern business and lead to company growth.

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PHRASEOLOGY WITH THE HAIR COMPONENT

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Abstract. The article considers the phraseological units with the hair component that implement thematically using the example of German and Russian languages. As the material shows, the required phraseological units are a translator of what cultural carriers mean by hair. Hair is a person's shame or anger. Also, a danger to life that borders on death. It is worth noting that phraseological units with the hair component can carry several shades of negative feelings of a person – regret, concern, fear and horror.

Keywords: phraseology, hair component, meaning, association, evaluation.

ФРАЗЕОЛОГИЗМ С КОМПОНЕНТОМ «ВОЛОСЫ»

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Аннотация. В статье рассмотрены реализующие в тематическом виде фразеологизмы с компонентом *волосы* на примере немецкого и русского языков. Как показывает материал, искомые фразеологизмы являются транслятором того, что под волосами подразумевают носители культуры. *Волосы* – стыд или гнев человека. Также опасность для жизни, которая граничит со смертью. Стоит отметить, что фразеологизмы с компонентом «волосы» могут нести несколько оттенков негативных чувств человека – сожаление, беспокойство, страх и ужас.

Ключевые слова: фразеологизм, компонент *волосы*, значение, ассоциация, оценка.

Phraseologisms with a hair component can carry different meanings in different languages.

Comparing two languages – Russian and German – one can come to the conclusion that there are both similar and characteristic for a certain people the meanings of hair. A special place is given to hair within phraseological turns. Phraseological units are an integral part of human life. The study of phraseological units allows you to understand the culture of the people.

Phraseologisms are expressions that consist of several words that form a single composition and have a standardized meaning that does not always correspond to the sum of the meanings of its individual words. The component "hair" in the language is one of the most frequently used and diverse to express and fix in the text an idea and an image defined by meaning.

The "hair" component in Russian is used to convey a wide range of meanings, such as distrust, interest, state of mind, beauty, and grooming. On the other hand, in German phraseological units based on the word "hair" are much less common than in Russian, however, they contain meanings that also reflect the national understanding of ideas related to hair.

The study of phraseological units helps not only to understand the cultures of peoples, but also expands the vocabulary and helps to better understand and interpret texts. Phraseological turns express not only linguistic culture, but also show the socio-cultural aspects of the life of the people, their views on the world around them, worldview and traditions.

It is also worth noting that different cultures use different phraseological units based on the "hair" component. To do this, it is necessary to pay attention to the context and history of occurrence in order to understand the semantic meaning of the expression in a particular language and culture. It must be taken into account that different languages represent different approaches to expressing ideas through language, as each language is shaped by history, culture and traditions.

In Russian, a phraseological unit with a hair component is used in the meaning of fear Hair stirred on the head [1] and Hair stood on end [1]. Both phraseological units are similar to each other. However, it is worth noting that in the first stable expression, the process of the hair began to stir, and in the second, the action that had already occurred, the hair stood up. Also in the first case, the hair stood up on the head, however, in the second phraseological unit, the place where the hair moved was not indicated. It is worth noting that although both phraseological units carry the meaning of fear, however, they have different shades. In the first case, the person was slightly frightened, and in the second one can see the "animal" fear. This is clearly seen in the word on end, which means "upright, rising up, standing up" [1].

It is worth noting that in the old days they used “to stand on end”, which meant “stretched out at the fingertips, at attention”. Also, in ancient times, thick hair on the body was a kind of protection from severe weather conditions. But even in a situation where a person was in danger from the enemy, the hair reacted to fear, “rising” on his body, and the ancient person became more menacing and massive in appearance. Such a protective mechanism can be observed in cat breeds: at the sight of danger, they begin to strongly arch their backs, and their fur “raises up”. That is why, we can say that the Russian PU Hair stood on end means not just fear, but horror.

In German, there is a phraseological unit Sorgen macht graue Haare und altert ohne Jahre (lit.: Anxiety makes hair gray and aging without going through the years) [2]. It carries the meaning of anxiety, which can lead to gray hair. Sorgen - anxiety, worries, excitement, chores. That is, a large number of experiences make a person older than he really is. This idea can be seen in the phrases gray hair and grow old

bypassing the year. The Germans talk about the consequences if a person worries a lot about something.

It is worth noting that fear and anxiety are negative emotions. However, there is a difference between them. Fear is a person's reaction to what is happening in the present period of time. Anxiety is worry about events that will happen in the future. In Russian culture, phraseological units The hair on the head stirred [2] and The hair stood on end [2] are painted in brighter shades of anxiety – this is fear, even horror. It is important to note that the reaction occurs instantly. A person is frightened and immediately the hair stands on end or moves. The Germans, in turn, wanted to convey feelings of fear, but the tone of anxiety is different from Russian culture. Also, the process is not so fast, because the hair turns gray, and a person ages over time, and not instantly.

There are also regrets in life. On this topic in the Russian language there is a phraseological unit to tear one's hair [3]. It expresses a strong feeling of missed opportunity, grief, and also despair. This expression first appeared in Greek. The origin is connected with the ritual when people tore their clothes I'm waiting for my hair as a sign of deep grief. This tradition was done publicly so that it could be seen how much a person regrets. In German, PU Keine Haare auf dem Kopf, aber einen Kamm in der Tasche (literally: No hair on the head, but a comb in the pocket) [3].

At first glance, one might assume that in Russian the process, and in German the result. However, not everything is so simple, because the Germans wanted to convey the idea that immature youth wants to imitate adults. A comb in your pocket means an overestimated conceit or self-confidence of a person. Young people do not yet have hair on their heads, but they are already expressing their point of view to the older generation. However, adults do not take young people seriously and believe that they are still children. It must be emphasized that German phraseology is a moralizing of the older generation to the younger.

In Russian there is a phraseological unit Blush to the roots of the hair [4], which means shame. A person can be so ashamed that in addition to his skin, his hair also turns red. It should be emphasized that this set expression can carry the meaning of anger. After all, a person also blushes when angry.

Russian phraseological unit Until gray hair [4] means that a person has lived to the old age of his years. Old age in Russian is often denoted precisely by gray hair. However, not only in Russian, but also gray hair is found in the German phraseological unit Jahre bringen Verstand, aber auch graue Haare (lit.: Years bring intelligence, but also gray hair) [4]. This means that a person changes not only physically, but also spiritually. Throughout life, a person gains experience and understanding of the world. Ver-stand – reason, understanding, as well as intelligence. That is, a person develops his intellect for years, and then gray hair comes. However, not only in old age can hair change its color, but also in youth. This is how the German people think in another Graues Haar wächst auch auf jungem Kopf (lit.: Gray hair also grows on a young head) [5]. I would like to note that gray hair can be in a person at any age. It has to do with genetics, more specifically with heredity. However, in the German stable expression, we are talking about the fact that even at a young age a person can have an intellect that will be greater than that of his

peers and the older generation. Gray hair is not a sign of old age for Germans, but for Russians it is the other way around. Thus, the German people believe that gray hair is wisdom.

In addition to wisdom, gray hair in German can also mean stupidity. German phraseological unit Der Esel hat von Jugend auf graue Haare (lit.: A donkey has gray hair since youth) [5]. Donkey means stupidity. After all, he is considered a stupid and stubborn animal. However, it is worth remembering that this is just a human delusion. In fact, the donkey is a smart creature that evaluates its strengths and understands the limits of its capabilities. Donkeys start stubborn when they are very tired. However, people in the past mistakenly considered the behavior of donkeys to be stupid. And the association "donkey – stupidity" has taken root in many nations. In German phraseology, a person is compared with a donkey. Gray hair is his intellect. Since the Germans used an animal that is associated with stupidity, therefore, the person is stupid. Thus, in this phraseological unit, gray hair is the stupidity of a person.

Russian phraseological unit Hanging by a thread [6] means being in a dangerous situation that can lead to death. The origin is well known. This phraseological unit arose thanks to the Greek myth. King Dionysius the Elder put the envious Damocles in his place during the feast. Later, Damocles noticed that a sword was hanging on a horsehair above his head, pointing down, which could break at any moment. Then he realized that the happy life of rulers is always fraught with mortal danger [6]. The hair in this case was not chosen by chance. Hair is thin and a person does not know when it can break. Thus, it is important to remember to always be careful.

In life, everything can change or change in a year. This is precisely the thought held by the German people in their phraseological phrase Ander Jahr, ander Haar (lit.: another year, another hair). Whatever happens here and now, it will definitely change. Another year means that you need to wait a while for changes. Other hair - change. Hair grows every year by a few millimeters. Therefore, it is not necessary to focus your attention on any situation, because everything can change in just a year.

The phraseological component "hair" can reflect a variety of meanings and meanings, which in different contexts can denote different ideas. For example, hair is often associated with changes in a person's life, as a symbolic transformation of the external appearance can reflect changes in his inner world.

At the same time, phraseological units with the word "hair" can also acquire a negative connotation, for example, in the context of a threat to life, when hair can cause danger and border on death. In addition, they can serve as an expression of feelings of shame, anxiety, fear and horror that a person experiences.

Gray hair in some cultures can serve as a symbol of wisdom and experience, while in others - stupidity and ugliness. The phraseological component "hair" can also be used to denote the feeling of anger and irritation that a person experiences.

However, it is worth noting that phraseological units with the word "hair" can have different meanings and shades depending on the culture and language. For example, in some languages the phrase "to have long hair" can mean sluggishness, while in other countries it can indicate health and beauty.

The study of phraseological units based on the component "hair" can help to understand not only the language culture and national traditions, but also the social and cultural meanings that accompany the use of certain expressions. The meaning of the word "hair" in different languages and cultures can be very different, and it is important to take this context into account in order to fully understand the meaning of phraseology.

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THE DEVELOPMENT OF PHYSICAL CULTURE IN THE RENAISSANCE IN WESTERN EUROPE

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Abstract. This work is devoted to the study of the main aspects of the development of physical culture and sports in the Renaissance (XIV-XVI centuries) in Western Europe, and the description of factors influencing the state of physical education.

Keywords: sports, physical education, military training, fencing, methods of education.

РАЗВИТИЕ ФИЗИЧЕСКОЙ КУЛЬТУРЫ В ЭПОХУ ВОЗРОЖДЕНИЯ В ЗАПАДНОЙ ЕВРОПЕ

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Аннотация. Данная работа посвящена изучению основных аспектов развития физической культуры и спорта в эпоху Возрождения (XIV-XVI вв.) в Западной Европе и описанию факторов, оказывающих влияние на состояние физического воспитания.

Ключевые слова: спорт, физическая культура, военная подготовка, фехтование, методика воспитания.

Physical culture and sports have been an inseparable part of the life of teenagers for many centuries. Physical training Renaissance in contrast to modern phenomena in that in that period of the emergence of activity was a narrower range of sports and sports. In addition, in modern physical education, there is more emphasis on healthy lifestyles and fitness development, and there is a wider range of sports and sports available for practice [1, 2].

In the future, the Renaissance became culture and sports one of the most important points of view on the development of the right side. Great philosophers, scientists and figures of the time believed that health and natural development is the basis for success in any area of life. However, the development of some types of sports movement has taken place due to the lack of sufficient funding and organizational support from the restrictions [2, 3]. By observing the presence of a problem, individual attention arises, therefore it is taken as the basis of this study.

The purpose of this work is to study the history of the development of physical culture and sports in the Renaissance, as well as a description of the characteristics that affect the sports movement of the XIV-XVI centuries. Tasks:

1) To study the world proposals for the development of physical fitness.

2) Characterize the features of physical education in Europe.

The period from about the 14th to the 17th centuries was part of the daily life of people, especially in Europe. This period is often called the Renaissance, since in most states there was a revival of interest in ancient culture and philosophy, including physical.

But for comparison, they were included in the study. In the Japanese language of origin, culture was centered around the scope of "Bushido"or "the way of the warrior", which embraced the development of oneself not only of the body, but also of the spirit and morality. Physical education developed in connection with certain changes in the development of the arts, such as karate and judo. A system of complex physical exercises was created, stimulating elements of well-being, cheerful exercises and meditation.

In the Russian kingdom during the Renaissance, cultural activity was not yet as developed as in other states. In addition, in Russia of that period, insufficient attention was paid to the issue of physical development, but it cannot be said that no measures were taken in this direction. In those conditions, physical activity had a fundamentally different meaning in the culture of the state. At that time, physical exercise and gymnastics were mostly covered by the military. Among the Russian nobility, horseback riding was occupied with activities, and often met on horse races. In addition, such games as gorodki, falconry, fisticuffs, lapta, backgammon and chess were popular.

In England at the turn of the 17th century, the system of class division in physical culture was preserved. The aristocrats rejected the chivalrous methods of educating the body, leaving only some elements of dance and swordsmanship. The peasants in the village have popular folk mass games, various power clubs. The first fencing clubs appeared, where fencing techniques and sparring are regularly taught.

In the Spanish kingdom, activity also occupies an important place in culture. The Spanish knights discovered their fighting skills and ability to ride horses. Much attention was also paid to wrestling and fencing. In addition, the Spaniards discovered their folk dances, which also manifested themselves in physical activity.

Physical activity in Venice, the Republic of Genoa, the Papal States, the Kingdom of Sicily, Florence at that time was closely associated with cultural martial arts and fencing, which were popular in the surrounding revival. Italian swordsmen and wrestlers were known for their skills and became a model for other states. In addition, the Italians were also passionate about horseback riding and other sports such as gymnastics, running and ballet.

As world experience shows, the development of healthy education and the development of culture in a healthy lifestyle at different speeds [4, 5, 6, 7]. It can be said that in the consequences of the impact on the development of physical culture and physical development there was an awareness of the need to use a large amount of health and physical fitness. In such cases, activity also has social significance. It

was not only an opportunity to get together with your health, but also an opportunity to show abilities and interests in society.

The features of the development of diseases in Europe are considered, since in this territory one can trace changes in cultural and physical activity that cause a return to European pagan feelings, which imply violations and aesthetics of the human body and capabilities.

We will separately consider the features of physical education in Western Europe, since in this territory one can trace those changes in the culture of physical activity that are caused by a return to European pagan values, which implied the triumph and aesthetics of the human body and capabilities. In these states, the development of science and medicine also had a more pronounced impact on the use of physical exercises for the treatment and prevention of many diseases than in other regions.

In the Renaissance, there was a significant breakthrough in the development of physical culture and sports, namely, new sports were created, competition rules were introduced, and the systematic training of athletes began. But at the same time, the process of restoration and development was far from simple, due to the lack of appropriate beliefs and scientific research.

One of the most common physical activities was horseback riding, which was popular among the aristocracy. They spent a lot of time in the stables, learning to ride horses and participating in tournaments and competitions. Ball games, wrestling, archery, fencing and running were widespread. Fencing was a popular sport among men, especially among the aristocracy, and was considered a necessary skill for knights.

The importance of physical culture was also noted in education. Some universities had courses in physical education, and many famous scientists and philosophers such as Leonardo da Vinci and Michel de Montaigne emphasized physical activity and a healthy lifestyle.

Leonardo da Vinci was a famous artist, he was also a scientist, engineer and inventor. He not only developed new inventions and explored nature, but also attached importance to physical health. His diary entries indicate that he was engaged in gymnastics, swimming and horseback riding. He also drew attention to the importance of a healthy diet and advised to eat more fruits and vegetables.

Michel de Montaigne was a French writer and philosopher known for his essays on various topics. He also emphasized the importance of a healthy lifestyle and physical activity. In his essays, he wrote that physical exercise and sports help to maintain health and strengthen the mind [3, 7, 8].

Leonardo da Vinci and Michel de Montaigne, as well as other researchers who were at the forefront of this trend, attached importance to physical activity and a healthy lifestyle. They understood that the health of the body and mind is a necessary condition for achieving personal and professional goals.

Such a distinctive feature of the physical culture of the Renaissance was its connection with military training. Many physical activities were essential for self-defense and warfare, and this made them more practical than modern sports.

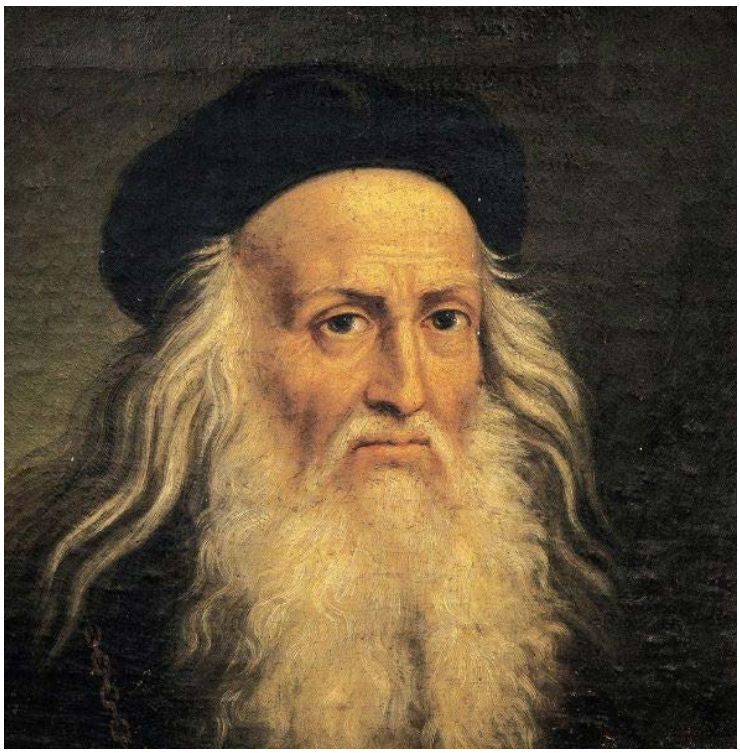


Figure. Leonardo da Vinci

A modern look in the Renaissance. In the era of the Renaissance in Western Europe, physical culture experienced a significant development. Modern scholars have different opinions on its impact, and some have voiced significant concerns.

On the one hand, many scholars argue that the development of physical culture during the Renaissance helped promote health and wellness among the population. Physical exercise was viewed as a way to maintain good health, and many new techniques and practices were introduced. Friedrich Jahn, a notable figure of the time, is often credited with introducing gymnastics, running and jumping exercises to promote physical fitness.

Others argue that the developments in physical culture during the Enlightenment were an extension of concerns about power and control over society. The focus shifted from individual holistic wellness to techniques of regimentation and organization of the body, primarily to produce obedient, healthy soldiers to protect the state. This tendency towards control was seen as oppressive, with physical exercise being co-opted into ideologies of power and domination.

Furthermore, some scholars believe that the development of physical culture during the Enlightenment period helped promote the development and growth of sport. The rules and regulations of games, including the introduction of standardized scoring systems, were introduced to encourage fair play and ensure that the outcome of games was fair and unbiased.

Overall, while there is little disagreement about the significant developments in physical culture during the Renaissance period, there remain debates over the intent and impact of its practitioners. The focus on regimentation and control suggests that while physical activity was promoted for its health benefits, it was also employed as a means of social control.

At present, when physical culture and sports occupy an important place in people's lives, studying the history and development of this area during the Renaissance can help in solving modern problems related to the training of athletes, the organization of competitions and the promotion of a healthy lifestyle. For example, knowledge of the factors will determine the society's need for physical education, necessary for the effective promotion of a healthy lifestyle. Or, bearing in mind the knowledge of the exercises of that period, you can actively introduce them into the modern training program.

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FINANCIAL RISK MANAGEMENT UNDER PREVENTION OF EXTERNAL FACTORS

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Abstract. The article reveals the essence and types of financial risk of corporations, it is concluded that in the current crisis conditions, the influence of external factors is beginning to take a leading place in the work of corporate financial risk management. Accordingly, using the methods of analysis and synthesis, systematization, the factors of the external environment were identified in the work and their systematization was carried out, which allowed them to be divided into five groups: depressive macroeconomic environment, tightening of monetary policy, political and legal factors, international factors, participants in the competitive environment.

Keywords: environmental factors, risk, corporate financial risk, risk management, analytical models.

УПРАВЛЕНИЕ ФИНАНСОВЫМИ РИСКАМИ В УСЛОВИЯХ ПРЕДОТВРАЩЕНИЯ ВНЕШНИХ ФАКТОРОВ

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Аннотация. В статье раскрывается сущность и виды финансового риска корпораций, делается вывод, что в современных кризисных условиях влияние внешних факторов начинает занимать ведущую роль в работе по управлению финансовыми рисками корпораций. Соответственно, используя методы анализа и синтеза, систематизации, в работе были идентифицированы факторы внешней среды и проведена их систематизация, которая позволила разбить их на пять групп: депрессивная макроэкономическая среда, ужесточение денежно-кредитной политики, политико-правовые факторы, международные факторы, участники конкурентной среды.

Ключевые слова: факторы внешней среды, риск, корпоративный финансовый риск, риск-менеджмент, аналитические модели.

Introduction

From management experience, it can be observed that the main factor in the

majority of bankrupt corporations was financial difficulties, but there are also cases when, despite the fact that the corporation is experiencing financial difficulties, it can overcome the crisis by, for example, restructuring assets. There are many factors that affect the financial condition of the corporation, they include poor staff performance or management, but at the same time, in addition to internal factors, some external factors, such as, for example, tightening monetary policy, have an impact on the company's activities. Recently, the business environment has become more complicated under the influence of increasing factors of direct and indirect influence, economic and political crises [1]. And the central place in the role of ensuring the financial stability of the corporation is beginning to be occupied by data that is growing exponentially from day to day and that must be processed, respectively [2], it is necessary to introduce IT technologies into the company's activities. The current trend will lead to an increase in the need for corporations to make management decisions in the field of financial risks [3].

Risk is a measure of quantitative multicomponent hazard measurement with the inclusion of the amount of damage from the impact of security threats, the probability of occurrence of these threats and uncertainty in the amount of damage and probability.

As for financial risk, there are several different points of view. Financial risk is considered as the uncertainty of repayment by the enterprise of the debts owed; as the probability of deviation of actual data (results) from those planned in the field of financial and economic activity. As a result of the effectiveness of a financial operation, its profitability, profit, dividends, etc. are considered [4]; as a risk that is associated with the financing of the enterprise; as the uncertainty of the financial position of the enterprise or the uncertainty of the financial activity of the enterprise to ensure the demand for working capital in economic activity.

Financial risk is a type of financial activity that, in the course of production, due to many risk factors, uncertainty of capital and cash flow, may eventually lead to the fact that the company's future financial income will differ from people's expectations.

However, all these approaches to determining the essence of financial risk assume that the financial risks of an enterprise are associated with a number of uncertain factors in financial activity that caused a gap between financial income and expected profit, which led to the loss of opportunity. They can be described using such characteristics as objectivity, i. e. the need to objectively assess the causes of its occurrence and identify; uncertainty, because it is its presence that affects its occurrence, since difficulties arise with the procedure for monitoring the situation; measurability, which indicates the possibility of its evaluation using statistical, mathematical methods.

Therefore, an important task in financial risk management is to determine deviations based on the main results, which may indicate the presence of risks. And to level them, it is necessary to determine the true causes of their occurrence, namely the factors that affect the company and plunge it into a state of financial insolvency.

Within the framework of this article, the purpose of the study is to identify external factors affecting the financial condition and modern approaches to managing them.

Methodology and methods

The theoretical and methodological basis is based on the theories of corporate financial management and risk management, which will allow to systematize external factors and identify approaches leveling their impact on the financial condition of the corporation.

The methods of research are the method of scientific cognition, systematization, analysis and synthesis.

The main part

In the literature, there are a large number of views on external factors that affect the occurrence of risks and have an impact on the financial condition of the corporation. As a result of the analysis of points of view on this problem, the systematization of factors and risks was carried out in several groups.

The first group of external factors is the "Depressed macroeconomic environment".

This may include, firstly, socio-economic instability, which is an uncontrolled group of factors by a corporation and may have an indirect impact on its financial condition. At the same time, such an influence cannot be tracked [5].

This group includes a wide range of risks:

- project risk involving a change in the ratio of supply and demand in the market, which will lead to a reduction in consumer demand for the brand.

- change in interest rates. This type of risk affects practically the change in the investment climate. Since, for example, an increase in the interest rate will lead to a deterioration in the investment situation, although it will have a different impact on different types of investments. Similarly, firms will react differently to the weakening of the economy. Cyclical firms will be in the worst position [2].

- instability of the financial market [6]. The most dangerous phenomena include fluctuations in interest rates and haphazard price changes.

- a recession that can cause an economic downturn, in which prices decrease due to the instability of demand and a decrease in production volumes, which will lead to a weakening of the purchasing power of the population.

The second group of factors is the "Tightening of monetary policy". This will make it more difficult to raise funds by issuing bonds or applying for a loan.

The third group of factors is "Political and legal factors". State policy in the field of lawmaking and law from time to time initiates laws, new rules that may negatively affect the financial activities of corporations. For example, a tariff change can have a significant impact on the activities of import and export corporations, reducing profit margins.

The fourth group of factors includes "International factors". Such as:

- international credit ratings of Russian companies. Deterioration of credit ratings leads to an increase in credit risk, which leads to an increase in risk

management costs [6].

- change in the exchange rate. This factor affects the results of the corporation's activities. Its consequences include: reduction of the company's market value, impact on liabilities and its assets. Some authors include such types of risks as operational, consolidated and economic.

- country risk. This is an integral indicator that illustrates the overall situation in the country in relation to doing business, including many elements: natural and climatic, political, economic and social spheres [7].

The fifth group of environmental factors affecting the financial stability of corporations includes "Participants in the competitive environment". Within this group, various market actors can have a negative impact on the company's activities: competitors, suppliers, intermediaries, consumers, NGOs, etc. For example, in China, an annual assessment of the business reputation of companies is carried out. Business reputation comes from acquisitions. If the offer price exceeds the fair value of the net assets of the object, the excess part is called goodwill. According to Chinese law, business reputation assets of companies must be checked for impairment every year. If the acquired objects have signs of wear and tear, companies should reduce the cost of business reputation. If the scale of the impairment is too large, it will greatly affect the results of the listed companies.

At the same time, the financial crisis of an enterprise, as a rule, is a gradually emerging, slow process of deterioration. Therefore, it has predictability. In order to avoid financial risks and protect themselves from them, companies need to fully understand and analyze financial risks, correct, improve and formulate appropriate countermeasures in a timely manner, and effectively improve the mechanism for early warning of financial risks.

To avoid financial risk, management should use timely measures to control the situation. Therefore, a good internal control system and a financial early warning system are very much needed [8].

Financial risk management is used for this purpose. It is understood, on the one hand, as a process involving a number of iterations: identification, analysis and decision-making, on the other hand, it is the task of monitoring financial risks and managing their impact. In any case, financial risk management consists of a certain algorithm of actions involving the collection of information, its processing in order to identify risk. Various methods are used for information processing and risk assessment, depending on the goals and objectives of the study. The next stages of the algorithm are control and management [5].

The problem of financial risk management reveals many possible ways to cope with the risk affecting the financial aspects of companies' activities. One of them is forecasting the future financial position of the company.

Thus, the main directions in which methods can be used to overcome them are [9]:

- the system of early diagnosis of the financial condition of the enterprise,
- internal audit and control,

- forecasting the future financial position of the company.

Currently, modern models have been developed aimed at reducing the level of risks for the financial management of the enterprise.

1. Stakeholder approach. This approach assumes a comprehensive assessment of the external environment of the corporation, which affects its financial stability. To do this, a study of the "risk profile" is conducted from the point of view of all stakeholders. As a result, it is possible to identify stakeholders who generate various risks. Next, the relationship with stakeholders is evaluated and risk indicators are determined. Based on the identified indicators, the corporation makes a decision on the type of interaction with them [1].

2. Normative approach. The essence of this approach is to determine a set of financial and economic coefficients, the actual data for which are compared with their threshold values reflecting the conditions of real production and economic practice [10].

3. Within the framework of the early diagnosis system of a financial enterprise, there are many approaches aimed at preventing corporate financial risks. Let's focus on more effective ones for the current stage of economic development.

4. From the approaches based on the analytical model of obtaining information related to the emergence of a potential crisis in the enterprise, an approach based on the analysis of a complex value chain can be distinguished.

When managing the value chain in a business, it is necessary to have an early warning system about a potential crisis.

Enterprises that ensure the reproduction of their value chain by creating and using their own capital must fulfill the condition of profitability, measured by the profitability coefficient. Within the framework of this method, the effective sale of a product to customers is considered as the basis for the reproduction of the capital of the enterprise [11].

The analytical criteria comparison system is used to check the possibility of a potential crisis on the basis of project analysis when determining the target values of the value chain and evaluating the progress of the implementation of this chain in relation to the values set for it.

5. Multivariate regression models. Thus, in the work of Valaskov, K., Klestik, T., and Kovakov, M. [9], a regression model is proposed that includes nine financial coefficients that are statistically significant: net return on capital, cash ratio, rapid liquidity ratio, current liquidity ratio, net working capital, RE/TA ratio, current debt ratio, the ratio of financial debt and the turnover of current assets on the basis of which a decision on a future default can be made. These factors are significant enough to manage financial risks, influence the profitability and prosperity of the company.

Also, in order to minimize the financial consequences from the implementation of possible negative risk events, it is necessary to insure risks associated with damage or loss of property, civil liability to third parties, as well as the life and health of employees [12]. Most financial risks, such as currency, interest rate, credit, and

liquidity risk also need to be minimized. Systems for generating rolling liquidity forecasts and cash flow budgets, as well as cash-pooling systems (intra-group financing) will help to minimize risks.

Conclusions

The main conclusion of the study is that in modern conditions of a high level of uncertainty, both at the international and country levels in politics and economics, the role of external factors affecting the financial stability of corporations is increasing. To organize the effective work of risk management, first of all, their identification is required. In accordance with this, as a result of the analysis of the information of the most significant works in this area, the systematization of external factors was carried out and the following groups were identified: a depressed macroeconomic environment, tightening of monetary policy, political and legal factors, international factors, participants in the competitive environment. These factors are risk generators that have a direct and indirect impact on the financial condition of the corporation. To prevent them, a financial risk management mechanism is used, within the framework of which various models are proposed aimed at reducing the level of risks for the financial management of the enterprise. Their use will allow corporations to carry out optimal work in the field of risk management through the system of early diagnostics of the financial condition of the enterprise and forecasting the future financial position of the company.

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DESTRUCTION OF OCEAN ECOSYSTEMS AND EXTINCTION RISK IN MARINE LIFE

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Abstract. The use of ocean resources significantly affects humanity's provision of food, medicine, energy, as well as transportation, trade, defense, and even recreation. One of the most significant developments in international law in the second half of the twentieth century was the growing concern for the marine environment. Issues of protection of the oceans are indeed central points of the new environmental consciousness. Water and land pollution, unsustainable and environmentally unfriendly exploitation of mineral resources are problems for all of humanity.

Keywords: ecology, the world’s ocean, marine ecosystem, marine species, marine economic activities.

РАЗРУШЕНИЕ ОКЕАНСКИХ ЭКОСИСТЕМ И РИСК ВЫМИРАНИЯ МОРСКИХ ОРГАНИЗМОВ

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Аннотация. Использование океанских ресурсов существенным образом влияет на обеспечение человечества продуктами, лекарствами, энергией, а также на организацию транспортировки, торговли, обороны и даже отдыха. Одним из наиболее значимых событий в области международного права во второй половине двадцатого века стала растущая обеспокоенность состоянием морской среды. Вопросы защиты океанов, действительно, являются центральными точками нового экологического сознания. Загрязнение воды и суши, неустойчивая и экологически неблагоприятная эксплуатация минеральных ресурсов – это проблемы всего человечества.

Ключевые слова: экология, морская экосистема, Мировой океан, морские виды, морехозяйственная деятельность.

The world's ocean is a vast but very fragile system. This has become especially evident in recent decades, when pollution of ocean waters has reached unprecedented proportions. Not only the well-being of ecosystems depends on the state of the water, but human civilization itself is largely dependent on the ocean: it affects the weather and climate of the entire planet. That is why the pollution of the World Ocean has become one of the most serious environmental problems of our time [1].

Some scientists and ecologists say that the destruction of ocean ecosystems is a serious threat to marine life, as it can lead to the extinction of many species of fish and other marine animals. They point to factors such as ocean pollution, overfishing, climate change, and the destruction of marine reefs. Others, however, believe that the human impact on ocean ecosystems is not as great and that nature will be able to adapt to the changes on its own. However, most scientists agree that preserving marine life and ecosystems requires environmental protection and sustainable use of marine resources.

The main causes of destruction of ocean ecosystems:

1. Overfishing and illegal fishing which lead to overpopulation of marine ecosystems and extinction of certain species.

2. Pollution of seawater with oil, chemicals, and toxins, leading to the death of many marine animals and disruption of ecosystems.

3. Climatic changes, such as rising seawater temperatures and changing acidity levels, which can lead to the extinction of certain marine animal species and disruption of ecosystems.

4. Destruction of marine ecosystems due to oil and gas extraction, port construction, and other infrastructure projects [2].

Ways to solve problems:

1. Imposing strict quotas on fishing and strengthening control and penalties for illegal fishing to prevent overpopulation of marine ecosystems and to conserve certain species.

2. Regularly controlling and penalizing the pollution of seawater with oil, chemicals, and toxins to prevent the death of many marine animals and disruption of ecosystems.

3. Reducing greenhouse gas emissions and other harmful substances to prevent climate change and preserve certain marine animal species and ecosystems.

4. Taking measures to protect marine ecosystems in oil and gas extraction, port construction, and other infrastructure projects [3].

It is well-known that that industrial livestock production is damaging our planet. Emissions of greenhouse gases, deforestation for grazing, pollution of rivers and lakes. Against this backdrop, switching to a fish diet may seem like a good alternative. But fishing is changing our planet just as much as the meat industry. Every year more than a trillion fish are caught in the seas and oceans that don't end up on our table, but are sent back to the sea, already dead.

During the last 50 years the world consumption of seafood and fish has more than doubled – today, each person eats on average about 22.3 kg of such products a year. Every year commercial fishing vessels catch more than 96 million tons of fish in the world. The most active fishing countries – China, Indonesia, Peru, Russia,

USA, India and Vietnam – are responsible for half of all fish caught.

The global trend away from animal products has hardly touched fish – the focus remains on meat and dairy products. Moreover, people are increasingly choosing fish as an alternative to meat products, thinking that it is less harmful to the environment. Nevertheless, irresponsible treatment of the ecosystems of the seas and oceans directly affects the rate of global warming – let's see how.

Every day, more than 4 million commercial vessels go to sea. Together, they catch about 2.7 trillion fish a year – more than 5 million fish a day. But not all of them end up on store shelves or in restaurants – statistics show that about 40 percent are thrown back overboard already dead. Sharks, dolphins and whales are among the "unnecessary" species for fishermen – a typical fishing vessel aims to catch the most popular fish like tuna, salmon and pollock.

Another problem caused by fishing is nets, which have already become a major source of plastic in the ocean. Each year, more than 640,000 tons of nets, fishing line and traps enter the ocean from commercial fishing.

What the large garbage patch consists of is shown in Figure.

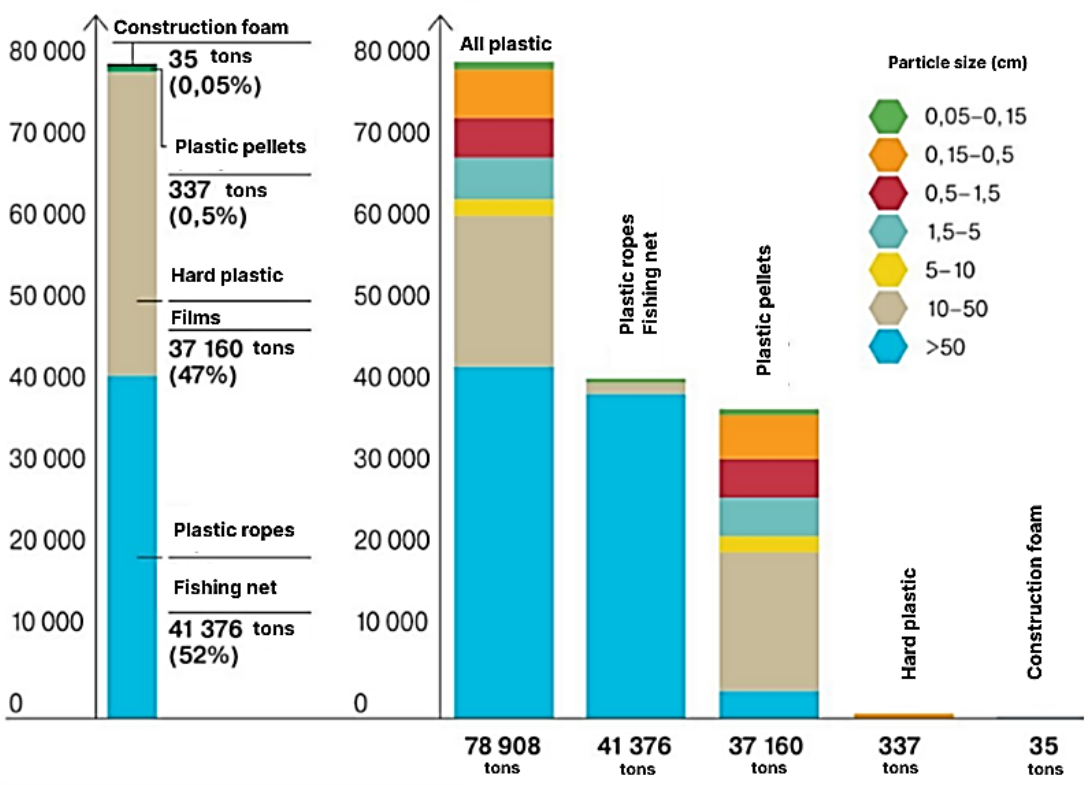


Figure. Composition of the garbage patch in the Pacific Ocean

Recent studies of the Pacific Ocean's large garbage patch showed that more than 70 percent of the large plastic waste on its surface was discarded in one way or another from fishing boats or related to the catching of fish.

Discarded fishing gear is especially dangerous – nets and lines can pose a threat to wildlife for decades, trapping everything from small fish and crustaceans to turtles, seabirds and even whales. Turtles are especially vulnerable - globally, six out of seven species of sea turtles are classified as endangered due to human activities [4].

The oceans and seas are home to many different species, some of which are still unknown. Unfortunately, rising water temperatures, sea pollution, and fishing are reducing the number of sea creatures. For example: the Bissa sea turtle. This species of turtle Eretmochelys imbricata, which lives in tropical and subtropical regions, is in danger of extinction. In the past century, its numbers have declined by more than 80 %. This is mainly due to hunting and poaching, as the bisected tortoise shell is widely used for ornamental purposes. Although there is an outright ban on turtle shell trade, the uncontrolled sale of bisected turtle shells continues on the black market.

The vaquita California harbor porpoise, Phocoena sinus are small and timid cetaceans that inhabit the area between the northern Gulf of California and the Sea of Cortez. They belong to the cetacean family, called porpoises, and among them only the vaquita lives in warm waters.

This animal is threatened with imminent extinction, with less than 60 individuals currently left in the wild. Their mass extinction is due to water pollution and fishing. Although these animals are not necessarily the target of fishing, they are often caught in fishing nets. Fisheries authorities and the U.S. and Mexican governments have not yet reached an agreement to ban this species from fishing, despite the continued population decline of these unique cetaceans.

The leatherback turtle Dermochelys coriacea is the largest modern turtle – among both aquatic and terrestrial species. This turtle lives in the Pacific Ocean and is considered the oldest turtle species (its ancestors have been traced back to the Triassic period). However, in just the last few decades, this species has managed to find itself in the "company" of endangered marine animals. Like the vaquita, the leatherback turtle is threatened with extinction by uncontrolled fishing.

Atlantic bluefin tuna common tuna, Thunnus thynnus is one of the most common fish on the market. It is so popular that the overfishing to which it has been subjected has reduced its numbers by 85 %. The bluefin tuna is on the verge of extinction due to over-consumption by humans. Despite attempts at control, tuna catches continue to break records, and most of this is due to illegal fishing.

The blue whale Balaenóptera músculus is the largest animal in the world and unfortunately makes the list of endangered marine life. The main reason for this, again, is due to uncontrolled fishing.

The blue whale is hunted for its fat and blubber, which is used to make soap or candles. Whale mustache is used to make brushes, and their meat is highly prized in some countries. There are other reasons for the decline of the blue whale population, such as acoustic or environmental pollution, which affect the ecosystem of these animals.

According to Professor Kirill Kuzischev, the International Red Book has a list of endangered fish. It includes the perch, shortnose whitefish, Danube salmon, Aral coho salmon, Arizona trout and many others. Scientists hope to save all of these species. The practice of preventing the decline of these species is very broad and includes many measures from the creation of special sanctuaries or nature reserves to artificial reproduction.

According to the expert, until very recently some sturgeon species were also on the verge of extinction, but thanks to the prohibition of fishing it was possible to

prevent their extinction. Until recently there was a threat of great losses of rainbow trout population, but because of its biological features it was successfully "domesticated" and increased in number.

With omul, muksun and eel, whose population also continues to decline, the situation is more complicated. Their development is slower, and it takes more time to get a large number of large and healthy fish. Urgent measures are already needed here to limit the catch of such fish at the international level.

In order to preserve the rarest fish species, mankind must actively implement technologies that help to increase their population and take measures to reduce the catch of such fish, the expert concluded.

The future of ocean ecosystems and marine life is disappointing. If nothing is done to stop marine pollution, overfishing, and climate change, we will face serious consequences. A possible scenario is a decline in fish stocks, the threat of extinction of some marine animal species, changes in biodiversity, and deterioration of marine products. In addition, climate change can lead to rising sea levels and deteriorating water quality, which can lead to serious consequences for the people and animals living on the coast [5]. However, if the international community acts together to preserve ocean ecosystems and marine life, there is hope for a more favorable future.

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LANDFILLS: THE PROBLEM OF POLLUTION OF THE ENVIRONMENT AND WAYS TO SOLVE IT

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Abstract. This topic deals with the problem of landfills and their impact on the environment. The article describes the main causes of landfills and their consequences, such as soil, water, and air pollution. It also presents ways to solve the problem, including recycling, the use of biotechnology, and the development of an ecological culture. The authors emphasize the importance of joint efforts of the state, society and business to achieve positive results in combating the problem of landfills.

Keywords: waste, landfills, landfill, dumping, landfill gas, carcinogen.

СВАЛКИ: ПРОБЛЕМА ЗАГРЯЗНЕНИЯ ОКРУЖАЮЩЕЙ СРЕДЫ И ПУТИ ЕЕ РЕШЕНИЯ

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Аннотация. В статье рассматривается проблема свалок и их влияние на окружающую среду. Описываются основные причины образования свалок и последствия их существования, такие как загрязнение почвы, воды и воздуха. Также представлены пути решения проблемы, включая переработку отходов, использование биотехнологий и развитие экологической культуры. Авторы подчеркивают важность совместных усилий государства, общества и бизнеса для достижения положительных результатов в борьбе с проблемой свалок.

Ключевые слова: отходы, полигоны, свалка, захоронение, свалочный газ, канцероген.

The main problems of landfills include pollution of the environment, including

soil, water, and air, the spread of disease and the creation of conditions for the reproduction of pests, and negative impacts on the economy and society. Landfills can lead to poor human health, reduced soil fertility, and threats to wildlife. In addition, landfills can lead to negative impacts on tourism and other sectors of the economy, which can affect the income of local residents [1].

There are several ways to deal with landfills:

1. Raising public awareness of the problems of landfills and their impact on the environment. This can be achieved through public awareness and education campaigns.

2. Developing and implementing recycling technologies that reduce waste, reduce pollution, and create new revenue opportunities.

3. Development of waste management strategies that will collect, recycle, and dispose of waste at the local level.

4. Conducting regular landfill cleanup and recycling activities, and monitoring their future use.

5. Development and implementation of legislation that will regulate the activities of companies and organizations related to waste production and disposal, and punish violators.

6. Cooperation of local authorities, business and the public to develop and implement comprehensive programs for waste management and landfill control [2].

There are several alternatives to landfills that can help solve the problem of waste accumulation:

1. Recycling is the process by which waste is processed and turned into new products or materials. This reduces the volume of waste, reduces pollution, and creates new profit opportunities.

2. Composting is a process in which organic waste is decomposed by microorganisms and turned into fertilizer for the soil.

3. Energy recycling is a process in which waste is incinerated to produce energy. This allows the waste to be used as a source of energy and reduces the volume of waste.

4. Separate waste collection – a process in which different types of waste are collected and recycled separately from each other. This improves recycling efficiency and reduces the volume of waste in landfills.

5. Reducing consumption is a process in which people try to reduce their consumer lifestyle and use less packaging, disposables, and other materials that can become waste. This reduces the volume of waste and reduces the load on landfills [2].

At present, the huge accumulation of garbage is the most critical issue. Household waste is most often taken to landfills outside the city. For this purpose, initially a plot of land is chosen, which is at a distant distance from populated areas. In this case, the size of landfills increases so quickly that they soon reach the nearest settlements. Environmental degradation due to landfills has a negative impact on human health, leading to dangerous diseases and even deaths.

Fast removal of bulky construction waste, household waste and old things should be ordered from serious companies that care about the state of the environment. Qualified specialists take the trash to specially designated landfills outside the city, rather than dumping it in unauthorized dumps.

For many years, mankind has tried to solve the problem of disposal of household waste. For the disposal of garbage chose a large landfill outside the city. However, rarely investigated the location of the future landfill. But decomposing garbage poisons the soil, water and air.

In one year alone, several hundred thousand tons of household waste accumulate in landfills in medium-sized cities. Big cities litter the environment much faster. The size of landfills increases at a catastrophic rate. They consume fertile land, cause the death of local flora and fauna, expand to the nearest settlements and poison people [3].

Waste disposal in organized and unorganized landfills, as well as spontaneous landfills pose an epidemiological hazard. A landfill is a serious source of environmental pollution. In the depths of the garbage heap, decomposition processes take place, which involve anaerobic bacteria. As a consequence of this process, a toxic biological gas is released, one of its components being methane. Deep contamination of the ground takes place, the stinking air is blown by the wind for long distances, and if there is groundwater under the dump, it is practically poisoned. Thus, nearby water bodies are toxic and dangerous for humans. And the soil is unusable for several hundred years after the landfill is closed.

The ignition of emitted gas is a fairly common occurrence in landfills. Toxic smoke enters the atmosphere and poisons all life within a radius of several kilometers. According to many scientists, methane is one of the culprits of the increasing greenhouse effect.

The landfill area is expanding at a very rapid pace. A dangerous epidemiological zone is approaching human settlements. The inhaled air leads to human poisoning. Villagers who live near such dumps often complain of poor health, and some develop cancerous tumors from poisonous fumes.

Spontaneous dumps are even more dangerous, as they are most often located near residential areas [4]. It can start with a small picnic, after which the waste was forgotten to be removed. And in a few months, such a place turns into a dump.

According to Rosprirodnadzor, Russian landfills occupy 4 million hectares. It is equal to the area of the Netherlands or Switzerland. The areas of landfills in different countries are shown in Figure 1.

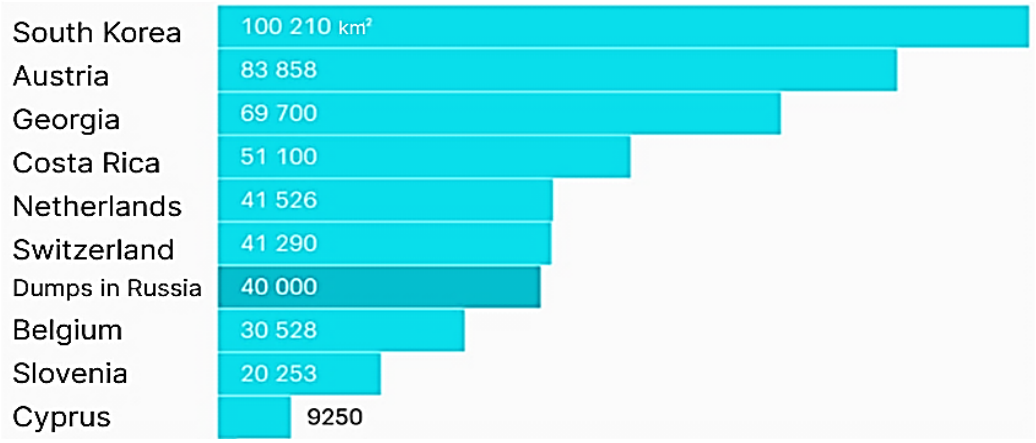


Figure 1. Areas of landfills in different countries

The territory occupied by garbage is increasing by 400 thousand hectares annually. If such rates are maintained, by 2050 landfills will occupy 1 % of the area of Russia. The number of recorded illegal dumps in Russia at the end of 2021 exceeded 15 thousand, which is 30 % more than it was at the end of 2019.

According to analysts, the largest increase in illegal dumps in 2021 compared to 2020 was observed in the Tomsk region, where their number increased fourfold – from 101 to 415. In Perm region, the number of such dumps increased from 491 to 671, in Kirov region – from 69 to 241, in Transbaikal Territory – from 670 to 813, in Amur region – from 72 to 206, in Sverdlovsk region – from 215 to 347, in Orenburg region – from 647 to 778, in Khabarovsk region – from 39 to 143, in Astrakhan region – from 442 to 525, in Krasnodar Territory – from 35 to 118.

The regions with the largest number of illegal dumps in Russia are shown in Figure 2.

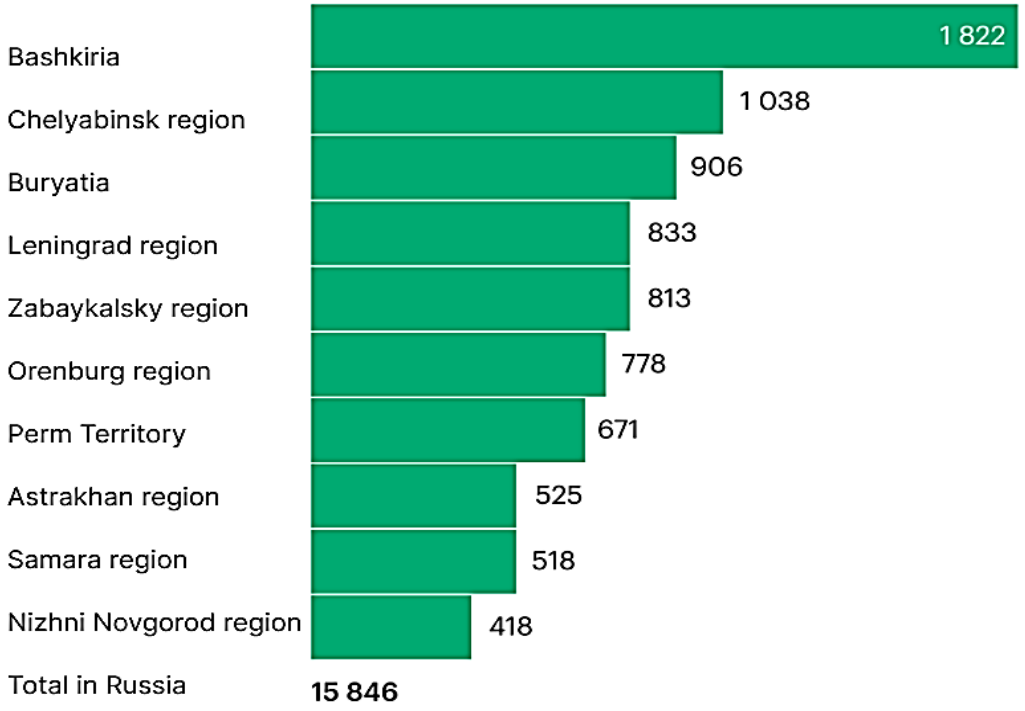


Figure 2. Regions of Russia with the largest number of illegal dumps

In 2021, the State Environmental Inspection of Tomsk Oblast actively detected unauthorized landfills, including with the use of remote detection means, which was reflected in the statistics. The press service of the Ministry of Natural Resources of Perm region pointed out that responsibility for illegal dumps is distributed between different departments, depending on where the dump was found: housing and utilities, the Perm Territory State Environmental Inspection, and local governments. On protected areas, household waste dumps are cleaned by forestry employees within the framework of the "Live Forest" project, with the involvement of forest tenants, volunteers, and local authorities [5]. RBC sent inquiries to environmental agencies in Krasnodar and Khabarovsk territories, Zabaikalye, Kirov, Amur, Sverdlovsk, Orenburg and Astrakhan regions.

In absolute values, the largest number of illegal dumps at the end of 2021 was recorded in Bashkiria – 1822, while in 2020 there were even more – 2167. In Chelyabinsk region – 1,038 dumps (in 2020 – 1,025), in Buryatia – 906 (was 730 dumps), in Leningrad region - 833 (was 828). RBC sent inquiries to the authorities of Bashkiria, Buryatia, Chelyabinsk and Leningrad regions.

In 2018, Russia launched the national project "Ecology", which included a subprogram to update the system of municipal waste management. In July 2020, President Vladimir Putin signed a decree that updated the goals of this national project. According to the decree, it is necessary to provide by 2030 a hundred per cent sorting of waste and reduce the proportion of landfill disposal to 50 %. In 2021, 94 percent of waste was sent to landfills.

In 2021 the government approved the strategic initiative "General cleaning", which allocated 20 billion rubles (of which 4 billion rubles for 2022) for the elimination of large-scale illegal dumps, abandoned wells, hazardous objects of accumulated environmental damage [6].

Now part of municipal waste gets to gray haulers under the guise of industrial waste and construction waste. The fee for removal of such types of waste is lower because the tariff does not assume sorting. In the Moscow region, household waste "disguised" as construction waste ends up in the forests. From 2019 to 2022, 372 unauthorized dumpsites were eliminated.

Garbage removal at illegal dumps is carried out, including by regional operators, which works in the Saratov, Volgograd, Murmansk and Nizhny Novgorod regions. In Tomsk region on the elimination of unauthorized dumps are going to spend environmental fines.

Dumps are a serious problem of environmental pollution, because they not only spoil the appearance of nature, but also harm the health of people and animals. This problem can only be solved by the joint efforts of the state, business and society. It is necessary to improve the system of waste disposal, develop recycling and raise public awareness of the proper disposal of waste. It is also important to reduce the consumption of disposable goods and increase the use of environmentally friendly materials. All these measures will help to reduce the number of landfills and preserve nature for future generations.

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COGNITIVE TECHNOLOGIES: THE KEY TO IMPROVING PRODUCTION AND REMAINING COMPETITIVE IN THE FUTURE

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Abstract. This paper discusses the basic principles and methods of cognitive technologies, their application in production processes. An overview and analysis of the current state of use to date is given. The prospects for the development of cognitive technologies in manufacturing in the near future to improve product quality and increase efficiency are considered.

Keywords: cognitive technologies, development prospects, quality, efficiency, production processes.

КОГНИТИВНЫЕ ТЕХНОЛОГИИ: КЛЮЧ К УЛУЧШЕНИЮ ПРОИЗВОДСТВА И СОХРАНЕНИЮ КОНКУРЕНТОСПОСОБНОСТИ В БУДУЩЕМ

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Аннотация. В данной работе описаны основные принципы и методы когнитивных технологий, их применение в производственных процессах. Приводится обзор и анализ текущего состояния использования таких технологий. Рассмотрены перспективы развития когнитивных технологий на производстве в ближайшем будущем для повышения качества продукции и увеличения эффективности работы предприятия в целом.

Ключевые слова: когнитивные технологии, перспективы развития, качество, эффективность, производственные процессы.

Cognitive technologies have the potential to improve product quality, increase the efficiency of production processes and optimize resource management. However, their use in production is limited by a number of technical, economic and social problems. This article discusses the study of the possibilities of using cognitive

technologies in production and their impact on the competitiveness of an enterprise [1].

Cognitive technologies are artificial intelligence methods that mimic human cognitive processes. They allow machines to analyze data and learn from experience, allowing them to make decisions and act according to changing conditions. Cognitive technologies use various methods of machine learning and data analysis, including neural networks, deep learning, text and image analysis, and natural language processing algorithms.

The basic principles of cognitive technologies include the imitation of human cognitive processes such as perception, information processing, decision making and learning.

The main methods of cognitive technologies are:

– Pattern and Object Recognition: Used to identify and classify objects based on their visual characteristics.

– Natural Language Processing: Used to analyze and interpret natural language constructs such as text, speech, and dialogue.

– Machine learning: used to create algorithms that can improve their performance through the accumulation of experience and data.

– Data analysis: used to identify patterns in large amounts of data, in order to uncover hidden dependencies and predict future events.

One of the key principles of cognitive technologies is continuous learning and self-learning of algorithms. This means that systems can learn from experience and data and make decisions based on their previous actions.

Cognitive technologies can be used in various areas of manufacturing processes, including product quality control, manufacturing process optimization, employee training, production cycle forecasting, and inventory management. For example, cognitive technologies can be used to automatically recognize defects in products, which can reduce the number of defects and increase production efficiency [1, 2].

Examples of the use of cognitive technologies in production:

– Product quality control. Cognitive technologies can be used to automatically detect defects in products, which can reduce scrap and increase production efficiency.

– Optimization of production processes. Cognitive technologies can be used to analyze production processes and identify hidden dependencies, which can reduce production time and increase its efficiency.

– Employee training. Cognitive technologies can be used to develop training programs for workers, which allows them to improve their skills and work efficiency.

– Forecasting of production cycles. Cognitive technologies can be used to predict production cycles, which allows for more accurate planning of production processes and inventory management.

– Inventory Management. Cognitive technologies can be used to optimize inventory management, reducing inventory costs and increasing production efficiency.

Advantages and limitations of cognitive technologies in production:

– Advantages. The use of cognitive technologies in production can reduce production costs, improve product quality, increase the efficiency of production processes, and increase the level of competitiveness of the enterprise.

– Restrictions. One of the main limitations of cognitive technologies is the high cost of developing and implementing systems based on these technologies. In addition, cognitive technologies require a large amount of data for training, which can be problematic for some enterprises [3].

The most promising cognitive technologies. Cognitive technologies can change both a person and his interaction with technology. Cognotropic drugs will help improve memory, develop intelligence, get enough sleep in less time, and activate the brain at the right time. Many of these developments already exist, but with the development of understanding of the work of the brain, they should become many times more effective.

Cognitive assistants are another possible breakthrough in technology. How to understand that the driver is losing attention behind the road? How to understand that a drunk person or a mentally inadequate driver wants to drive a car? These adaptive support systems will make it possible to understand the state of the driver, and given the current development of car "autopilots", it will be possible not only to block the car, but also to independently take the owner to the right place.

At present, the company of the Institute of Radio Engineering and Electronics of the Russian Academy of Sciences is already producing drivers' wakefulness sensors, which are designed to record early signs of falling asleep.

Interfaces for the brain and new sense organs

Brain-computer interfaces are also gradually becoming a reality, threatening to leave behind the usual keyboards, mice and touch panels. Robots can be taught to feel like humans. The reverse case – the transmission of an image directly through the implanted electrodes to the brain, bypassing the eye with the optic nerve - will help many blind people gain sight. Similarly, you can create other senses, and in many cases, it will not be about restoring lost abilities, but about their cardinal improvement, because sensors can be much more sensitive than human senses.

In the near future, we should expect numerous breakthroughs in this area, which can immediately significantly change the market, providing new interfaces, intelligent computer systems and technologies, as well as expanding human capabilities. And, if we recall the latest advances in robotics and the possibilities of three-dimensional printing, then the synthesis of these technologies can surprise even science fiction writers.

At present, cognitive technologies are beginning to be actively used in various areas of production. Some companies have already implemented projects to introduce cognitive technologies into production processes. However, despite all the advantages, the use of cognitive technologies in manufacturing remains limited and still requires further research and development.

The prospects for the development of cognitive technologies in production are associated with expanding the scope, improving the interaction between man and machine, improving product quality and reducing production costs.

Prospects for the development of cognitive technologies in production are associated with the further development of artificial intelligence and machine learning technologies. With the development of these technologies, cognitive systems are becoming more accurate and efficient in solving various problems in production.

One of the prospects for the development of cognitive technologies in production is the expansion of the scope of these technologies. At present, cognitive technologies are mainly used to solve problems of product quality control, optimization of production processes and inventory management. However, with the development of machine learning and artificial intelligence technologies, cognitive systems can be applied to solve more complex problems, such as forecasting demand for products and planning production cycles.

Another prospect for the development of cognitive technologies in manufacturing is to improve the interaction between man and machine. With the development of speech recognition and natural language processing technologies, cognitive systems can become more intuitive and easier to manage for production workers.

Finally, the prospect of developing cognitive technologies in production is to improve product quality and reduce production costs. Cognitive systems can help prevent errors in manufacturing processes and detect problems early, reducing scrap and improving product quality. In addition, cognitive systems can help optimize production processes and reduce production costs [4].

One specific example of the application of cognitive technologies in manufacturing is the use of a machine vision system for product quality control (Figure). The machine vision system can scan products for defects such as scratches, chips or other damage and determine if the products meet certain quality standards. Such a system can be built into the production line and work automatically.



Figure. COGNEX Vision System for Product Quality Control [5].

The machine vision system for product quality control is based on the use of cameras and sensors that scan products for defects. The data received from cameras and sensors is then processed using machine learning algorithms that allow the system to determine whether the products meet the specified quality standards.

In the process of training the system, it is provided with images of products with defects and without defects, so that the system can learn to distinguish between the characteristics associated with defects. For example, the system can learn to recognize scratches, chips, cracks, and other damage.

After the training, the system starts to scan the products and compare them with the images that were provided during the training. If the system detects a defect, it can automatically reject the product or send it for further inspection.

Thus, a machine vision system for product quality control based on cognitive technologies can automatically and accurately detect defects in products, which can reduce the number of defects and improve product quality [5].

The use of cognitive technologies can lead to a reduction in production costs, an increase in product quality and an increase in the efficiency of production processes.

Also, cognitive technologies can be used as a speech recognition technology for managing production processes. This technology is called speech control. It uses speech signal processing technologies to recognize speech and translate it into actions on the production line.

This technology can be used to control robots, machines and other devices on a production line. For example, an operator can use voice commands to start or stop a machine, change the speed or direction of a robot, and so on.

Speech control works through the use of special programs and algorithms that process audio signals and recognize speech. These programs use dictionaries and grammars to recognize commands and actions. Speech recognition systems can be implemented both locally, running on a computer or device, and cloud-based, when recognition occurs remotely via the Internet.

Voice control can help improve production efficiency, reduce task completion time, and reduce human error.

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SCANDINAVIAN STYLE IN THE DESIGN OF THE ENVIRONMENT

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Abstract. The article considers the main features of the Scandinavian style in interior and exterior design. The features and uniqueness of the style are revealed on the examples of its application in landscape design and interior design. The materials that are used to create such a design are presented, which colors are the main ones, as well as useful tips from designers. When creating a cozy atmosphere in your home or apartment, Scandinavian style is an excellent choice.

Keywords: scandinavian style, environmental design, landscape design, interior design.

СКАНДИНАВСКИЙ СТИЛЬ В ДИЗАЙНЕ СРЕДЫ

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Аннотация. В статье рассмотрены основные черты скандинавского стиля в дизайне интерьера и экстерьера. Раскрыты особенности и уникальность стиля на примерах его применения в ландшафтном дизайне и дизайне интерьера. Представлены материалы и основные цвета, которые используются для создания такого дизайна, а также полезные советы от дизайнеров.

При создании уютной обстановки в своем доме или квартире скандинавский стиль является отличным выбором.

Ключевые слова: скандинавский стиль, дизайн среды, ландшафтный дизайн, дизайн интерьера.

Scandinavian style in the interior is one of the popular, it combines complete unity with nature, functionality, practicality, picturesque and simplicity. This style has many advantages, one of which is its extreme flexibility: it can be applied both in arrangement of large public objects and for decoration of apartments.

The main goal of the Scandinavian style is to create a harmonious atmosphere that promotes relaxation and comfort. To do this, use light colors and natural materials such as wood, leather, cotton or linen.

The Scandinavian style is characterised by a maximum use of natural light and open spaces. Here, glass walls, light curtains and light screens are encouraged instead of partitions and black curtains.

An important element of the Scandinavian style is the correct use of space. All items should be placed so as not to create a sense of cramped or cluttered. It is also important to use functional interior items that will serve not only to decorate the room, but also to solve specific problems.

Another important element of the Scandinavian style is light. It plays a huge role in creating an atmosphere of comfort and coziness. The use of soft and pleasant light, as well as various light sources (lamps, lanterns, backlighting) helps to create the effect of soft and relaxing light.

This style attracts by its minimalism, simplicity and coziness, which is created through the use of natural materials and a light color scheme.

In general, the Scandinavian style in environmental design is simplicity, functionality and comfort.

This style is characterized by the following features:

- closeness to nature;
- ecology;
- minimalism and functionality;
- bright colors, including marine and linen;
- the use of wood, stone and metal in the decoration of the premises;
- simplicity in the zoning of space;
- the use of lighting effects, including backlighting of walls and furniture [1, 2].

The Scandi style, as it is called by American designers, is also characterized by attention to applied art, straightforwardness and unpretentiousness.



Figure 1. Scandinavian style bedroom and living room

Scandinavian style is also called and eco-style, because when creating an interior designer are primarily inspired by nature, because it is so strongly associated with this style. Picturesque landscapes and landscapes, natural materials, wood, combining both hardness and malleability – all this charms and inspires, creates a unique warm atmosphere and comfort.

Pastel colours such as light grey, white, cream, beige, blue, mint, ochre, amber, green and brown dominate the Scandinavian style. Elements made of natural materials such as wood, stone, glass and textiles made of linen, cotton and wool are often used. The combination of these components does not catch the eye, but creates a feeling of a warm sunny day and sets the mood for relaxation [3].

The simplicity of Scandinavian design is evident not only in the minimalist forms and materials used, but also in the abandonment of decoration and embellishment. The interior in the Scandinavian style seems simple, but behind this lies its functionality and rationality: it is unlikely to find unnecessary or conspicuous details. Furniture is light, not massive and durable is almost always made of natural wood. The naturalness in everything is an important difference between the Scandi style and others close to it in spirit.



Figure 2. Scandinavian style interior

In landscape design, the Scandinavian style refers to classical fundamentalism. It was formed under harsh conditions – two-thirds of the year it is winter, the soil is depleted, there is a lot of snow and little sun. But this does not prevent it to remain multifaceted, plastic and lively.

The distinctive features of the style are: simplicity, functionality, naturalness, restraint and orderliness. Scandinavian style is characterized by compactness and a small area, which rarely exceeds 5-10 square meters. On it there are harmoniously placed plantings of low conifers, garden décor, green lawns, flowerbeds and flowerbeds, stone paths and hedges.



Figure 3. Scandinavian style garden

The whole style is built on the use of natural materials (stone, wood), often evergreen plants and primroses, as well as bright ornaments. Decorative elements are made of natural materials: benches and benches, chairs, tables, wooden sculptures, bird feeders, wicker planters and others. Most of the decor is covered with light paint with bright accents [4, 5].

Stones are taken in different sizes, in groups or singly. And so that they do not look monotonous and boring, different material is chosen – colorful stones, pebbles, granite, marble, cobblestones and boulders. Along with the stones to decorate the garden use cut shrubs and large trees on which bird feeders are attached. Preferred trees include pine, maple, birch, and weeping and dwarf forms.



Figure 4. Conifers

The Scandinavian style in environmental design is a harmony and balance between functionality and aesthetics, between the natural and the artificial, between simplicity and sophistication. Every element of the interior in such a house is not just a decoration, but a necessary element for creating a harmonious and cosy atmosphere.

Scandinavian design is a style that is concise, functional and simple. Although it is considered one of the most popular styles in contemporary interior design, it also has its disadvantages:

Firstly, the Scandinavian design can make the room too cold and uncomfortable. White walls, grey or beige shades, modern furniture and minimalist forms can give a feeling of lack of cosiness and warmth.

Secondly, Scandinavian design can be too sterile and monochromatic. All design elements, including colours and textures, should be chosen very carefully to create the right impression.

Finally, Scandinavian design is not necessarily suitable for all types of homes and flats. Rooms that are too large with high ceilings and wooden beams do not always look good with Scandinavian furniture and decor.

Thus, despite all the disadvantages of Scandinavian design, it is suitable for almost everyone, rarely one who does not like its aesthetics. It is important to remember that interior design should reflect the personality of the owner and be cosy, comfortable and functional.

The philosophy behind Scandinavian design is simplicity, functionality, clarity and lightness. It attracts people from all over the world. But beyond that, Scandinavian design has its own interesting facts that few people know.

First fact: Scandinavian design does not put fashion first.

Unlike many other styles, Scandinavian design doesn't try to cater to trends and fashions. Instead, it concentrates on creating a functional space with as few items in it as possible. This allows you to choose the furniture and decor that best suits your needs and your preferences.

The second fact: Scandinavian design is born of poverty.

Scandinavian design originated in the north of Europe, where winter lasts many months and the cold forces people to spend most of their time indoors. While the rich could afford luxurious furniture, ordinary people had to create their own home furnishings.

Third fact: Scandinavian design is easily integrated into different cultures.

Scandinavian design was originally created to create a cozy home space suitable for living in harsh climates, but today this style has become international. It is successfully blended with other styles, and people all over the world who want to enrich their homes are increasingly choosing Scandinavian design for their homes.

Interesting fact: Scandinavian design has a strong connection to nature.

One of the main aspects of Scandinavian design is the respect for nature. Most Scandinavian homes are decorated with natural materials such as wood, stone, wool, cotton and linen fabrics. This helps to create a sense of tranquillity and harmony between people and nature.

Conclusion: The Scandinavian style in environmental design is a combination of natural beauty, brevity, naturalness and relaxedness. Natural materials, light colors give the feeling of tranquility and peace. The interiors, made in this style, look as natural as possible and do not irritate the eye with excessive decor and complicated forms. And parks and gardens look well-groomed and alive.

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PHRASEOLOGY WITH THE HAND COMPONENT

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Abstract. The article considers phraseological units with the hand component on the example of German and Russian languages. As the material shows, the required phraseological units are a translator of how much cultural information native speakers mean by using the hand component in stable language turns. The hand is mutual help, and sincerity. The hand is man's greed. You should always remember that an opponent may want more than a person can give. The hand is the value of something close, not something ephemeral and distant.

Keywords: phraseology, hand component, meaning, association, evaluation.

ФРАЗЕОЛОГИЗМ С КОМПОНЕНТОМ «РУКА»

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Аннотация. В статье рассмотрены фразеологизмы с компонентом *рука* на примере немецкого и русского языков. Как показывает материал, искомые фразеологизмы являются транслятором того, какой объем культурной информации носители языка подразумевают, используя компонент *рука* в устойчивых оборотах языка. *Рука* – взаимопомощь, искренность. *Рука* – жадность человека. Всегда нужно помнить, что оппонент может хотеть большего, чем человек может дать. *Рука* – ценность чего-то близкого, а не чего-то эфемерного и далекого.

Ключевые слова: фразеологизм, компонент *рука*, значение, ассоциация, оценка.

The word hand comes from the Greek word "palm, hand"; "collect, fold"; "a tool for collecting, piling up." [1]. The noun “hand” has existed in Russian since the 11th century. Formed from the common Slavic "roka", semantically related to the specified Greek word [1]. At first glance, the hand is an ordinary human upper limb, which we unconsciously use in everyday life. But in fact, it can carry different meanings in different languages. There are a number of phraseological units where it appears.

Russian and German languages have much in common, but at the same time they also have their own individual characteristics. One of these features is the meaning of the hand in each of the languages. In both languages, ru-ka has a significant meaning and occupies an important place in various phraseological phrases.

Phraseologisms are an integral part of any language and culture of the people. The study of phraseological units helps to understand and learn the history and culture of the people. All stable phrases that have been used by the people for a long time are saturated with national and cultural elements encoded inside them. Therefore, the study of phraseology is not only the assembly of lexical information, but also immersion in the mental space of a particular people.

There are many phraseological units where the hand is an essential part of phraseological turnover. For example, in Russian one can single out such phraseological units as "grab by the throat", "give a hand", "twist your hands", "roll up your sleeves" and many others. And in German, the phraseological phrase "die Hände in den Schoß legen" (literally translated as "put hands on the bosom") denotes inaction and passivity, and "Hand aufs Herz" (hand on heart) is a request to say the truth.

Thus, the study of phraseological units allows not only to expand the vocabulary, but also to better understand the culture and mentality of the people. Each nation has its own unique phraseological turns that express its views on life and everyday situations.

Russian PU Better a tit in the hands than a crane in the sky [2], as well as the German PU Lieber den Spatz in der Hand als die Taube auf dem Dach (literally: it is better to hold a sparrow in your hand than a dove on the roof) [2] carry the same meaning. It is worth appreciating the little that a person can get here and now, rather than waiting and hoping for something unattainable. The stable expression was first used in Rome. Later it appeared in many languages of the world. However, unlike the same judgment, the words that each of the peoples use to convey thoughts are different.

In Russian, a tit, and in German, a sparrow. These birds were not accidentally used by each of the peoples. The tit is the bird of God, the Slavs believed. She brings good luck. Various signs were associated with her. For example, in the Voronezh, Novgorod and Belgorod provinces, they believed that if a tit bangs its beak on the window, then expect bad news. However, in the Arkhangelsk, Saratov and Smolensk regions, this meant good news.

In the course of studying this phraseological unit, one can notice that the peoples of Russia and Germany use different birds to convey this idea. However, both birds are of significant importance for the peoples of their countries.

In Germany, the sparrow has traditionally been considered a symbol of good luck and justice. He was inseparable from medieval German culture and rituals. For example, in German fairy tales, sparrows act as protectors of their heroes, helping to overcome difficulties and overcome obstacles. Nowadays, sparrows also play an important role in the conservation of the ecosystem and biodiversity.

In Russia, the titmouse has a long history in folk culture and beliefs. The tit is associated with many symbols, including those of the Divine and life. In the old days, she was painted on houses so that she would protect her from troubles and misfortunes. It was believed that if a titmouse makes a nest at the entrance to the house, then this speaks of well-being and happiness in the family.

People followed the behavior of birds. If the birds gathered in flocks near the houses, then the winter will be cold and frosty. If they whistle loudly, then the weather in winter will be sunny and clear, and if they gather at the feeders, then there will be heavy snowfalls and snowstorms. It is also worth noting that in German there are idioms Besser ein Vogel in der Hand als zehn am Strand (lit.: Better a bird in the hand than ten on the beach) [3], Besser ein Sperling in der Hand als ein Kranich auf dem Dach (lit.: Better a sparrow in the hand than a crane on the roof) [3]. In German, as well as in Russian, you can find a combination of a small bird and a crane. The tit and the sparrow are special birds for a certain people, but the crane is a good sign for many nationalities. It is worth noting that the tit and the sparrow live next to people. A person, if he wishes, can reach them. However, a crane and a dove fly in the sky at a height inaccessible to people and not everyone can touch them.

Russian phraseological unit Do not put your finger in your mouth - it will bite off your whole hand [3] and German phraseological unit Gibt du dem Narren einen Finger, so will er die ganze Hand ha-ben (lit.: if you give a fool a finger, he will want to have the whole hand) [3]. And in German and Russian, set expressions are similar. They have the same meaning. It's about a greedy person. You cannot give your finger to anyone, because the whole hand may be in danger. FE arose thanks to the groom. Initially it was a warning to him. All grooms know to be careful when putting a bit in a horse's mouth. After all, not every horse can be flexible. The groom must be very dexterous and prudent, because there have been cases when horses have bitten their owners. If the groom puts his finger in the horse's mouth, this is the highest degree of trust between them. It is worth noting that the German language uses a person who can perform an action – a person, unlike Russian. Thus, Russian and German phraseological units have the same meaning, which should not be trusted to a person, because he may require more.

The Russian The hand washes the hand and both whites live [4] and the German PU Eine Hand wäscht die andere (literally: one hand washes the other) [4]. Set expressions come from the Latin PU Manus manum lavat (lit.: hand washes hand) [4]. Denotes mutual assistance, which is beneficial to both parties. A stable expression can be seen in the dialogue "Axioch" of the philosopher Plato, in the Roman writer Petronius in "Satiric-con", and also in Seneca in the satirical work "Pumpkin". The meaning of this phraseological unit can be explained by the action - washing hands. We often use two hands in our daily activities. They help each other. In phraseology, people are compared with hands. It is worth noting that all people are the same and sometimes you need the help of another person to accomplish any goals. Since both parties want to remain in an advantageous position, they come to a compromise and help each other. Thus, the Russian phraseological unit denotes the mutual assistance of people with favorable conditions for both parties.

The meaning of harming or turning away from a benefactor can be seen in the Russian Do not bite the hand that feeds you [5] and the German PU Man beißt nicht die Hand, die einen füttert (literally: do not bite the hand that feeds you) [5]. For the first time, a set expression was used in 600 BC by a storyteller who lived in Greece. The idiom is illustrated in one of Aesop's fables, The Gardener and His Dog. The gardener's dog, frolicking on the edge of the well in the garden, accidentally fell.

The gardener ran to help him, but when he tried to help him, the dog bit him on the arm. The man, annoyed at being bitten, considered it an ungrateful behavior towards him. After all, his only goal was to save the dog's life. He got up and left, leaving the dog to drown [5]. The idea of this fable shows a situation with the help of which one can clearly understand the essence of a phraseological unit. It is also worth noting that Russian and German phraseological units carry the same idea, because they originated from the same Greek phraseological unit.

Russian Hand on heart [6] and German phraseological unit Hand aufs Herz (literally: Hand on heart) [6]. Phraseological units carry the idea of sincerity and frankness. It is worth noting that the meaning comes from the gesture of placing the hand on the chest, in the area where the heart is located. Both peoples used this gesture when bowing to greet the interlocutor, as well as to show the authenticity of their words. A hand placed on the chest points to our heart, and this action was considered a symbol of honesty and fidelity to one's words.

In Russian and German, phraseological units have the same meaning and are used in situations where a person is confident in his words and wants to emphasize his sincerity. For example, "I can honestly say that this is true" or "hand aufs Herz, ich habe das nicht gemacht" – "in all honesty, I did not do this."

However, it is worth noting that different cultures may have their own unique context for the use of a gesture and, accordingly, phraseological units. For example, in church, when worshiping, the hand is applied not only to the heart, but also to the crossed arms on the chest, which can also be a symbol of sincerity and devotion.

In addition, the hand, as a symbol of sincerity and fidelity, has a strong cultural significance in various societies. The hand extended for help symbolizes kindness and mutual assistance. At the same time, hand clutching banknotes can be a symbol of greed and selfishness.

Having studied these phraseological units, we can come to the conclusion that in the German and Russian people the lexeme hand is used in different meanings, for example: mutual assistance, sincerity, greed, and also causing harm to a person. It is worth noting that, comparing these phraseological units, one can notice that the Russian and German peoples think the same way. This is not accidental, because many phraseological units with the hand component were first used by the German and Russian peoples, and also based on legends, tales, and even customs, which were subsequently distributed throughout the world. The hand is the upper limb of a person. We do a lot of things with it: we eat, drink, and also move things. Man cannot live without hands. After all, they perform many functions to meet our needs.

Undoubtedly, the hand is of great importance in culture and society. Many arts and crafts are directly related to the work of the hands. For example, painters,

sculptors, musicians, jewelers, seamstresses and many other professions require excellent motor and hand skills.

Moreover, the hand has become a symbol of many social movements and protests. For example, the raised hand has become a universal sign of solidarity and protest against violence and dictatorship. Also, hand-related gestures such as "hand to hand" or "hand to heart" symbolize unity, harmony and love.

It is important to note that different cultures may have their own unique symbolic meaning and related phraseological units. For example, in the culture of East Asia, various hand gestures and symbols are common, which have their own symbolic meaning.

In general, the hand is an incredibly important and multifunctional human organ that plays a huge role in the life and culture of mankind. The study of linguistic and cultural features of the use of phraseological units with the participation of the hand helps to better understand the mentality and values of different cultures, as well as expand your horizons and general cultural erudition.

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GLOBAL TRENDS IN RENEWABLE ENERGY

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Abstract. This article describes trends in areas of renewable energy such as solar energy, hydropower, wind power, and bioenergy, and also draws attention to robotics and the use of green hydrogen.

Keywords: renewable energy, solar power, hydropower, wind power, bioenergy, robotics, green hydrogen.

МИРОВЫЕ ТЕНДЕНЦИИ В ОБЛАСТИ ВОЗОБНОВЛЯЕМОЙ ЭНЕРГИИ

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Аннотация. В данной статье приведены тенденции в таких областях возобновляемой энергии, как солнечная энергетика, гидроэнергетика, ветроэнергетика, биоэнергетика, а также робототехника и использование зеленого водорода.

Ключевые слова: возобновляемая энергия, солнечная энергетика, гидроэнергетика, ветроэнергетика, биоэнергетика, роботизация, зеленый водород.

A global trend today is the world's attempt to switch to clean energy. This affects the creation of new developments in the field of renewable energy. It is the following factors that support this trend: reducing waste, reducing energy costs and, of course, improving the ecological condition of the planet.

The use of photovoltaics (technology for converting solar energy into electricity) has been widespread for the last 10 years and will probably become one of the world's main sources of electricity. The following trends are influencing the efficiency of this technology in solar panels:

– The integration of photovoltaic systems into all aspects of the environment, reducing the need for additional land area;

– development of thin-film cells to make solar panels more flexible, economical and environmentally friendly;
– use of perovskite in photovoltaic materials, which multiplies the efficiency of energy processing;
– Innovative technologies for concentrating solar energy through lenses and mirrors.

For example, the first commercial technology using perovskite elements was a building with photovoltaic louvers that regulate the heat balance in the room, which reduces the cost of air conditioning and heating. Perovskite elements are a group of minerals that include compounds of calcium, titanium, and other elements. They are also referred to as semiconductor quantum dots, which are nanoparticles of semiconductor material with unique optical and electronic properties. Their size usually ranges from a few to several tens of nanometers. The automation system interacts the perovskite modules with a weather station installed on the roof, which allows them to automatically change their position depending on the course of the sun. An interesting addition is the louvers' generation of clean energy from the sun [1].



Figure 1. Building with photovoltaic blinds [1]

Perovskite elements show great potential in biomedical technology because of their unique optical properties. They can be used in a variety of applications, including imaging, diagnostics, and therapeutics. One specific example of the use of perovskite elements in biomedicine is cell labeling and tracking.

Quantum dots can be functionalized to form nanoparticles, which can then be attached to or embedded in cell surfaces. These nanoparticles have unique optical properties, such as high luminescence brightness and a wide absorption and emission spectrum. When tagging cells, their optical properties can be used to visualize and track cell movement in real time. This can be useful in studies of cell migration, cell interactions and many other biological processes.

In addition, perovskite elements can also be used in imaging in living tissues. They can serve as light probes to create high-contrast and high-resolution images of biological structures and processes. This can be useful for diagnostics of various diseases and research of tissue architecture.

The use of perovskite elements in biomedical technology has great potential and continues to be actively explored. They have several advantages, such as high brightness and stability of luminescence, possibility of multiplex labeling (simultaneous use of several different perovskite elements) and good biocompatibility.

Turning to the energy derived from the movement of water (hydropower), it should be noted that innovations in this area are aimed at developing energy converters and modifying components to increase the quantitative collection of energy.

The main trend is the development of modular wave energy converters, which are placed on the surface of the water and connected to generators at the bottom of the water. The waves provide the converters with energy, and the switchgear allows it to be converted into electricity, which is then used in the grid. This solution is able to provide offshore companies and coastal settlements or cities with the possibility of generating wave motion energy as an alternative.

The Green Energy Development (GED) Company has found a way to introduce electrification in underdeveloped areas by placing a floating drum microturbine in canals and rivers, the rotation of which generates electricity as a result of the flow. In addition, this technology can promote ecotourism and the preservation of nature, as it does not have a negative impact on the environment [2].

The main trends in wind energy are focused on the development of offshore and airborne wind turbines. Often technologies in this area are combined with other energy sources. Blade designs are improving all the time to increase efficiency, but the main problem in this industry is the environmental friendliness of the material of the blades. That's why many companies have turned their attention to bladeless technology or to thermoplastic materials for blade production.



Figure 2. Wind power plants [3]

For example, Helicoid has taken up the challenge of increasing the "longevity" of blades: changes in the stacking and rotation of fiber sheets that form a helicoidal structure improve the quality of the blades, increasing their resistance to impact, erosion, as well as their strength and stiffness. A helicoidal structure is a structure that has the appearance of a spiral or screw, formed by repeating turns or spirals.

One of the most interesting innovations in bioenergy is the production of bio-oil from algae using synthetic biology. Genetically engineered algae release oil into the environment cyclically, as the same batch is reused, which accelerates and lowers the cost of the process, because algae only need air, water and sunlight to grow. The environmental advantage of this technology is that it "closes the loop" between greenhouse gas emissions and fuel production from bio-oil [4].

Green hydrogen is becoming very popular today. It has a high energy density and produces almost zero greenhouse gas emissions. The main trends in the development of this sphere are aimed at improving the storage, transportation and distribution of hydrogen.

The Australian company Lavo manufactures hydrogen fuel cells, which are stored in a patented system – a metal hydride storage tank; it also contains a lithium-ion battery, which operates in a wide temperature range, for fast response. This system allows businesses to continuously store energy for days at a time.

The most popular trend in the direction of using green hydrogen is the development of environmentally friendly cars based on it. Hydrogen is used to charge fuel cell cars in a home fueling station by adding fuel filler to green hydrogen storage tanks, similar to the above [2].



Figure 3. Hydrogen Vehicle Refueling Station in Japan [5]

Combined Heat and Power (CHP) is another modern and promising technology in bioenergy. It is based on the efficient use of thermal energy that is usually lost in electricity generation. In a CHP system, biomass such as sawdust, agricultural residues or energy crops are burned or biochemically decomposed to produce heat and electricity simultaneously. The heat energy produced is used for space heating, hot water supply or process heat generation in various industrial processes, and the electricity generated can be used to power electrical appliances and networks.

The advantage of the CHP system is that it allows a more efficient use of available energy, since heat and electricity are produced simultaneously, which reduces losses and increases useful energy. In addition, the use of biomass in the CHP system helps to reduce greenhouse gas emissions and reduce dependence on fossil fuels, making this technology environmentally and economically attractive.

An interesting and important technology in the field of robotization is the development of autonomous robots for cleaning solar panels. They use an ultra-soft microfiber cloth to remove dust and debris – this allows cleaning without the use of water. Centralized control facilitates preventive maintenance and automatic charging of the robot. Management and control of the robot is possible remotely.

One example of the use of modern technology in the field of robotics and clean energy is the development of autonomous solar robots for agriculture.

Traditional agricultural methods can be resource-intensive and have a negative impact on the environment. However, with autonomous solar-powered robots, a more efficient and environmentally sustainable approach can be achieved. Autonomous solar robots can be used for various tasks in agriculture, such as planting seeds, watering, fertilizing and harvesting. These robots are equipped with sensors, cameras, and computer vision algorithms that allow them to determine optimal paths and make decisions based on the collected data. Solar panels mounted on the robots allow them to generate electricity from solar radiation, which provides them with energy to run throughout the day. Excess energy can be stored in batteries to be used at night or during periods of lack of sunlight.

This approach to off-grid farming has several advantages. First, it can reduce the use of traditional fuel resources, such as gasoline or diesel, and reduce emissions. Second, it can improve efficiency and increase yields through precise control and optimization of processes. This innovative solution helps to combine process automation with sustainability and care for the environment.

To summarize, it should be noted that in the near future the use of renewable energy sources will be funded and developed, which will have a positive impact on the environment around the world.

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THE EVOLUTIONARY DEVELOPMENT OF CHATBOT TECHNOLOGY IN EDUCATION

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Abstract. The chatbot technology has come a long way since the first simple chatbots that could only answer a few predefined questions to the modern multifunctional assistants equipped with machine learning and artificial intelligence. This article discusses the types of chatbots in the educational process, their functions, advantages, and disadvantages. The ways of applying chatbots in education to improve the quality of students' learning are also presented. The functionality of chatbots is expected to expand with each passing year.

Keywords: chatbot, virtual interlocutor, conversational program, educational process, education, artificial intelligence, machine learning.

ЭВОЛЮЦИОННОЕ РАЗВИТИЕ ТЕХНОЛОГИИ ЧАТ-БОТОВ В ОБРАЗОВАНИИ

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Аннотация. Технология чат-ботов прошла значительный путь развития, начиная от первых простых чат-ботов, которые могли только отвечать на несколько заданных вопросов, до современных многофункциональных ассистентов, обладающих машинным обучением и искусственным интеллектом. В данной статье были рассмотрены типы чат-ботов в образовательном процессе, их функции, преимущества и недостатки. Также описаны способы применения чат-ботов в образовании для повышения качества обучения учащихся. Возможности функционала чат-ботов будут расширяться с каждым годом.

Ключевые слова: чат-бот, виртуальный собеседник, программа-собеседник, образовательный процесс, образование, искусственный интеллект, машинное обучение.

Chatbots in education are a relatively new phenomenon. Currently, they significantly improve the learning process and ease the workload of teachers. This is achieved through the automation of routine tasks such as answering frequently asked questions, grading test results, and providing class schedules.

Chatbots, also known as virtual interlocutoror or programs-interlocutoror, are designed to interact with humans through a dialogue interface [1]. They are used for automated message processing, providing answers to user questions, performing tasks, and delivering information. Depending on specific requirements, chatbots can be based on predefined algorithms or utilize artificial intelligence and machine learning to process messages and provide responses.

Initially, chatbots were primarily used for handling incoming requests and customer service.

The history of chatbots dates back to 1950 when Alan Turing proposed the famous "Turing Test," which measures a computer's ability to simulate human thinking. The essence of this test is that an expert asks questions to both the computer and a human without knowing with whom they are communicating. If the expert cannot definitively determine which one is the computer, then the computer is considered to have passed the Turing Test.

In 1966, American scientist Joseph Weizenbaum created the first chatbot called "ELIZA." This chatbot employed simple natural language processing rules to simulate conversations with a psychologist. ELIZA used templates that identified key words in user messages and generated responses based on that information (Figure 1) [2]. Users of this chatbot began anthropomorphizing it, meaning that test participants could perceive ELIZA as a "conversational partner" and display human-like emotions towards it.

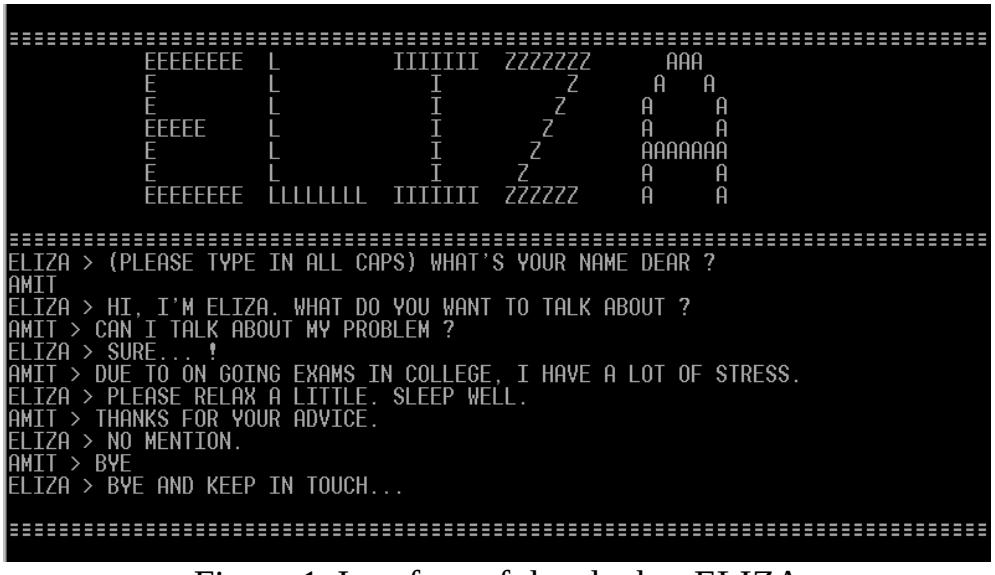


Figure 1. Interface of the chatbot ELIZA

The chatbot PARRY was developed in 1972 by programmer Kenneth Colby. This virtual interlocutoror represents a chatbot that employs the opposite strategy of the ELIZA chatbot. It simulates a paranoid schizophrenic individual capable of engaging in conversation, answering questions, asking its own questions, provoking

debate, and compelling the interlocutor to provide thorough responses to the posed questions.

PARRY was used as a training tool for young professionals in the field of psychiatry to help them understand how schizophrenic individuals might react in various situations and how to engage in dialogue with them. Colby's goal was to provide a communication practice tool for psychiatrists and psychologists to interact with paranoid patients and gain a deeper understanding of the disorder [3].

In 1988, the chatbot JABBERWACKY was created by British programmer Rollo Carpenter. This virtual interlocutoror was one of the first chatbots capable of learning from users, making it unique for its time. Instead of being rigidly programmed with answers to specific questions, the bot could analyze incoming data and generate responses based on the context and user's mood. This learning capability allowed the bot to better adapt to different languages and user moods.

Currently, JABBERWACKY remains one of the first chatbots that demonstrated machines can communicate with humans on a more flexible and natural level. It gained popularity for its ability to "find common ground" with users, as well as its capacity for humor and mood variation (Figure 2) [4].



Figure 2. Interface of the chatbot JABBERWACKY

A.L.I.C.E. (Artificial Linguistic Internet Computer Entity) was one of the first chatbots developed for natural language communication with humans in 1995. It used AIML (Artificial Intelligence Markup Language), a specialized markup language for artificial intelligence, to structure its knowledge base and understand user queries. A.L.I.C.E.'s learning model is known as supervised learning, which means that the

bot's owner could track conversations, make corrections, and add new categories to improve the bot's performance. This allowed A.L.I.C.E. to learn quickly and enhance its responses. The dialogue of A.L.I.C.E. was based on algorithms that automatically detected patterns within the embedded conversational data. The bot utilized these patterns to determine the best response to a user's question or query (Figure 3) [5].

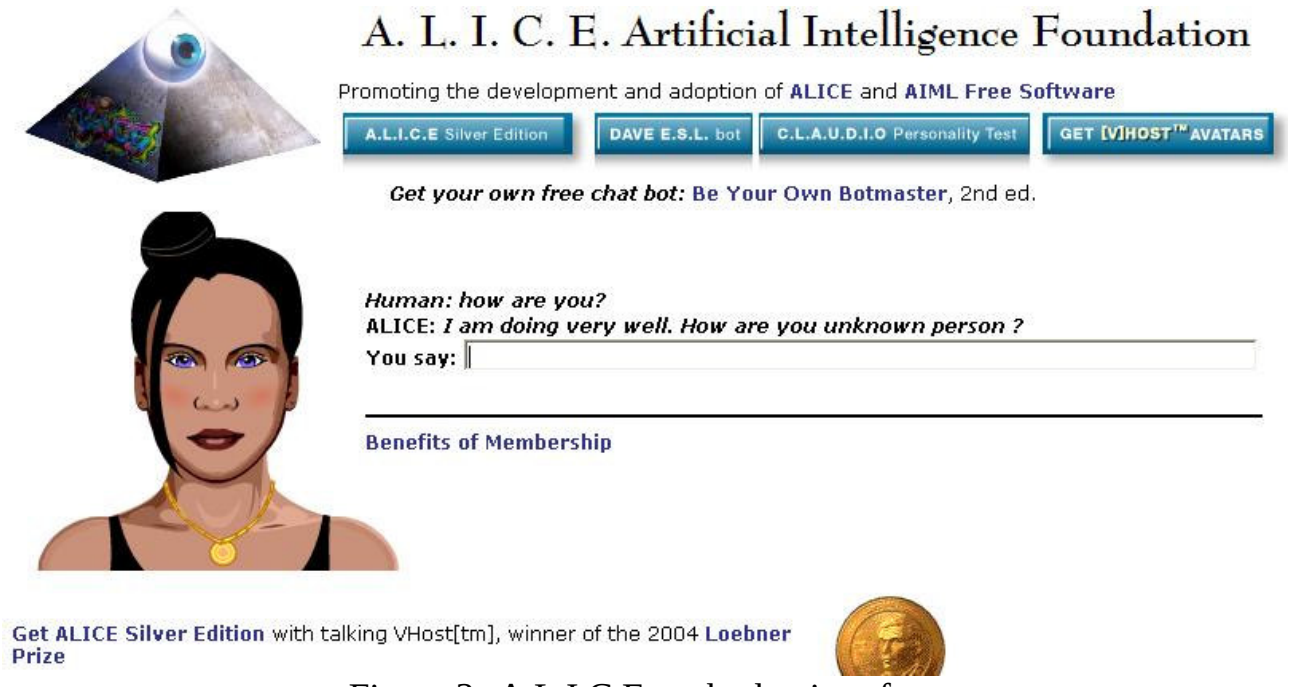


Figure 3. A.L.I.C.E. web-chat interface

In the 2000s, chatbots became more accessible for development thanks to the advancement and availability of open APIs (Application Programming Interfaces) and development platforms such as Pandorabots and Chatfuel. This led to a rapid growth in the chatbot market and the emergence of new types of chatbots, including business chatbots and educational chatbots.

One of the most well-known chatbots of this period was Siri, developed by Apple in 2011. Siri was the first mass-market chatbot with speech recognition and voice command capabilities. It could answer user questions, perform various tasks, and even recommend music.

In 2015, Microsoft introduced Cortana, a chatbot designed to be a virtual assistant. Cortana can assist users with tasks such as reminders, internet searches, calendar management, and more.

Google Assistant, developed by Google, was released in 2016. It is an intelligent chatbot that can help users with tasks such as managing smart home devices, finding local businesses, setting reminders, and many other functions.

In 2017, Yandex, a Russian company, developed a chatbot named Alice. It utilizes artificial intelligence technologies to understand natural language and engage in more human-like conversations. Alice is also a virtual assistant capable of assisting users with various tasks, such as internet searches, ticket purchases, food ordering, weather forecasts, and more.

ChatGPT is one of the most advanced language models that employs generative AI technology to simulate natural conversations and generate text. It was developed by OpenAI in 2020 and is based on transformer technology. ChatGPT can be used to create other chatbots that can engage in conversations with humans on various topics, answer questions, process requests, and even write program code. It can also be utilized for automated chat responses, text analysis, content generation, and many other applications.

Chatbots have come a long way since their inception in the 1960s (Figure 4). They started as simple programs that could only respond to specific questions but have evolved over time to become increasingly sophisticated and capable of performing various tasks using artificial intelligence.

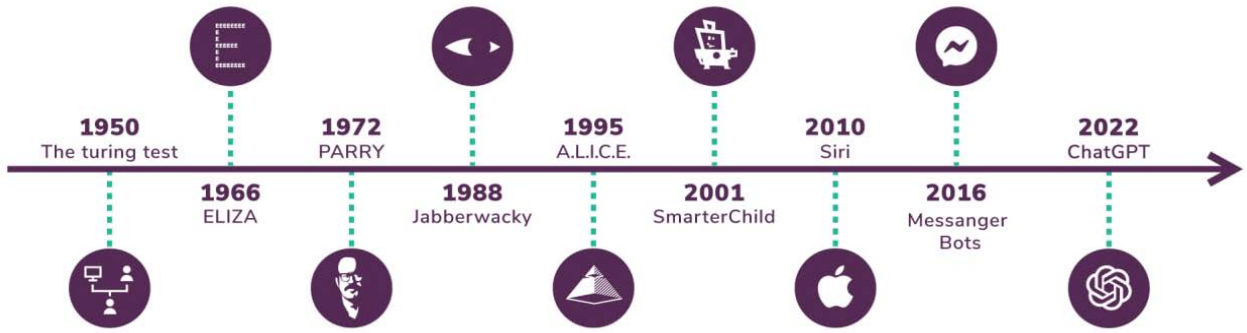


Figure 4. The evolution of chatbots

With the advancement of technology, the functionality of chatbots has become more extensive. Now chatbots are used in various fields, including education (Table 1).

Table 1 – Possible areas of application for chatbots

Application Area	**Possible Functions**
Commerce	Order processing, customer consultations, order status notifications
Medicine	Health support and treatment recommendations, providing information about medical services
Banking	Processing payments, balances, and transactions, account status notifications, customer consultations
Technical support	Assistance in solving technical issues, user training and consultations
Education	Student training and consultations, support in choosing educational programs and problem-solving
Travel	Hotel and ticket booking, providing information about attractions and transportation, assistance in itinerary planning
Entertainment	Games, chat for communication and networking, providing recommendations for movies, music, and other forms of entertainment

Government services	Application and document submission, notifications on the status of application and document processing
Customer service	Customer support and problem-solving, providing information about products and services, consultations
Logistics	Cargo and transportation tracking, delivery status notifications

The general architecture of a chatbot can be represented by the following blocks (Figure 5):

- Server selection (platform): A server (platform) is chosen to interact with users.
- Creation of channels/pools: Channels/pools are created for message transmission.
- Server communication: Channels/pools are connected to the server, where instructions for performing specific actions are stored.
- Action execution: The bot performs the actions specified by the user.
- Feedback: After executing actions, the bot provides feedback to the user.

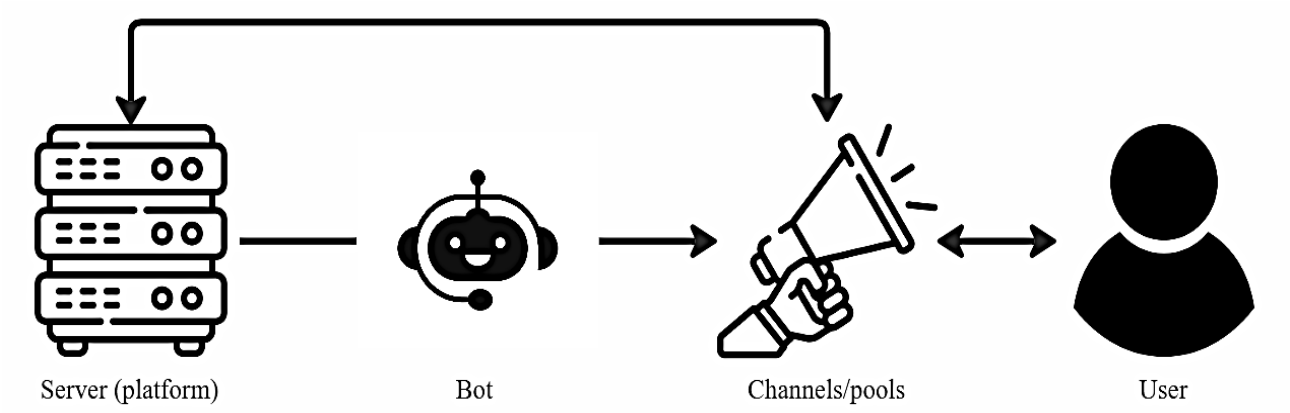


Figure 5. The general architecture of a chatbot

The use of chatbots in the field of education started a bit later than in other areas but has gained significant momentum and interest among educational institutions. The active implementation of chatbots in Russian universities began in recent years.

Two main types of chatbots in education can be distinguished [6]:

- rule-based chatbots, where the user inputs a set of rules (Figure 6);
- machine learning-based chatbots (Figure 7).

The first type involves predefined rules and templates that determine how the bot should respond to specific user queries or questions. Such chatbots do not have the ability to self-learn and do not consider context, which limits their functionality and accuracy of responses.

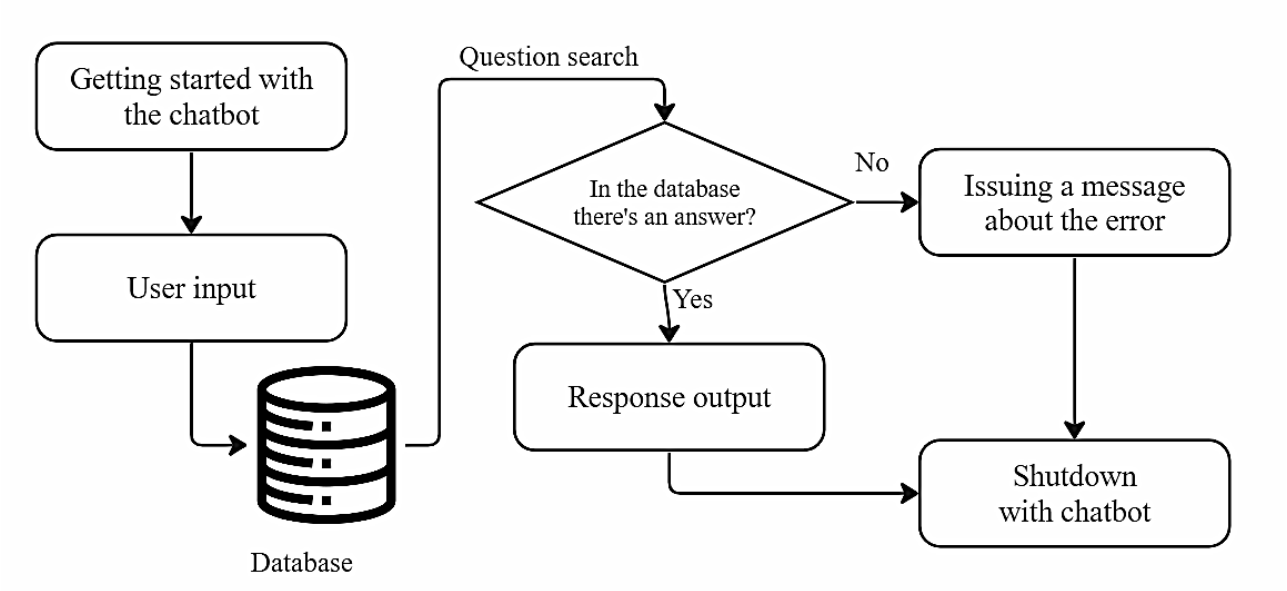


Figure 6. Scheme of a chatbot-based on sets of rules

The other type of chatbot utilizes machine learning algorithms to analyze and interpret incoming queries and build context. These bots can learn based on the history of interactions with users, adjust their responses, and clarify information to provide more accurate and helpful answers. They can also recognize natural language and have the ability to autonomously improve their performance through feedback and direct interaction with users [7].

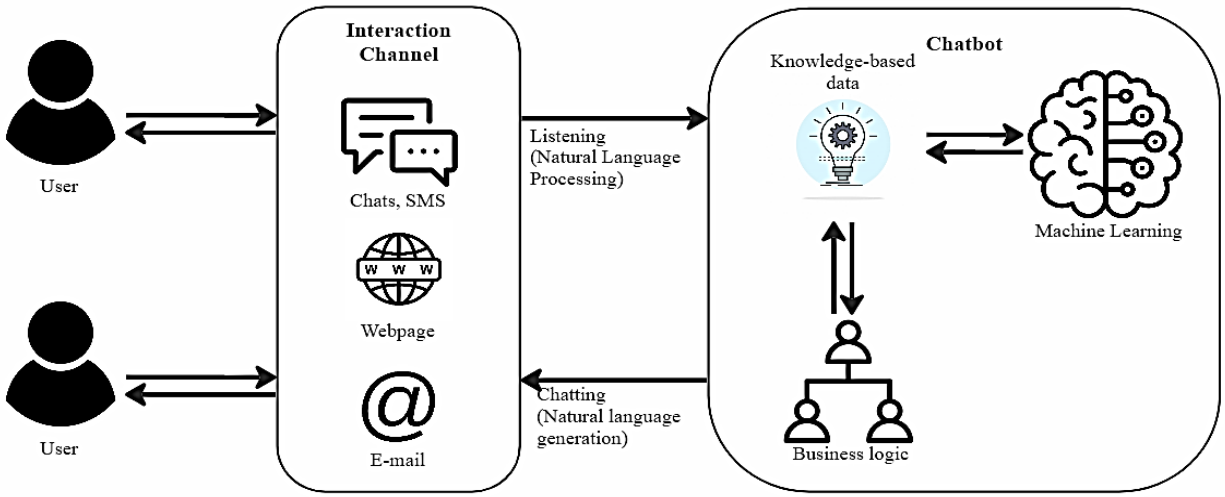


Figure 7. Scheme of a chatbot-based on the principles of machine learning

Currently, chatbots are being used in various universities in Russia and abroad. They help students quickly obtain necessary information about class schedules, exams, grades, research opportunities, and also facilitate communication between teachers and students.

Today, chatbots in universities are used for various purposes, such as:

– Providing information about class schedules and exams.
– Answering frequently asked questions (FAQs).
– Evaluating teaching quality and collecting feedback from students.

– Automating admission processes and scholarship distribution.
– Monitoring and analyzing student activity in distance learning systems, among others

By using chatbots in universities, the interaction between students and teachers is improved, decision-making processes are accelerated, the quality of education is enhanced, and costs related to personnel and resources are reduced.

Chatbots have had a significant impact on educational processes in universities. As a result of their implementation, a wide range of changes has occurred, including:

– Improved accessibility of information: Virtual assistants allow students to receive answers to their questions anytime and from anywhere. This significantly simplifies the process of obtaining information and enables students to quickly address issues they encounter.

– Optimization of the learning process: Chatbots can provide personalized approaches to learning. They can adapt materials and assignments according to each student's level of knowledge and individual needs, thus enhancing the effectiveness of learning.

– Reduced workload for teachers: Chatbot programs can answer many student questions, allowing teachers to focus on more complex tasks and questions that require individual attention.

– Decreased time spent on administrative tasks: Chatbots can automate various administrative tasks, such as checking the availability of required documents and student information, reducing the time spent on these tasks.

– Increased student satisfaction: Improved accessibility of information, optimization of the learning process, and reduced workload for teachers contribute to students feeling more confident and satisfied with their educational achievements. This can lead to an enhanced reputation for the university and attract more students.

Every chatbot has its advantages and disadvantages (Table 2).

Table 2 – Advantages and disadvantages of chatbots in education

Advantages	**Disadvantages**
24/7 accessibility	Limited capabilities
Automation	Limited ability for analysis
Interactivity	Insufficient accuracy
Insufficient	Limited confidentiality
Personalization	Limited quality control
Time and resource savings	Inability to consider context
Feedback	Limited potential for skill development
Availability in multiple languages	Ineffectiveness in teaching complex subjects
Increased motivation	Insufficient flexibility
Wide coverage	

One specific example of using a chatbot in a university is the "Schedule Assistant of Siberian State Industrial University" chatbot, developed by students of

Siberian State Industrial University (SibSIU). This chatbot is designed for the convenience of students and university professors, providing them with up-to-date class schedules (Figure 8).

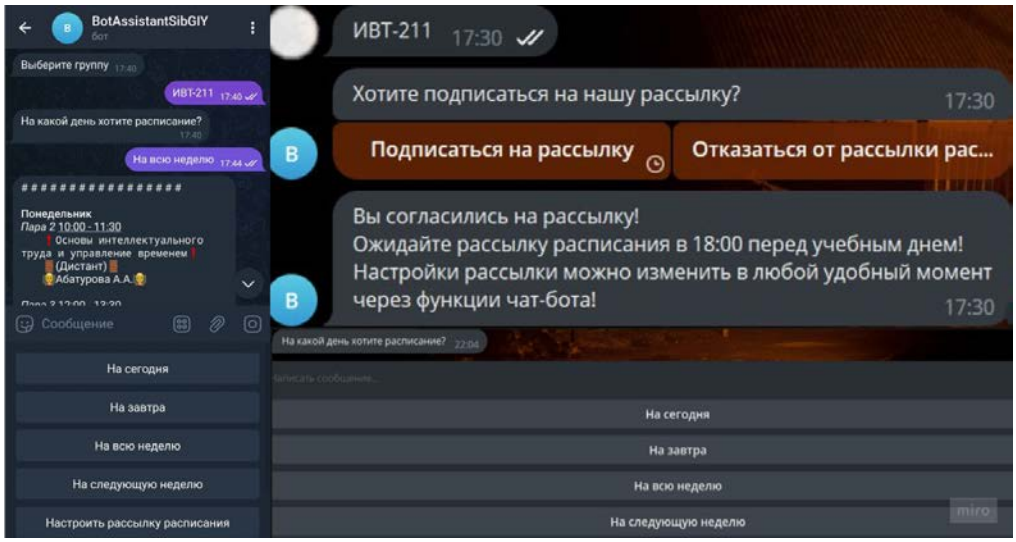


Figure 8. Telegram chatbot Schedule Assistant SibSIU

The Schedule Assistant of Siberian State Industrial University is integrated with the Telegram messenger, allowing students to receive real-time notifications about their schedule and any changes to it. Currently, this chatbot can provide class schedules. The concept of image recognition, proposed by the students, will be implemented in the future.

Image recognition is one of the ways chatbots can be used in education. With the help of computer vision algorithms and artificial intelligence, such chatbots are capable of recognizing objects, texts, and other elements in photographs. This method can be useful for educational purposes.

Examples of using image recognition in education through chatbots include:

- Text recognition on a whiteboard or screen.
- Object recognition in images.
- Facial recognition.
- Molecule structure recognition.
- QR-code recognition.

It should be noted that the accuracy of recognition may depend on the quality of the photograph and the technology used.

The integration of chatbots into educational processes in universities has had a significant impact on improving student learning. They help simplify access to information and make it more interactive and engaging.

Chatbots in education have emerged relatively recently, but they have come a long way in their development. The earliest education chatbots were based on simple rules and templates, providing basic answers to common questions and tasks. With the advancement of machine learning technologies, education chatbots have become more sophisticated and intelligent. They can learn from large volumes of data and autonomously improve their responses and algorithms.

When natural language processing technologies emerged, chatbots became capable of understanding and generating natural language. This allows them to engage in more complex dialogues and ask more precise questions. More recently, education chatbots have started using image recognition technologies, enabling them to analyze photos and videos and provide more accurate answers based on this data.

Currently, social networks and educational communities are actively developing, and chatbots can be used for social learning. They can provide access to educational materials, conduct interactive courses and assignments, and facilitate collaborative learning and communication between students and teachers.

In conclusion, chatbots in education have come a long way in their development and have become smarter, more flexible, and more efficient in their use, taking the educational process to a new level. The progress of chatbots continues, and each year their capabilities and functionality will expand, accompanied by the emergence of new technologies and approaches to improve the quality of education.

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REDUCING EMPLOYEE TURNOVER IN TODAY'S IT COMPANY

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Abstract. The paper considers the principles of application of correlation analysis of data on the real case of a large Russian IT company. Ways to reduce staff turnover and increase employee satisfaction are considered.

Keywords: turnover, data, correlation analysis, duplicates, omissions.

УМЕНЬШЕНИЕ ТЕКУЧЕСТИ КАДРОВ В СОВРЕМЕННОЙ IT-КОМПАНИИ

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Аннотация. В работе рассматриваются принципы применения корреляционного анализа данных на настоящем кейсе крупной Российской IT-компании. Рассмотрены способы уменьшения текучести кадров и повышения уровня удовлетворенности сотрудников.

Ключевые слова: «текучка», данные, корреляционный анализ, дубликаты, пропуски.

In recent years, the IT industry has seen high staff turnover, which can have a serious impact on a company's business processes and financial performance. In this regard, the issue of reducing the turnover rate is one of the most relevant and important for IT companies. In the framework of Innoevent-2023 held at the Higher School of Technology and Energy of St. Petersburg State University of Industrial Technologies and Design, OMEGA Company presented a case study of a real working practice of a data analyst, which required to develop measures to reduce employee turnover in the company, based on the survey of current employees.

OMEGA has provided an excel file with a satisfaction survey of various factors for analysis and solution development. (Figure 1). The highlighted names of the columns are loyalty indicators. These are the indicators that must increase in order to reduce turnover [1].

	A	B	C	D	E	F
1	Your age	What branch do you work in?	Please indicate the field of activity in which you work	Length of service with the Company	I assess the Company as the optimal place of work for me	In the next few years I plan to work at the Company
2	28	St. Petersburg	Methodological and analytical activities (all departments)	From one to three years old	Disagree	Disagree
3	44	St. Petersburg	Development, programming (all stacks, all departments)	More than 8 years	Hard to answer.	Rather agree.
4	99	St. Petersburg	Development, programming (all stacks, all departments)	Up to a year	Rather disagree.	Disagree
5	23	St. Petersburg	Development, programming (all stacks, all departments)	From one to three years old	Hard to answer.	Hard to answer.

Figure 1. Part of the database

The analysis was performed using the Python programming language and the built-in Pandas library. The first step is to obtain data and perform preprocessing [2, 3].

Data preprocessing is a large part of the analysis, because without it, results can be highly skewed or inaccurate. The preprocessing for this case study included:

– Filling of gaps. After checking it turned out that gaps are only in categorical data, so we wrote them down with "unknown" values;

– Data correction: The "Your Age" column contained unsuitable values for analysis. Such values should be converted to an integer format. For example, the value "30-60 :)" was converted to "45";

– Getting rid of anomalies. The "Your age" column contained values: 0, 99. Such values are considered outliers, in this case it was decided to get rid of these values;

– Correction of duplicates. Column "Please indicate the field of activity in which you work". Employees indicated the field of activity with capital and small letters, so they need to be reduced to the same type. It can also be argued that the value of "production";

The next stage was exploratory analysis. Its first stage was the development of the encoder function, which translates categorical string values into categorical integer values for subsequent correlation analysis [4, 5]. Thus, the value "Disagree" was recorded as 1, "Rather Disagree" as 2, etc.

A correlation analysis was then performed, showing the correlation between the loyalty indicators and the survey items. As a result, several attributes correlate quite well with the loyalty indicators. Thus, the sign "I get a regular appraisal of my work from my immediate superior" with several of the loyalty signs has correlations coefficients: 0.5; 0.45; 0.51, so this sign can be left for further analysis. Next, 2 more

traits were identified that correlate normally with the traits of loyalty, these traits are: "I think that the salary corresponds to the level of my professionalism and the results of my work" and "The office space disposes to productive work".

The next step was to find the groups with the greatest number of dissatisfied participants on these three grounds.

Figure 2 looks at several departments that have a high percentage of employee dissatisfaction with the employee self-actualization trait. About 10 % of employees in the Methodology and Analysis Department rather disagree that the office space is conducive to productive work, also about 22 % of employees in the Development Department find it difficult to answer.

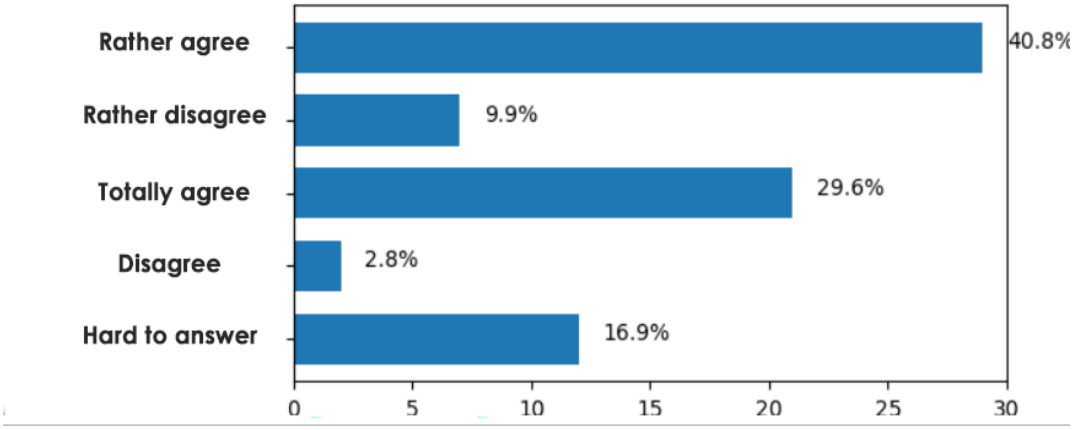


Figure 2. Methodology and Analysis Department

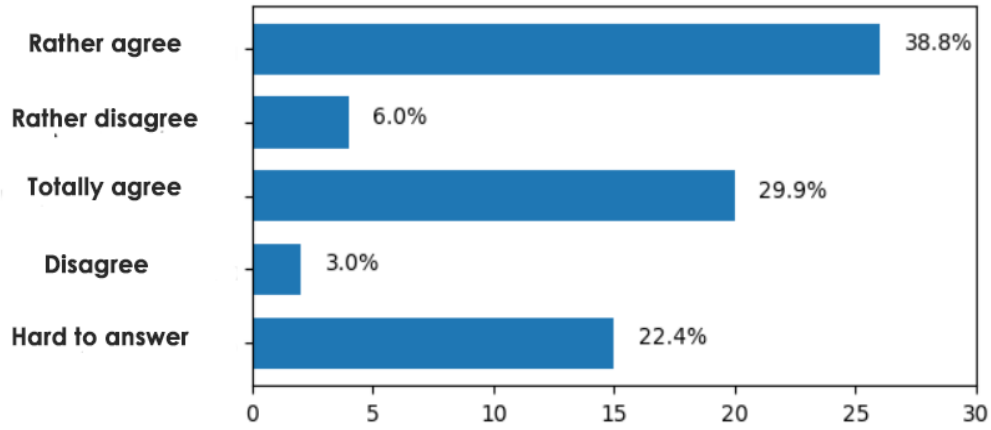


Figure 3. Development Department

Measures can be taken to increase the percentage of satisfaction such as:

– Implementation of Agile methodology Scrum, which solves the problem of insufficient evaluation of employees;

– Formation of teams within the team;

– Creating a backlog, that is, a list of tasks that need to be completed;

– Sprint planning. Sprints are short periods of time (usually 1 to 4 weeks) during which the team works on completing tasks from the backlog;

– Creating an evaluation and monitoring system to manage the process and adjust the strategy;

– Continuous support and leadership: Managers at all levels must actively support and promote the Agile approach. They must demonstrate their commitment to Agile methods, participate in the process, and provide support to teams.

Considering the percentage of satisfaction with the office space by department, we can say that the management department about 20 % of employees disagree and rather disagree. In the methodological and analytical department about 20 % find it difficult to answer, and about 11 % rather disagree.

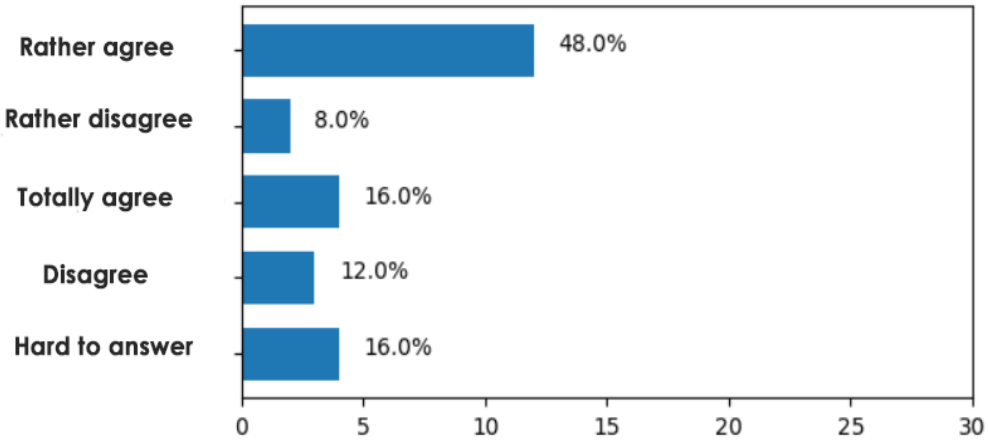


Figure 4. Management department

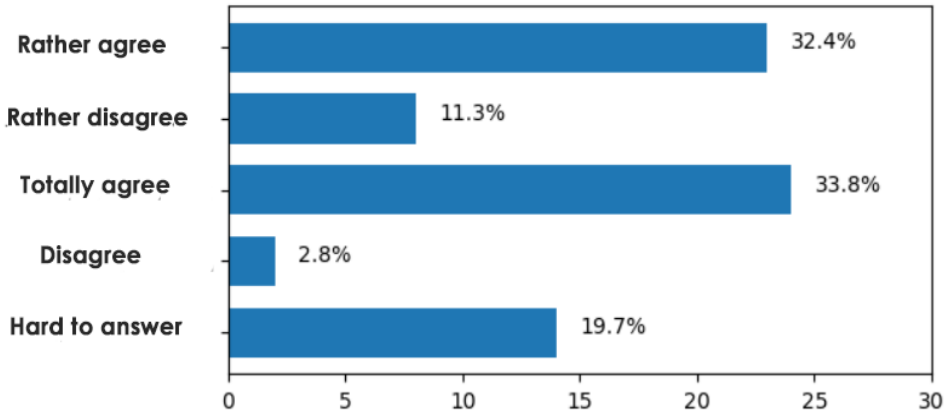


Figure 5. Methodological and analytical department

Several measures can be taken to increase the percentage of satisfaction:

– Create Open Layouts with Collaboration Zones: Create an open layout that promotes communication and collaboration among teams. Organize collaborative work areas where employees can exchange ideas and solve problems together;

– Opening areas for rest and relaxation: You need to provide spaces where employees can rest and recuperate during the work day, such as cafes, play areas, or quiet rooms for meditation and sleep;

– Purchase of ergonomic: provide employees with ergonomic chairs, desks and workstations that reduce the risk of musculoskeletal disorders and increase productivity;

– Green the office: add plants to improve air quality, reduce stress levels, and increase overall employee satisfaction;

– Create natural light and quality artificial light: provide sufficient natural light and quality artificial light.

As a result of the study, problem areas were identified that the company should pay attention to, as well as suggested modern methods of solving them.

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УДК 004.8

UNMANNED CARS

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Abstract. Artificial intelligence is currently used in various fields such as medicine, finance, engineering, transportation, etc. In recent years, artificial intelligence has attracted a lot of attention because of its ability to optimize the automotive industry. One of the most promising applications of artificial intelligence in the automotive industry is the development of unmanned vehicles, also known as autonomous vehicles. This article presents the advantages and disadvantages of such vehicles.

Keywords: artificial intelligence, unmanned cars, automotive industry, intelligent technology, algorithm, reinforcement learning.

БЕСПИЛОТНЫЕ АВТОМОБИЛИ

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Аннотация. В настоящее время искусственный интеллект используется в различных областях, таких как медицина, финансы, машиностроение, транспорт и др. В последние годы искусственный интеллект привлекает большое внимание благодаря возможности оптимизировать автомобильную промышленность. Одним из наиболее перспективных применений искусственного интеллекта в автомобильной промышленности является разработка беспилотных автомобилей, также известных как автономные транспортные средства. В данной статье представлены преимущества и недостатки таких автомобилей.

Ключевые слова: искусственный интеллект, беспилотные автомобили, автомобильная промышленность, интеллектуальные технологии, алгоритм, обучение с подкреплением.

Artificial Intelligence (AI) is a field of computer science that deals with the development of algorithms and computer systems that can perform tasks designed for

human intelligence. This can include such things as speech recognition, text understanding, decision making, and machine learning. Artificial intelligence is used in a variety of fields such as medicine, finance, engineering, transportation, and more.

AI technology is being implemented almost everywhere today. Automation of the functioning of any business, production or trade structure, logistics, educational and medical institutions are all areas of application of artificial intelligence. The effectiveness of AI application is gradually increasing due to the constant increase in memory size and strengthening of neural network internal connections.

At the emergence of AI, it was mainly assumed that it would only have the functions of text translation, object recognition and the meaning of spoken words. But today it is becoming clear that its capabilities are almost limitless. Artificial Intelligence is entering a wide variety of areas of life.

One of the most significant applications of artificial intelligence is in health care. Machine learning algorithms are used to analyze large amounts of medical data, such as patient records and scanned images, to help identify patterns and make accurate diagnoses.

Another area in which artificial intelligence is having an impact - is finance. Machine learning algorithms are used to analyze market data and predict stock prices and other financial indicators.

Intelligent technology is also used in manufacturing and logistics. Robots and other machines equipped with artificial intelligence can be used to automate repetitive tasks and improve efficiency in factories and warehouses

Artificial intelligence is also being used to improve customer service and support. Virtual assistants and chatbots can be used to answer customer inquiries and provide information, freeing employees to perform more complex and creative tasks (Figure 1).

Artificial intelligence has received a lot of attention in recent years because of its potential to optimize the automotive industry. One of the most promising applications of artificial intelligence in the automotive industry is the development of unmanned vehicles, also known as autonomous vehicles.

In recent years, unmanned cars have become an increasingly common phenomenon on the roads. This is due to the fact that autopilots have made it possible to drive more safely and conveniently.

Artificial intelligence (AI) plays a key role in the development of autopilot cars. Self-driving cars rely on advanced artificial intelligence algorithms to navigate and make decisions on the road. These algorithms process data from various sensors, such as cameras, lidar, radar, and ultrasonic sensors, to understand the environment around the car. They then use this information to make decisions about braking, acceleration, and steering (Figure 2).

One of the key challenges in developing unmanned vehicles is ensuring the safety and reliability of the artificial intelligence system. It must be able to handle different driving scenarios, such as traffic jams, construction, and inclement weather, and make the right decisions to avoid accidents. In addition, the AI system must be able to handle extreme cases, such as unexpected objects or behavior, and respond accordingly [1].

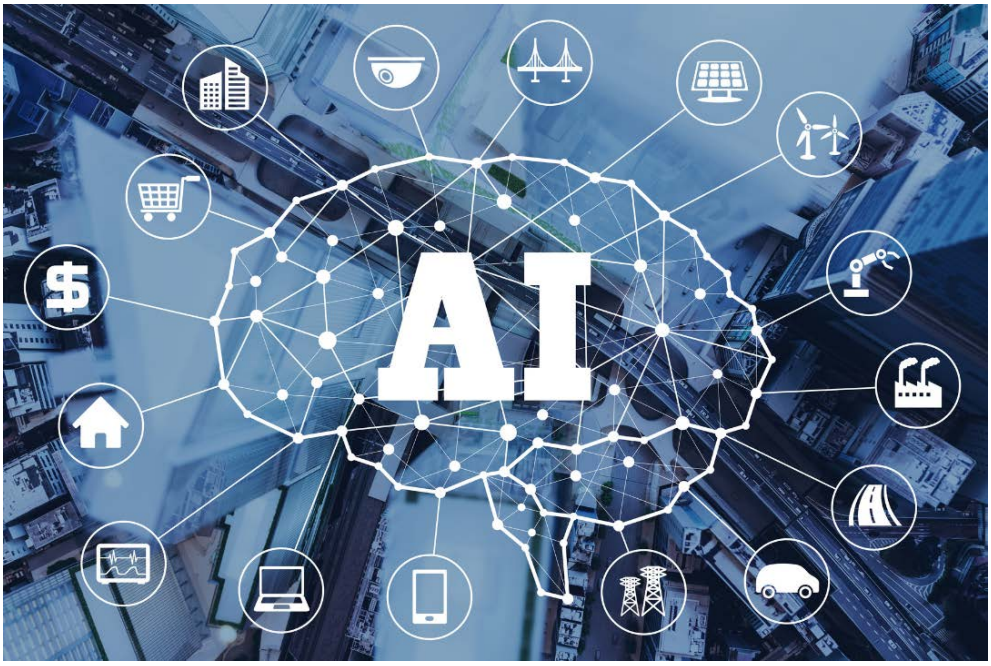


Figure 1. Applications of Artificial Intelligence

To achieve this level of reliability, researchers and engineers use a combination of techniques, including machine learning, computer vision, and control systems. Machine learning algorithms, such as neural networks, are used to process sensor data and predict the environment. Computer vision algorithms are used to understand the environment and detect objects such as other vehicles, pedestrians, and traffic lights. Control systems are used to implement decisions made by the AI system and control the movement of the vehicle.

One of the most promising areas of artificial intelligence research for unmanned vehicles is deep learning, a machine learning technique in which a model learns to find patterns in data by building many layers of a neural network.

Deep learning algorithms such as convolutional neural networks (CNNs) are effective in image and video analysis, which is critical for unmanned vehicles. CNNs can be trained to detect objects, such as other vehicles and pedestrians, in images and video captured by cameras.

Another important area of AI research for unmanned vehicles is the development of decision-making algorithms. These algorithms are responsible for interpreting sensor data and making decisions about the vehicle's actions. Researchers use techniques such as reinforcement learning, a type of machine learning that involves training an AI agent to make decisions through trial and error, to develop decision-making algorithms for unmanned cars.

AI can also be used to predict traffic on the roads, allowing car autopilots to choose the most efficient route. Some car autopilots also use AI to monitor driver behavior and prevent unsafe actions such as drowsiness and distraction [2].

Today, unmanned cars are being tested in six countries: the U.S., China, Russia, Israel, the U.K. and South Korea, usually only one-time tests. To reduce the risk of accidents during testing of drones, special-trained people are used, who are put

in the passenger or driver's seat, to prevent emergency situations. There are a handful of cities where drones make trips without an insured driver, one such city is Innopolis – where Yandex cars make unmanned passenger transportation. Not everyone can call an unmanned cab, but only a narrow circle of people who have something to do with the development of this technology. This was the situation worldwide until 2020. In October, Waymo, a Google subsidiary, launched an unmanned cab service in a suburb of Phoenix, the fifth most populous city in the United States. So far, the problem of calling an unmanned cab has been solved, and anyone can call a robo-taxi by downloading the app.

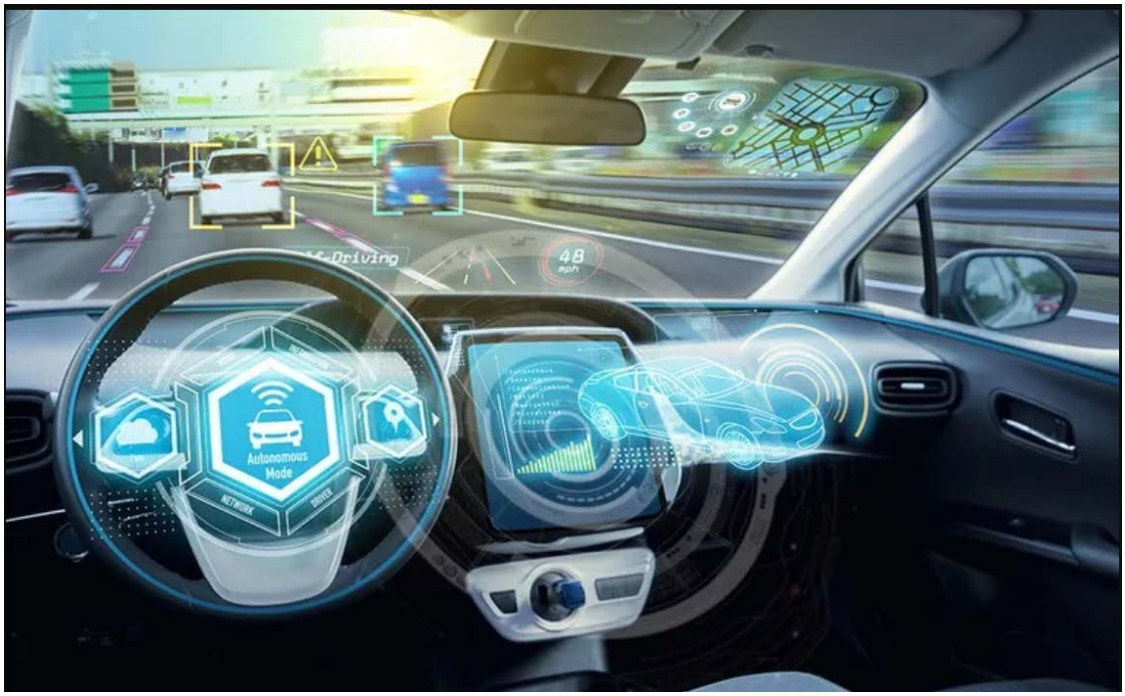


Figure 2. Example of an unmanned vehicle

In Russia, there are two leading companies testing passenger drones: Sber and Yandex. At the end of 2020, Sber put ten cars on the roads of Moscow, when Yandex was already testing just over 100 cars. Now there are 160, just over 140 of them in Moscow, and the rest in Innopolis, Ann Arbor, and Tel Aviv. For example, a Yandex car is being tested in Michigan. The state is allowed to test drones without a safety driver in the front seat [3].

They are trying to make all kinds of vehicles unmanned, from streetcars to SUVs for the north. Last year, Gazprom Neft tested the operation of unmanned Kamaz trucks capable of driving through difficult terrain in the Yamalo-Nenets Autonomous District. One driver-operator has three to five vehicles at his disposal. The cars are loaded at the base, the driver gets into the first car, connects the others to him and goes on a set route, leading the column. Slave cars repeat the movements of the leader and control their surroundings [4].

Drones drove almost 3 thousand kilometers in the Arctic. They were tested in conditions of low temperatures, snowstorms and poor visibility. The test drives showed that unmanned vehicles even in extreme conditions allowed for 10-15 % cost reduction in cargo transportation. For example, fuel costs are reduced due to the

smoother movement of vehicles in the convoy. For round-the-clock transportation with five autonomous vehicles, two drivers instead of ten will be sufficient. The introduction of cargo drones into full operation in the Arctic is planned by 2022 [5].

Another direction is unmanned harvesters in agriculture. There are several companies in Russia that are developing them. Usually, the combine harvester assumes several control modes: from minimal assistance to the driver to full self-management. Autonomous harvesters are already being used on farms. Cognitive Pilot tested three autonomous harvesters four years ago. Last year, there were 350 such machines on Russian farms. A combine harvester, unlike a car, is in a sense a factory of technological processes. The harvester must not only drive the machine, but also manage the harvesting process. After a while he gets tired and the combine harvester begins to leave behind tails, uncollected areas.

With the guidance system the operator can concentrate on monitoring the harvesting parameters and minimize the chance of not harvesting.

In conclusion, artificial intelligence plays a crucial role in the development of unmanned transportation. Using advanced artificial intelligence algorithms such as deep learning and reinforcement learning, researchers and engineers can develop unmanned vehicles that can safely and reliably navigate the road. However, there is still much work to be done to realize the full potential of AI in the transportation industry and get drones on the roads.

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УДК 004.9

ORGANIZING A REMOTE DESKTOP SERVER WINDOWS SERVER

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Abstract. This paper focuses on discussing the primary operating systems that are used to organize app servers. By conducting a meticulous analysis of the relevant factors, it selects the optimal operating system to effectively organize the server. The study considers the pros and cons of different operating systems, such as Windows Server and Linux Server, against the server's requirements. After evaluating various factors like cost, resource consumption, and embedded support solutions, the paper concludes by detailing the process of setting up the server with the selected operating system along with the various steps involved in organizing it effectively.

Keywords: server, remote desktop server, domain, Windows Server, Active Directory.

ОРГАНИЗАЦИЯ СЕРВЕРА УДАЛЕННЫХ РАБОЧИХ СТОЛОВ WINDOWS SERVER

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Аннотация. В работе рассматриваются основные операционные системы для организации сервера приложений. После проведенного тщательного анализа соответствующих факторов была выбрана оптимальная операционная система для эффективной организации работы сервера. В рамках анализа рассматриваются плюсы и минусы различных операционных систем, таких как Windows Server и Linux Server, в сравнении с требованиями сервера. После оценки различных факторов, таких как стоимость, потребление ресурсов и встроенные решения поддержки, в завершении статьи подробно описывается процесс настройки сервера с выбранной операционной системой, а также различные шаги, необходимые для его эффективной организации.

Ключевые слова: сервер, сервер удаленного рабочего стола, домен, Windows Server, Active Directory.

In light of recent events, remote workplace technologies have become increasingly popular. More and more employers are transitioning their employees to a remote work format. However, despite the convenience of a remote workplace for both employers and employees, technical support issues may arise. This is because employees may not always have enough power on their devices to perform remote work. To avoid such issues, organizations can set up a remote desktop server, whereby the entire load of processing operations is transferred to the server.

A server is specialized equipment, such as a service computer or workstation, designed to perform service software without human intervention. Servers can perform various functions, including storing information for one or more sites, coordinating the interaction of multiple computers on the same network or storing corporate data and employee access to information. Depending on the function, servers can be different types and types. The main types of servers include web servers, game servers, local area network servers, application servers, remote desktop servers, and mail servers. Servers in global computer networks are typically high-performance computers with specialized components. They can be equipped with multiple processors to process large amounts of data, but their high performance also requires a powerful cooling system and specialized server rooms. Since human interaction with the server occurs only during maintenance or modernization, most of the software component may not require a graphical interface, eliminating the need for a powerful video card. A regular personal computer can also act as a server, depending on the size of the network. To do so, one would need to install one of the server operating systems, such as Windows Server or Linux Server.

Remote Desktop is a technology that provides remote access via the RDP protocol to a server or computer, allowing the user to work on it as if it were local. Remote Desktop Services is Microsoft's implementation of the thin client architecture in which the Windows software and the entire desktop of the computer on which RDS is installed are made available to any remote client computer that supports Remote Desktop Protocol (RDP) [1, p. 658]. Input from the client system is passed to the server, where the software is executed, and user interfaces are displayed from the server to the client system. This differs from application streaming systems, such as Microsoft App-V, in which computer programs are streamed to the client on demand and executed on the client computer.

A Remote Desktop server is a server that provides users with the ability to work on the operating system remotely. This technology is applicable in many areas of business and is particularly popular among enterprises that work with large expenditures of computer resources. Using a remote desktop server enables various application tasks to be performed without using the resources of the user's device, as the entire burden of processing and storing information falls on the host server or its nodes.

As previously mentioned, the most popular server operating systems are the Windows Server and Linux Server series.

Windows Server is a line of server operating systems developed by Microsoft. The most popular Windows Server operating systems to date are Windows Server 2012, Windows Server 2012 R2, and Windows Server 2016. These operating systems

are designed for large enterprises and corporations, offering a large list of embedded solutions and variability. Each product in this line comes with different features and pre-installed software, including operating systems both with and without a graphical interface. However, Windows Server has its drawbacks, the main one of which is its high resource consumption compared to its competitors. Additionally, Windows Server is an expensive operating system, which significantly reduces demand for it.

Linux Server is a large list of open-source operating systems, including many popular systems such as Ubuntu Server and openSUSE.

Ubuntu Server is the most popular Linux operating system, offering a great user experience. Although similar to Ubuntu, Ubuntu Server has enhanced backend usability with OpenStack Mitaka, Nginx, and LXD, which are designed for system administrators. It is mainly used to deploy web servers [2, p. 107].

OpenSUSE has two versions: Leap and Tumbleweed. Leap has longer release cycles and is better for stability, while Tumbleweed is a rolling release and better suited for advanced users. Standard toolsets in openSUSE include openQA for automated testing, Kiwi image deployment for Linux on multiple platforms, YaST configuration for Linux, and a comprehensive package manager Open Build Service. By prioritizing stability over the previous nine-month release cycle, openSUSE has become a viable Linux server environment.

Debian is a lightweight, stable distribution that is often used on both servers and desktops. Many other distributions are based on Debian, this is one of the OG distributions. It has 3 “threads” to choose from: stable, test and unstable (Sid). Stable uses a standard release cycle with a longer support duration, Testing uses a rolling release cycle. For servers, people usually prefer to use Debian stable. Debian also has an LTS option aimed at supporting the release for at least 5 years.

Red Hat Enterprise Linux operating system (RHEL) is the most popular commercial Linux server distribution. Offering commercial, professional support, as well as stability and reliability. The LTS version offers 10 years of support. One of the best features of RHEL is the ability to fix the kernel without having to reboot. You can't find a ready-made OS image for RHEL from most hosting providers. What you need to do is use their “Custom ISO” option and download the RHEL iso or just get the RHEL repositories into your CentOS.

Arch Linux is the most popular distribution among developers and experienced users. It is often used for servers because of their extensive documentation and Wiki, as well as the freedom and ability to install and configure every part of your Linux server.

CentOS is the second most popular Linux distribution for servers. If you are a beginner hosting your site on cPanel shared hosting, most likely your server is running CentOS. This is a popular choice among developers and people who want a reliable and stable option.

In recent years, there have been several changes in CentOS, such as the separation into “streams” – CentOS Linux (“old” CentOS) and CentOS Stream (user-oriented RHEL, with a shorter EOL and a release cycle similar to RHEL). CentOS switched their focus from CentOS Linux to CentOS Stream. One of the main advantages of CentOS Linux was its stability and long-term support. This, among

other changes in CentOS, has made the distribution less popular in recent years, which has led to the creation of alternatives. Some of the best alternatives to CentOS are AlmaLinux and Rocky Linux, which we will discuss below. We discussed whether we should include CentOS in this minimum (at least in the second position), but it is still one of the OGS and the most used server distribution.

Despite the variety of Linux-based servers, Windows Server 2016 is still considered the most optimal solution for implementing a remote worker server [3, p. 453].

To implement a remote desktop server, it is common to use multiple interconnected devices. Devices in a remote desktop server are usually divided into three types: domain controller, server node, and user's device.

A domain controller is a device that runs an Active Directory service and acts as a domain host, controlling access to server nodes. Access to server nodes is obtained through an account in the Active Directory [4, p. 128].

A server node is a device that organizes remote desktop sessions based on the principle of creating a virtual machine session from a template and providing access to it using hyper-V technology [5, p. 45].

The user's device is a computer that is included in the domain and is authorized under an Active Directory account (Figure).

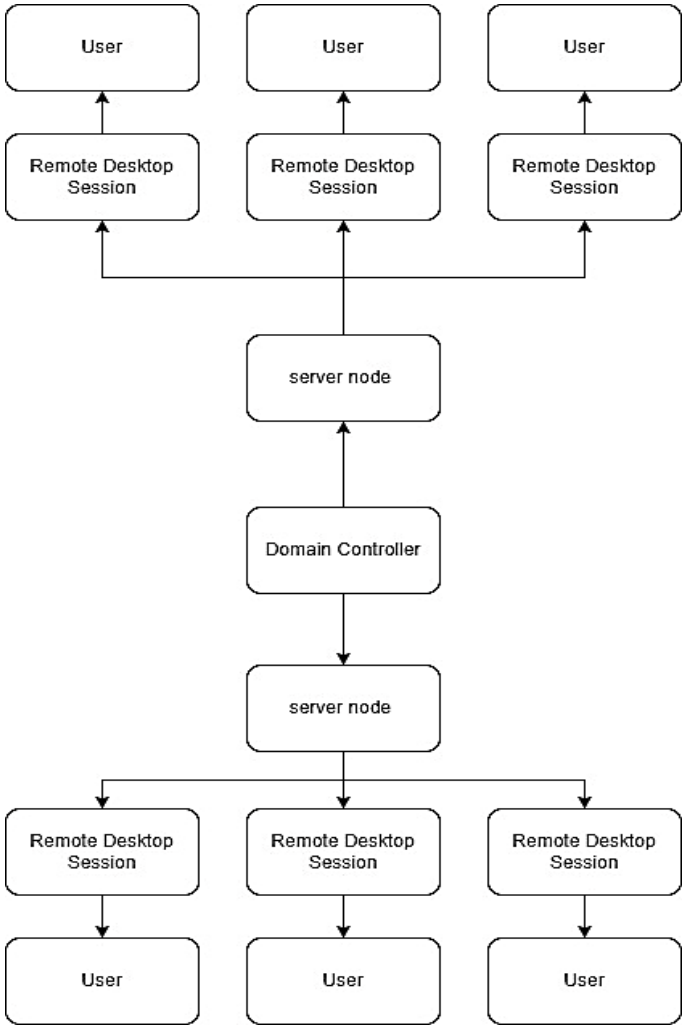


Figure. Organizational chart of the remote Desktop server

In order to set up a remote desktop server, the operating system must be installed on the domain controller and server node. After installation, the domain controller must be configured, including setting the server's static IP address and name. Next, the Active Directory service should be installed and configured to create a new Local domain such as RDesctop.com and a new user group "UserRD".

To configure the server node, a static IP address must also be set, the host name configured, and the device included in the domain. Remote desktop services should be installed, and a template VM created, which will serve as a basis for creating remote desktop sessions. Finally, the node must be added to the collection of the domain controller to complete the server organization process.

In conclusion, a remote desktop server can be a valuable tool for businesses with remote employees or teams working on complex tasks. While both Windows Server and Linux Server have their advantages and disadvantages, choosing the right operating system for a remote desktop server largely depends on the specific needs and resources of the organization. Regardless of the chosen operating system, implementing a remote desktop server can improve efficiency, reduce technical support issues, and enable employees to work from anywhere in the world.

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METHODOLOGY PLAN OF THE LESSON: "THE FUTURE TENSE EFFECT IN THE CHINESE LANGUAGE"

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Abstract. The methodical aspects of teaching students to use such a syntactic phenomenon of the Chinese language as the "the future tense effect", which is understood as the time interval that occurs between two completed processes in the future, are studied. The lesson plan consists of a speech warm-up, the revision of studied material, goal setting, introduction of a new syntactic phenomenon and its practice, teaching students to use the studied syntactic phenomenon and lexical units in their speech. Quizlet cards are used as the means of visualization.

Keywords: teaching, methodology, Chinese language, syntax, future tense effect, combinatorial semantics, semi-suffixes, modal particles, interactive cards.

МЕТОДИЧЕСКОЕ ПОСТРОЕНИЕ ЗАНЯТИЯ: «ЭФФЕКТ БУДУЩЕГО ВРЕМЕНИ В КИТАЙСКОМ ЯЗЫКЕ»

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Аннотация. В статье рассматриваются методические аспекты обучения студентов по использованию такого синтаксического явления китайского языка, как «эффект будущего времени», под которым понимается временной промежуток, возникающий между двумя завершенными процессами в будущем. План занятия состоит из речевой разминки, повторения изученного материала, целеполагания, введения нового синтаксического явления и его отработки, обучения студентов использованию изученного синтаксического явления и лексических единиц в своей речи. Интерактивные карточки в оболочке Quizlet используются в качестве средств визуальной наглядности.

Ключевые слова: преподавание, методика, китайский язык, синтаксис, эффект будущего времени, комбинаторная семантика, полусуффиксы, модальные частицы, интерактивные карточки.

The article is devoted to the study of the methodological aspects of teaching the syntax of the Chinese language at the Minsk State Linguistic University on the example of the lesson "The effect of the future tense".

Modern Russian linguistics presents comparative studies of the means of expressing the category of time in Russian and Chinese [1], a comparative analysis of

the circumstances of time with prepositions of the Russian language and the corresponding expressions of the Chinese language [2], the concept of "time" in Chinese and Russian linguistic cultures [3], in the Chinese picture of the world [4], etc. In addition, the future tense effect was previously studied as a syntactic phenomenon (linguistic aspect) [5]. However, the methodological aspects of teaching the Chinese language syntax using the example of the future tense effect remain unconsidered.

The research material is sentences from the electronic version of the Big Russian-Chinese Dictionary [6].

To facilitate subsequent communication in a foreign language, it is recommended to start the lesson with a speech warm-up (ask questions like *你们的心情怎么样?*(‘How are you feeling’), etc.)

Then, the previously acquired knowledge should be revised, namely, information about the signs of the syntax alphabet (semi-suffixes, modal particles, etc.), which belong to the metalanguage and are characterized by a metalinguistic meaning, since they point at the facts of the language, and not to the model of the world [7, p. 20]. Using cards in the Quizlet shell [8], the teacher demonstrates to students the terms from combinatorial semantics (language, world model, signs of syntax alphabet) [9] and the corresponding pictures, students give the definitions, which they have memorized by heart. Further, these interactive materials are used to introduce new vocabulary and as visual supports when doing speaking exercises.

Then it is necessary to formulate the goal of the lesson – to master the syntactic phenomenon "the future tense effect in Chinese" and the tasks: to form an idea of the future tense effect in Chinese, as well as the ability to use the studied syntactic phenomenon in their speech.

It is necessary to draw students’ attention to the fact that the Chinese language is applicative, it does not have morphological designations of temporal relations [9].

The future tense effect is understood as the time gap that occurs between two completed processes in the future, and is created by a combination of the semi-suffix 了 (-le) and the modal particle 了 (le), as well as other signs of the micro-level syntax alphabet (the sign of the syntax alphabet 再 (zai) and the modal particle 了(le), amplificator 就 (jiu) and modal particle 了(le), etc.).

Before proceeding directly to the interpretation of this syntactic phenomenon, it is necessary to overcome lexical difficulties. Using cards in the Quizlet shell as visual aids, the teacher presents students new lexical units and explains their meaning. At the same time, it is recommended, first of all, to show students an illustration, second of all, the use of a word in context and, third of all, definition in Chinese, if possible, without resorting to translation into Russian.

Then, substitution exercises are done, made on the basis of fragments of texts, which will be studied at the following parts of the lesson.

你 (…) 说一次，我 (...) 不干 (...) 。

如果我 (...) 此离开，这片海岸就无人守卫(...)。

这句话, 去(...)几个字, 就更明显(...)。

你(...)完成了我下达给你的任务，那么我们就可以控制那一带(...) 。

如果你碍 (...) 我的好事，我就只能解决你 (...)。

Next, students translate the sentences presented above from Russian into Chinese or from Chinese into Russian (depending on the level of language proficiency).

The task might look like this:

Translate from Russian into Chinese

You say it again and I won't do it.

If I leave, the shore will be left unprotected.

I will complete the task and immediately leave the Millelites.

If a few hieroglyphs are omitted from this phrase, it will become even clearer.

When you complete this task, I'll take everything under my control!

If you try to interfere, I'll have to deal with you.

At the next stage, the teacher explains to the students that in the following examples (from the electronic version of Big Chinese-Russian dictionary) processes (‘you say’), (‘I leave’), (‘I will complete the task’) (‘are omitted’), (‘when you complete this task’), (‘you try to intervene’) precede actions (‘I won't do it’), (‘the shore will be left unprotected’), (‘I'll take control of everything’), (‘there will be clearer’), (‘we will have to figure it out’) in the future. In the first sentence, the future tense effect is created by the combination of the syntax alphabet character 再 (zai) and the modal particle 了(le), in the second – by the combination of the amplificator 就 (jiu) and the modal particle 了(le), in the third, fourth and fifth – by the combination of the semisuffix 了 (-le) and modal particle 了(le).

你再说一次，我就不干了 (‘You say it again and I won’t do it’).

如果我就此离开，这片海岸就无人守卫了 (‘If I leave here, the shore will be unprotected’).

任务结了，我就从千岩军辞职 (‘I will complete the task and immediately leave the Millelites’).

这句话, 去了几个字, 就更明显了 (‘If you drop a few characters from this phrase, it will become even clearer’).

你就完成了我下达给你的任务，那么我们就可以控制那一带了 (‘You will complete this task. So I will take control!’).

Using illustrations from interactive cards in the Quizlet shell as illustrative supports, students make dialogues / microgroups in pairs (depending on the composition of the study group). Each microgroup is given a specific communicative situation. The teacher approaches the students, listens to the discussions without interrupting the speakers, writes down mistakes or marks where he considers it necessary to give lexical / grammatical / stylistic comments. Both microgroups are provided with the support schemes presented below.

In the first microgroup, one of its members acts as a teacher: he checks the sentence written by his student (another team member) and offers to remove from it a few unnecessary, in his opinion, words (hieroglyphs). The student first pretends that he hasn’t heard the teacher's words, and then refuses to do the task at all, saying that he shouldn't do it: if these words are omitted, the sentence will sound worse.

In the second microgroup, the roles are distributed in the same way as in the first (a student and a teacher). The difference is that a student who is offered to correct a sentence by a teacher happily agrees and asks to be released from class as soon as he has finished his task. The teacher disagrees and says that after this exercise they will move on to the next one.

这句话, 去了几 ..., 就更 ...了 (‘If you drop a few … from this phrase, it becomes more …’).

任务结了，我就 ... (‘Having completed the task …, I immediately …’).

不是，　你就完成了我下达给你的任务，那么我们就可以　(...)了　(‘No, having completed the task …, we can …’).

Consequently, on the one hand, the studied syntactic phenomenon and lexical units are used in the speech of the students. On the other hand, by acting out such dialogues, students learn to express agreement / disagreement when speaking Chinese.

Thus, the lesson plan "The effect of the future tense in Chinese" consists of the following stages: speech warm-up, revision of the studied material, setting goals and objectives, introduction of a new syntactic phenomenon (the future tense effect) and practicing it, using the studied syntactic phenomenon and lexical units in the students' speech. The Quizlet cards used during the lesson will be published on the telegram channel “Chinese in the context of modernity” [10].

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THE PHENOMENON OF PSYCHOPATHY IN LEGAL ACTIVITY

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Abstract. The paper presents an overview and analysis of characteristics of psychopathy and its influence on human behavior. Attention is paid to the behavior of psychopaths and its impact on criminology. The work contains data and research conducted by various authors in the field of psychopathology, criminology and legal practice

Keywords: psychopath, psychopathy, criminology, crime, personality, behavior, psychology, guilt.

ФЕНОМЕН ПСИХОПАТИИ В ЮРИДИЧЕСКОЙ ДЕЯТЕЛЬНОСТИ

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Аннотация. В работе представлен обзор и анализ психопатии, ее влияние на поведение человека. Рассмотрены различные типы психопатий, особое внимание уделено поведению психопатов и его влиянию на криминалистику. Работа содержит данные и исследования, проведенные различными авторами в области психопатологии, криминологии и юридической практики.

Ключевые слова: психопат, психопатия, криминалистика, преступность, личность, поведение, психология, виновность.

Psychopathy is one of the most significant and complex mental disorders, which is reflected in various areas of life, including law. Experts have long noticed that psychopathic individuals can become criminal elements and tend to violate laws, which in turn affects the activities of law enforcement agencies, the judicial system and the society as a whole. Currently, there is an increase in the number of psychopathic individuals in the society, which causes serious concerns in the field of security and law and order.

The problem of psychopathy is especially relevant for legal activity, since psychopathic individuals can be involved in the commission of various types of crimes. As Robert Hare's research [1] shows, psychopathic individuals lack empathy, are incapable of guilt and lack normal moral principles, which makes them more likely to break the law.

The purpose of this article is to examine the problem of psychopathy in the context of jurisprudence and to identify its impact on judicial practice. To achieve this goal, data from research on psychopathy and its impact on crime, as well as the experience of practitioners working in the field of law and criminology, will be used.

Psychopathy is a pathological condition of the individual that is characterized by a violation of emotional and behavioral control, as well as an inability to adapt socially. People who suffer from psychopathy may show such traits as indifference to other people's feelings, cunning, manipulative tendencies, excessive conceit, irresponsibility etc.

Psychopathy is not so much a disease as a special type of personality. To identify psychopathy, a specific questionnaire is used to identify characteristic behavioral patterns. Such stereotypes include lack of emotional responsibility, unreliability, deceitfulness, extreme self-centeredness and manipulativeness, lack of empathy, tendency to impulsivity, and lack of long-term planning. Psychopaths are not capable of experiencing complex emotions and do not experience feelings of guilt, shame and regret, which often leads to immoral acts and crimes. With all these indicators, the main cognitive functions of psychopaths remain normal: thinking and memory are fully developedприсутствует, and the value system is present.

Socially, psychopathy usually involves extensive and manipulative self-serving behavior, and is often associated with repeated delinquency, crime, and violence. There is some disagreement about which traits should be considered as part of psychopathy, so researchers identify about 40 traits, but the following characteristics can be identified as central:

1. Arrogant and deceitful interpersonal communication style: impression management or superficial charm, exaggerated and grandiose self-esteem, pathological lies/deception, and various manipulations for personal gain.

2. Lack of affective experience: lack of remorse or guilt, superficial affect (coldness and dispassion), callousness and lack of empathy, inability to take responsibility for one's own actions.

3. Impulsive and irresponsible lifestyle: impulsivity, risk-taking, irresponsible and unreliable behavior, financially parasitic lifestyle, and lack of realistic long-term goals.

The criminological aspects of psychopaths are particularly well understood at present. Initial interest in the issue was determined by requests from legal practice. In the Russian literature, the diagnosis of "psychopathy" was first made in the 90s of the last century (V. Kh. Kandinsky, V. M. Bekhterev, I. M. Balinsky). Cruelty to people and animals, selfishness, lack of compassion, a tendency to lie and steal were noted.

Later, psychiatrists and criminologists contributed to the development of ideas about the increased criminogenicity of psychopaths.

P. B. Gannushkin, the founder of the psychiatric school and the author of the classification of psychopaths, identified 3 most important criteria for psychopathy:

1. Pronounced pathology of personality traits, impaired adaptation;

2. The totality of psychopathic features that determine the entire mental appearance of a person (motivational and emotional sphere, thinking, etc.);

3. Relative stability, small reversibility [2].

According to the peculiarities of formation and development, it is also customary to distinguish between two types of psychopaths:

1. "Nuclear" psychopaths. The main role in their formation is played by biological, innate factors. This type of psychopathy includes congenital psychopathic anomalies, in which disharmony of the emotional and volitional sphere is revealed.

2. Regional psychopaths. The formation of such personalities is associated with a violation of personality development after birth (in the postnatal period). These are character anomalies that arise as a result of personality development under the influence of unfavorable social and psychological factors, such as emotional deprivation in early childhood (with physical disabilities, orphanhood, etc.), as well as improper upbringing – excessive (hyper-care) or insufficient (hypo-care) attention from parents.

Data from clinical and criminological studies [3] show that psychopaths and other types of neuropsychiatric disorders can disrupt an individual's social adaptation, contribute to the commission of crimes, and an antisocial lifestyle in the microenvironment of criminals and the acquisition of bad habits can exacerbate mental disorders.

Psychopaths of the excitable type.

According to Yu. M. Antonyan and V. V. Guldan [4], most of the criminals studied have psychopathic personalities of the excitable type, which show short temper, irritability and fits of anger. These people are prone to emotional outbursts for any reason and often suffer from mood disorders. Most of these individuals are characterized by resentment, cruelty, sullenness, and a tendency to accumulate emotions. However, the main feature of excitable psychopaths is an "explosive" reaction to external obstacles, countering their claims and obstacles. Such individuals often show a tendency to dominance, intolerance to opposition, stubbornness, resentment and a tendency to violence. The characteristic features of such personalities are domineering, resentful, prone to self-aggrandizement and violations of public order. This type of personality is characterized by a hidden accumulation of affect and its unexpected manifestation, often in the form of aggressive actions.

- 42 % of illegal actions were committed by them. They were directed against the person (murder, bodily harm, rape);
- 35 % – self-serving and self-serving violent crimes;
- 21 % – crimes against public order, including hooliganism;
- 2 % – other crimes.

A psychological study of the personality of criminals suffering from excitable psychopathy shows that the most pronounced feature of their personality is insufficient socialization, which manifests itself in a violation of the ability to adequately perceive the environment and build their behavior in accordance with the requirements of social norms. Such norms are poorly assimilated and not internalized, and therefore do not have a serious impact on behavior.

Psychopaths of the hysterical type.

The main signs of hysterical psychopaths are unstable emotions, egocentrism and a tendency to manipulate others. Their behavior can be extremely unpredictable, and they can be very extravagant. One of the key features of hysterical psychopaths is

the desire to attract attention to their personality: othey will often try to attract the attention of other people by demonstrating their attractiveness, outstanding talents or incredible feats. They often turn to extravagant or unusual methods to achieve their goals, and may be prone to cheating and lying to get what they want.

Hysterical psychopaths can also show strong emotional instability. They can easily fall into extreme states, such as rage, panic, or hysteria. They can also switch quickly between emotions and often overreact to small events. For example, a hysterical psychopath may suddenly start crying or screaming in response to criticism or failure.

- 58 % of the criminal acts committed by hysterical psychopaths are crimes against state and personal property of citizens (among them, a large percentage are fraudulent actions);
- 28 % – crimes against the person;
- 8 % – crimes against public order;
- 6 % – other crimes.

In general, hysterical psychopaths can be very manipulative and susceptible to other people's influence. They can easily make sure that others do what they need to do, and they can often use their talents to manipulate others. However, they can also be very vulnerable and unstable, and their behavior can be highly unpredictable.

Psychopathic personalities of the inhibited circle.

Such psychopathic individuals are constantly on the lookout for external stimulation and arousal. They can engage in any activity, as long as it allows them to feel at least some excitement. They are prone to gambling, drugs and alcohol. These individuals may also have unstable behavior, impaired social adaptation, antisocial tendencies, and inadequate assessment of the situation. They can be aggressive and disrupt public order, but not because of a desire to harm someone, but because of an inadequate response to external stimuli.

- 35 % of illegal actions in the group of inhibited psychopaths are directed against public order;
- 30 % – crimes against the person, which differ in the severity of the crime;
- 29 % – crimes against property;
- 6 % – other crimes.

Psychopathic individuals of the inhibitory circle can be dangerous to others, as their behavior can be unpredictable, especially if they are in a state of excitement. However, unlike other types of psychopaths, their actions are random rather than purposeful.

Psychopathy cannot be viewed from the perspective of traditional views on mental disorders: psychopaths are not disoriented, do not lack a sense of reality, and do not suffer from delusions, hallucinations, or severe distress. Unlike psychotic individuals, psychopaths think rationally. They are clearly aware of what they are doing; their actions are the result of a conscious choice. The complexity of making a diagnosis makes it more difficult to fix the concept of "psychopath" in the mass consciousness as a synonym for the words "mentally ill" and "crazy".

The label "psychopath" is usually accompanied by a lot of stigma and consequences related to the severity of the punishment for criminal acts, treatment,

and so on. Therefore, in recent years, attempts have been made to clarify the meaning of the term. Although no psychiatric or psychological organization has approved the diagnosis of psychopathy, the assessment of psychopathic characteristics is widely used in various forensic and legal institutions, and in some countries the assessment can have serious consequences for individuals. Thus, psychopathy is not included in the list of official psychiatric diagnoses of ICD-10 [5], but the American DSM-5 [6] states that psychopathy and sociopathy are synonymous with antisocial (dissocial) personality disorder.

In any case, these classifications cannot determine whether psychopathy is a separate mental disorder, so it cannot be used as a mitigating factor in sentencing. Also, due to neurobiological factors, psychopaths do not have feelings of guilt and remorse, and they cannot admit their guilt, which makes it difficult to identify them.

According to Robert Hare, author of the book "Devoid of Conscience" and creator of the standard tool for diagnosing psychopathy, psychopaths are sane according to modern legal and psychiatric standards. They understand the laws of society, know the difference between good and evil, can control their actions, and are aware of the possible consequences. However, the problem with psychopaths is that knowing these things is not always enough to stop them from committing antisocial acts. Many murderers, such as Ted Bundy and John Wayne Gansey, were recognized as psychopaths, that is, according to modern legal and psychiatric standards, mentally healthy people: their actions were based not on mental illness, but on a cold and calculating mind.

Some experts point out that psychopaths lack the mental and emotional mechanisms necessary to turn their knowledge of the law into socially acceptable behavior. Due to their lack of conscience, psychopaths do not develop feelings of guilt and regret, which makes it difficult to control their behavior. Therefore, despite the modern version of "moral insanity", this concept cannot serve as an argument when making a decision on criminal liability.

In conclusion, it can be emphasized that the problem of psychopathy is not limited only to judicial activities. This is a serious mental disorder that can manifest itself in various areas of life, including business and politics. Studying psychopathy helps to better understand people's motivations and behaviors in different situations, which can be useful not only for practicing law and law enforcement, but also for understanding interpersonal relationships and improving the quality of life of society as a whole.

Despite the fact that not all psychopathic individuals are criminals, and not all criminals are psychopaths, it is necessary to recognize that criminal activity can be one of the manifestations of psychopathy. Therefore, it is important to conduct qualified research to detect psychopathy in suspects and accused persons. This will help to develop appropriate methods of dealing with them as subjects of law and prevent criminal activity.

Finally, it is worth noting that the study of psychopathy can help society understand and respond more consciously to the manifestations of this mental disorder. Developing appropriate measures and tools to work with psychopathic

individuals can be useful for creating a safe and sustainable environment for people's lives and activities, as well as improving the justice system.

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THE USE OF ENERGY BATTERIES AS A BACKUP SOURCE OF ENERGY

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Abstract. The article discusses the possibility of application of energy storage systems as backup power sources. The article also describes how energy storage systems ensure the continuous operation of critical systems and equipment during power outages.

Keywords: energy storage systems, backup power sources, energy infrastructure.

ИСПОЛЬЗОВАНИЕ ЭНЕРГЕТИЧЕСКИХ БАТАРЕЙ В КАЧЕСТВЕ РЕЗЕРВНОГО ИСТОЧНИКА ЭНЕРГИИ

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Аннотация. В статье рассматривается возможность применения систем хранения энергии в качестве резервных источников питания. Описывается также, как системы хранения энергии обеспечивают непрерывную работу критически важных систем и оборудования в случае отключения электропитания.

Ключевые слова: системы хранения энергии, резервные источники питания, энергетическая инфраструктура.

Backup energy sources are a necessary component of modern infrastructure, as they ensure the reliability of the energy system, protect against possible failures in the main energy sources and allow to keep important facilities, such as hospitals, telecommunications centers, etc., running.

Energy batteries can be used as backup power sources because they are capable of storing large amounts of energy that can be used in the event of a major power outage. This ensures the continuity of critical systems and devices in case of emergencies.

There are many types of energy batteries, such as lithium-ion, lead-acid, nickel-cadmium, nickel-metal hydride, and others. Each technology has its own characteristics, advantages and disadvantages, as well as different battery capacity, cost, and life expectancy. It is important to choose the technology that best meets the requirements of a particular application.

Energy batteries are widely used as a backup power source in a variety of applications such as telecommunications, power systems, security systems, and consumer and commercial electronics. Battery-based backup power sources are used to ensure continuity of operation of systems and equipment in the event of an outage of the main power source, such as mains power.

In telecommunications, energy batteries are used to provide power to base stations, telephone networks, mobile cellular towers and other equipment. When the main source of power fails, energy batteries provide the necessary power to keep the telecommunications system running continuously.

Power systems use energy batteries to stabilize voltage, balance loads, and maintain continuous power to the system. Standby power sources are also used to ensure continuous operation of critical systems, such as medical equipment, banking systems, and industrial equipment.

In security systems, such as security, video surveillance, and access control systems, energy batteries are used to provide continuous power and maintain records in the event of a main power supply outage.

In consumer and commercial electronics, energy batteries are used to power portable devices such as smartphones, tablets, laptops, cameras and other electronic equipment. Backup energy sources are also used to keep smart home systems and other automation systems running continuously [1].

Although energy batteries are a promising and environmentally friendly way to store energy, their use as a backup energy source still has some limitations.

One of the main limitations is the power and capacity of the battery. Even the most powerful and high-capacity batteries cannot provide energy for large objects, such as buildings or even entire cities, for a long time. This means that energy batteries can only be used as a temporary backup source of energy, not as the main source.

Another limitation is the need to replace batteries frequently. The average life span of energy batteries is approximately 5-10 years, depending on type and technology. In addition, the process of replacing batteries can be expensive and time consuming, especially if the batteries are installed in remote or hard-to-reach locations.

It is also important to consider that energy batteries can be subject to a variety of external influences that can affect their performance and service life. For example, extreme temperatures, humidity, and weather conditions can negatively affect batteries, resulting in reduced efficiency and shorter battery life.

Despite these limitations, energy batteries still have a number of advantages as a backup power source. They can be used to provide energy for small objects, such as homes or offices, or as a temporary backup for power systems, such as in the event of a power outage. In addition, energy batteries can be used as a backup source of

energy in critical industries, such as medical facilities, airports, and transportation systems.

However, despite their many advantages, energy batteries also have some limitations as a backup power source. One major limitation is their limited capacity, which limits their use in large-scale systems.

In addition, energy batteries can lose capacity over time, which can shorten their lifespan. It can also increase the cost of battery maintenance and replacement. Another limitation is the need to install a battery management system, which can be complex and costly. It should also be noted that not all types of energy batteries can be used as a backup power source. For example, lithium-ion batteries (Figure) have great potential for use as a backup power source, but not all types of lithium-ion batteries are suitable for this purpose.

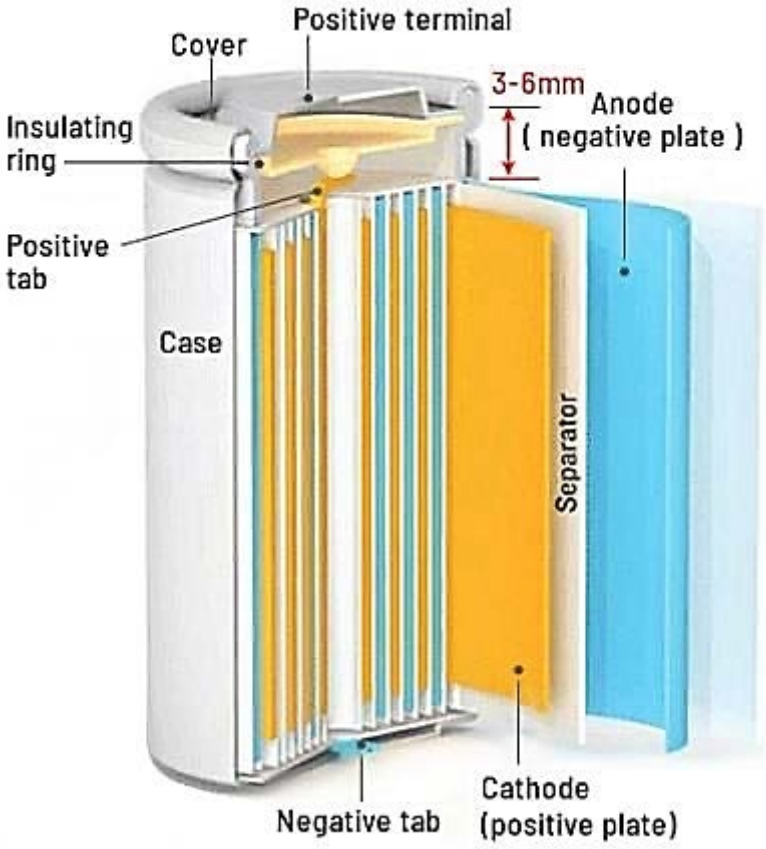


Figure. Lithium-ion battery

Overall, despite some limitations, energy batteries are an effective and promising solution for a backup energy source. They can help reduce dependence on traditional energy sources and increase the sustainability of power supply systems in critical industries [2].

Table – Classification of batteries

Battery type	*Application*	*Advantages*	*Disadvantages*
Lead-acid	Used in automotive and marine applications and for power backups for large facilities like hospitals and shopping malls	Low cost, easy maintenance	Neo-environmental, slow charge times, short life span
Lithium-ion	Used in portable electronic devices, electric cars, home and small office power supplies	High power capacity, fast charging, long life	High cost, possibility of fire or explosion
Nickel-Cadmium	Used to power small objects such as radios, traffic lights and wireless devices	Reliable, wide temperature range, low self-discharge	Toxic, has lower capacity than lithium-ion batteries
Nickel-metal hydride	Used in medical devices, wireless devices, electric cars	Safe, less toxic than nickel-cadmium batteries	Need for frequent charging, have less energy capacity than lithium-ion batteries

As you can see from the table, each type of energy battery has unique characteristics that can affect their efficiency, cost, and longevity as a backup power source. For example, lead-acid batteries can be reliable and cheap, but their efficiency can decrease over time, while lithium-ion batteries can provide higher efficiency but can be expensive [3].

Using energy batteries as a backup power source can be an effective solution in many cases. It allows energy to be stored in places where it can be used when needed, such as when the main power source goes out or when there is a shortage of power during peak hours. One of the most important characteristics of batteries is efficiency. Studies show that the average efficiency of backup sources is about 95%. This means that when used properly, batteries can provide a reliable and long-lasting power source. However, the efficiency of energy batteries depends on many indications.

Some applications of the energy accumulator as a backup power source are shown below:

1. Solar photovoltaic installations. In their composition it is necessary to use accumulators capable of working for a long time in cyclic modes of charge/discharge. Lead-acid batteries are the most popular at the moment. Relatively inexpensive

automotive batteries are widely used, although they have a disadvantage: they do not like deep discharges and are not designed for uniform power output over a long period (their "vocation" is a powerful short-term pulse), so they do not last long in photovoltaic systems. Batteries with liquid electrolyte and "smeared" plates due to high price and limited production have not yet found wide application in Russia. At the moment hermetically sealed AGM batteries are the best choice. The controller monitors the "fullness" of lead-acid batteries, afraid of both overcharge, which shortens their life, and deep discharge. The controller disconnects the solar battery from the battery if it is fully charged, and disconnects the load if it is discharged to the limit.

2. Wind turbines. The principle of wind turbines is simple: under the pressure of the wind, a wind wheel with blades rotates, transmitting torque to the shaft of the generator, which generates electricity. The larger the diameter of the wind wheel, the more air flow it captures and the more energy the wind turbine generates. The charger converts the current it generates into direct current suitable for charging the batteries. The process of charging the batteries does not begin immediately: the wheel must accelerate to a certain speed. The size of the charging current is determined by the speed of the wind. The batteries accumulate energy, which, when necessary, is consumed through an inverter, which converts the direct current into alternating current suitable for powering consumers.

3. Diesel stations with controllers. They work in such a way: when the voltage in the network disappears, the automation gives a command to start the power plant, which in a few minutes after start-up and warm-up starts to feed the wiring in the house, and after the appearance of voltage in the network gives a signal to the diesel engine to stop. The inclusion of battery inverters in this scheme and control with an automatic start system allows reasonable use of diesel fuel, saving on it. When there is voltage in the mains, the inverter charges the batteries. When the mains voltage fails, it supplies the consumer with the current stored in the accumulators. After the battery voltage drops when the battery charge is used up, the controller starts the mini-electric power plant. Part of the energy from it goes to the consumer, and part of it is used to charge the batteries. When the batteries are charged or there is voltage in the network, the controller stops the generator. The diesel does not run continuously, but only for a few hours a day. This not only saves a lot of fuel, but also reduces noise and emissions.

There are several factors that affect the efficiency of standby power batteries. One important factor is battery capacity, which determines the amount of energy a battery can hold. The higher the capacity, the longer the battery will be able to meet the needs of consumers. Temperature also plays an important role in affecting battery in colder conditions, the backup source may perform less efficiently because those batteries need more time to warm up. Also, the efficiency of the batteries may depend on how they are used. For example, if the batteries are used to power emergency systems, they will operate in standby mode and only occasionally give rise to active mode. This mode of use can increase the performance of the batteries for a long time, thereby increasing the efficiency of the batteries.

In addition, the efficiency of energy batteries can be limited depending on the specific application. For example, if batteries are used as a backup energy source for large businesses or manufacturing facilities, the energy demand may be too high, which may lead to the need for a large number of batteries, which in turn increases the cost of the project [4]. Good efficiency gives confidence that the backup source will function stably and reliably. Therefore, especially in areas where lives and health depend on reliable operation, the choice of high-efficiency energy batteries is of utmost importance.

In conclusion, there are many advantages to using energy batteries as a backup power source, such as high efficiency, low cost and long life. However, the limitations of each type of battery, such as low temperature resistance or limited capacity, must be considered. In addition, the use of energy batteries as a backup energy source on a large scale may require significant installation and maintenance costs. In general, the use of energy batteries as a backup power source is an effective solution for many applications, but requires tradeoffs and selection of the most appropriate battery type for a particular application [5].

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ANALYSIS OF THE DEVELOPMENT OF THE THEORY OF THE LIFE CYCLE OF PRODUCTS

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Abstract. This article discusses the development of the theory of the product life cycle as a result of scientific and technological progress, describes in detail all the stages of the life of a modern product, and also compares the concepts and approaches of the last century with the principles that are used today.

Keywords: life cycle, products, product, product, stage, production, quality, development, development, consumer.

АНАЛИЗ РАЗВИТИЯ ТЕОРИИ ЖИЗНЕННОГО ЦИКЛА ПРОДУКЦИИ

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Аннотация. В данной статье рассматривается путь развития теории жизненного цикла продукции вследствие научно-технического прогресса, подробно описываются все этапы жизни современного продукта, а также сравниваются концепции и подходы прошлого века с теми принципами, что используются сегодня.

Ключевые слова: жизненный цикл, продукция, изделие, продукт, этап, производство, качество, разработка, развитие, потребитель.

Before getting into the hands of consumers, any product goes through a certain path, consisting of many interrelated stages. Their combination forms such a concept as the product life cycle. However, the life of any product is not limited to the processes of its creation and use, because in fact it is a much more complex and multi-stage concept.

The concept of the life cycle is now widespread in the social sciences. We can find its application in the analysis of the development of various social objects - from

individuals to large organizations and their aggregates. This concept is used to describe the processes of maturation and generational change, controlled by the mechanisms of reproduction in natural populations.

Despite many studies and concepts proposed by economists, the American economist Theodore Levitt presented the first full-fledged and meaningful theory of the product life cycle in 1965. He published his article "Exploit the Product Life Cycle" in the Harvard Business Review. He put forward the idea that absolutely any product, regardless of its type and brand, is going through a natural process of birth and death, as it inevitably faces competition. Due to continuous technological progress, new offers appear on the market that outperform competitors in many ways, thereby reducing the demand for old products [1].

Levitt believed that the concept represents the greatest value for managers at the stage of introducing a new product. Forecasting the possible cycle of a product allows for a more rational approach to the issue of product planning and sales planning, in addition, it helps to optimize the time of many processes after the launch of the product to the market, including the possibility of faster competitive responses, increased product life and exit of the old product from the market. In general, the length and slope of the product life cycle curve depends on the complexity of the product, degree of novelty, relevance to customer needs, and the availability of competitive substitute products. Typically, the following factors can prolong the implementation stage and create the most serious problems: high complexity of the product, absolute novelty, low dependence on fashion trends, a large number of people influencing the purchase decision, high price of the product, the need to change the habitual behavior of consumers. However, it is these factors that can create opportunities and become a source of product success [2, p. 102].

This theory was developed by another American Raymond Vernon in 1966. He believed that the development of world trade in finished products is explained based on the stages of their life [3, p. 31]. By life stage, Vernon means the period of time during which a product remains viable in the marketplace and achieves the seller's goals. He identifies the following stages (Figure):

1. Development and implementation – at this stage, a new product is developed that meets the emerging requirements within the country. This stage is characterized by a small-scale production format and at the same time, it needs highly skilled workers. The main task here is to present the product to the audience, study its reaction and, based on this data, generate demand. All products are concentrated mainly in the country of innovation, but a small part of it can also be supplied to the foreign market.

2. Growth in demand – a logical continuation of the previous stage is an increase in demand for the product and, as a result, the expansion of its production, an increase in exports to other developed countries and the desire for a more standardized form.

3. Maturity – at this stage, the release of the product moves to a large-scale format, and now the price factor begins to prevail in competition, rather than at the

previous stage. In order to reduce production costs and the cost of production, production begins to move to developing countries, where labor is much cheaper than in the country of innovation.

4. Decline – the final stage of the life cycle, which leads to the fact that the demand for the product decreases and, accordingly, production also decreases. Now the sales markets are mainly in developing countries, and the country of innovation becomes a net importer. There may be several reasons for the decline, for example, the development of the scientific and technical sphere of society and the emergence of new materials, technologies, ideas, etc.

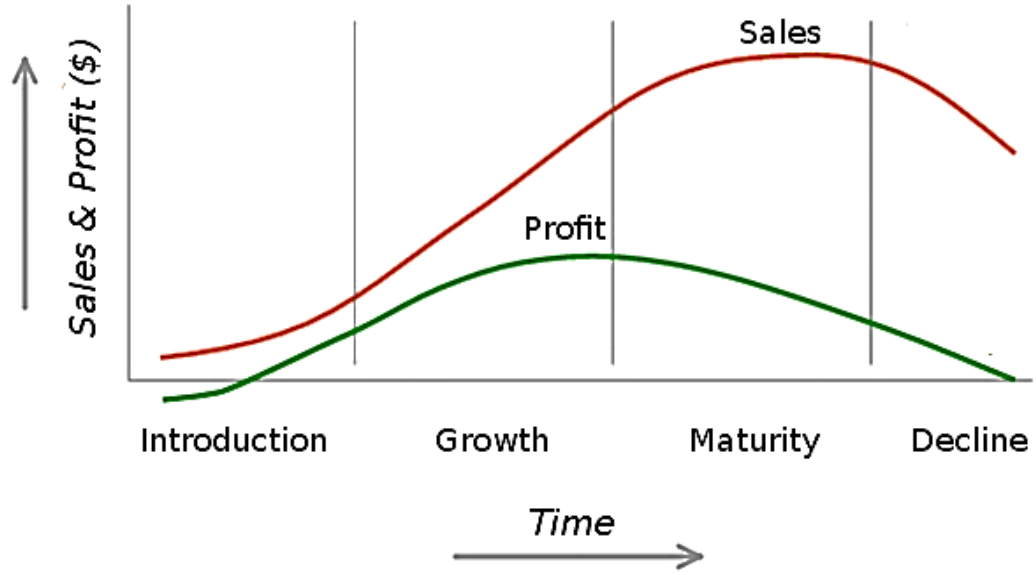


Figure. Product life cycle stages

It is worth noting that the country of innovation is the undisputed leader and has an advantage as long as it owns the latest technologies and resources that are not available to manufacturers in other countries. Nevertheless, eventually there is technological diffusion, product standardization, and due to lower production costs abroad, developing countries begin to displace the leader and comparative advantages pass to them.

All ideas and concepts of economists of the twentieth century. Served as the basis for modern life cycle theory. The stages proposed by Vernon were preserved in their essence, but at the same time expanded and supplemented, based on modern realities and the development of the techno sphere of society. Today, this concept is a set of sequential changes in the state of products that occur from the moment the need of society arises and until the moment when it is fully satisfied and the product is disposed of [4].

According to GOST R 53791 of the Federal Agency for Technical Regulation and Metrology, as well as the ISO 9004-1 standard, the life cycle of products for industrial purposes consists of a number of stages [5]:

1. Concept development, development justification, marketing – this stage includes marketing research aimed at obtaining information about consumer demand for specific products, as well as conceptual modeling and business process planning. This also includes the development of terms of reference (TOR) – the main document for product development. The product developers who directly know what determine the content of the requirements and in what form they want to receive.

2. Design and development – here it is necessary to create a set of design and technological documentation, in which signs will be established that identify a particular product, for example, brand, type, version, etc. To all this is added a description of the name of the product, its purpose, characteristics and scope, which must be necessary and sufficient for the competent presentation of the goods to the purchaser.

3. Technical preparation of production – this stage is quite extensive. It includes both economic training, including the purchase of equipment, tools, controls, design and organizational training, namely work with the project, drawings and technical documentation, as well as training and education of employees.

4. Manufacturing and research – when all processes are established and production is ready for full-fledged work, a sample of the products is manufactured in order to establish compliance of the manufactured product with all the requirements using the available quality control tools. The conclusion of this stage is a document confirming the quality of the product.

5. Production – now products can be launched into mass production, accompanied by control and testing to maintain the desired quality.

6. Intermediate stage – it can accommodate all those processes that occur between the direct release of the finished product and its use by the consumer. This includes product packaging and storage, its transportation to the market and the development of financial and shipping documents, installation and commissioning, etc.

7. Operation – despite the complete readiness of the product and the implementation of a huge number of stages, the product in the hands of the user must receive maintenance if necessary, and spare parts must be supplied for repair.

8. Disposal – the final stage of the product life cycle, which consists in the removal of the product from production, the termination of its operation, the dismantling and disposal of both the product itself and the materials used in the process of its production.

The life cycle of a product is depicted using several curves that reflect sales and profits over a certain time period. In addition to the main variants of the curves, there are additional ones that demonstrate the demand for products based on pricing policy, marketing and management decisions. The main curves of the life cycle include the following options:

1. "BOOM" – characterizes the emergence of high demand for certain items of goods. Consumer demand is maintained for a long time, which contributes to a stable growth in sales and profits. Typically, "BOOM" is characteristic of popular products,

which is supported by the appropriate marketing strategy of the company. Products in this category do not mature, so there is no decline, as with other products. Well-known examples include Apple products, Coca-Cola products.

2. "Plateau" – this curve shows a rapid increase in interest in goods and the same rapid decline in demand. At the same time, sales continue in the stage of product maturity. The curve is typical for a quality product that is well known to customers and has managed to earn their trust. When forming such a reputation for a product, fashion trends and trends are also taken into account. At the onset of maturity, the product is preferred by conservatives, new buyers are more likely to prefer technological innovations. An example would be e-books or tablets.

3. "Seasonality" – this model demonstrates the demand for a product that is renewed after a certain time period. Most often this happens with seasonal goods or products for which there is a periodic demand. At the time of maturity and decline, the curve creeps up or down, which shows a repeated cycle. The demand for such goods is dictated by seasonal needs or fashion trends, for example, nostalgia for a certain period. Examples of such products are retro accessories, winter clothes.

4. "Scallop" – the curve shows the growth of consumer demand, characteristic of the stage of maturity, in the form of a wave-like movement. Such products are good products that are of interest to a significant number of buyers. Customers choose products not only because of the quality, but also because of the decent level of service. Various product modifications can stimulate consumer interest, which prolongs the stage of product maturity. An example would be BMW cars, for which there is always a stable demand, and new models stimulate an increase in interest.

5. "Failure" – this curve is typical for unpopular products that did not justify the cost of production. Immediately after the start of sales, the product is no longer purchased, which is why it does not have a moment of growth, and the stage of maturity is not reached. The curve shows that if purchases are made, then the profit from this is too small to be taken into account. This happens when customers are not satisfied with the quality, cost or features of the product. An example is expensive drugs that have more affordable analogues.

Comparing the life cycle theory presented in the 20th century and the process that products go through today, noticeable differences are visible. Despite the broader interpretation of Vernon's four steps, quality control now plays a huge role in the life of a product. Today, the quality of a product is the main factor that consumers rely on when choosing. Today, quality is monitored as closely as possible than before, as the product standardization system is actively developing, as well as quality control tools that are being introduced at many stages in order to achieve a greater effect and prevent the production of defective products.

Thus, the theory of the product life cycle makes it possible to draw up long-term plans for possible successive actions, systematize forecasts, plan the expected duration of the stages of the life cycle of a new product, and effectively develop a pricing policy for a product.

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THE PROBLEM OF IMPORT SUBSTITUTION OF ANTIDIABETIC DRUGS

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Abstract. The paper considers in detail the problem of import substitution of antidiabetic drugs. To date, many foreign companies are engaged in the production of antidiabetic drugs, the manufacture of which in recent years has been mastered by Russia.

Keywords: diabetes mellitus, antidiabetic drugs, import substitution problem, pharmaceuticals, domestic market.

ПРОБЛЕМА ИМПОРТОЗАМЕЩЕНИЯ САХАРОСНИЖАЮЩИХ ПРЕПАРАТОВ

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Аннотация. В работе подробно рассматривается проблема импортозамещения сахароснижающих препаратов. На сегодняшний день многие зарубежные фирмы занимаются производством сахароснижающих препаратов, выпуск которых в последние годы освоила и Россия.

Ключевые слова: сахарный диабет, сахароснижающие препараты, проблема импортозамещения, лекарственные препараты, отечественный рынок.

Type 2 diabetes mellitus is a chronic disease that is dangerous for people [1]. The number of patients with diabetes in the Russian Federation is also steadily increasing every year. According to data for 2022, the number of diabetes patients in Russia is about 10.5 million people.

The peculiarity of this disease is that patients have to take expensive medications for life. The importance of antidiabetic drugs is increasing. Domestic manufacturers should strive to produce full-cycle drugs.

According to the International Diabetes Federation (IDF), there were 573 million diabetics worldwide in 2021; by 2030 they are projected to increase to 643 million and by 2045 to 783 million.

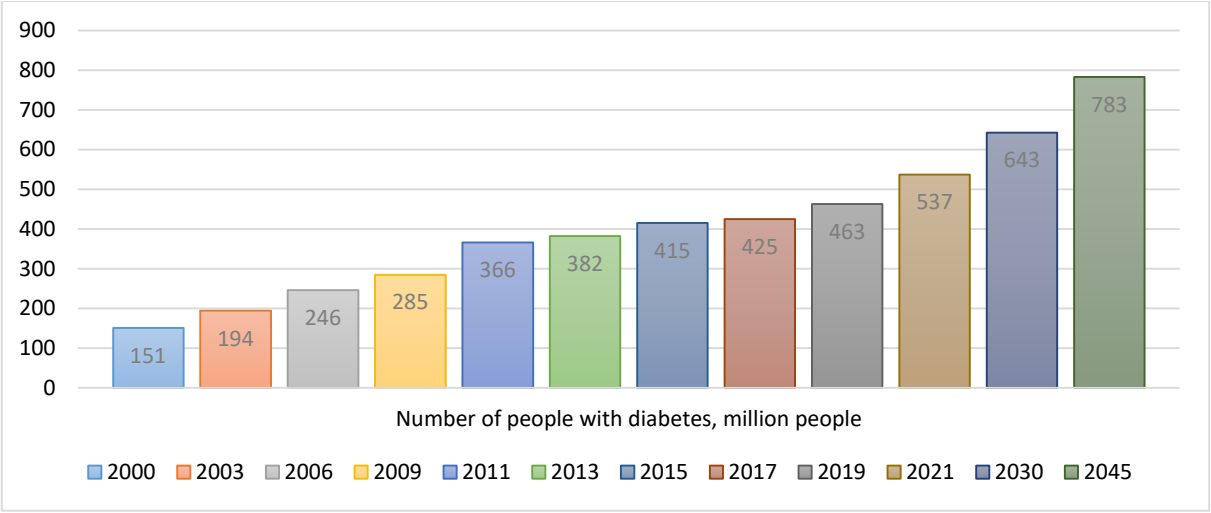


Figure 1. Statistics on the number of diabetics in the world

Currently, the arsenal of antidiabetic drugs is quite wide. In Russia, oral antidiabetic drugs are represented by monocomponent dosage forms and also by combined dosage forms [2]. Domestic production antidiabetic drugs is developed, but highly effective innovative drugs that have no generic analogues are produced exclusively abroad. Domestically produced drugs are usually reproduced medicines [3].

For the study of oral antidiabetic drugs, we used the reference book of official information on medicines: State Register of Medicines of Russia.

Analysis of the assortment structure by production feature showed that the majority of drug products are foreign (75 %). The largest number of drugs are produced in Germany (18.3 %), USA (13.3 %), India (8.3 %) and Denmark (6.7 %). Russian-made is 25 % of the drugs.

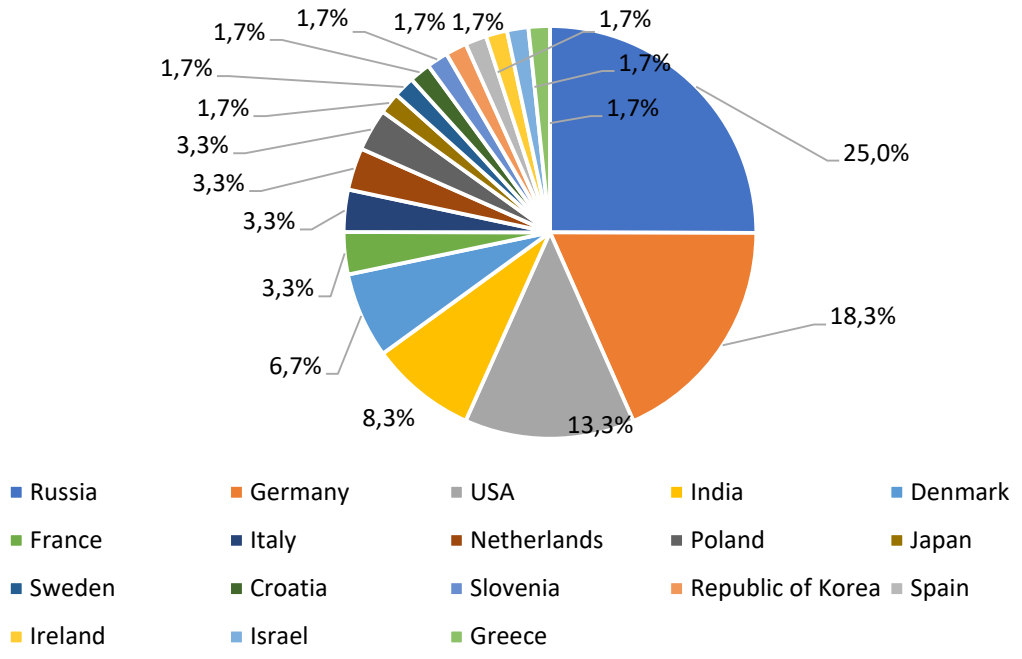


Figure 2. Structure of the assortment of oral hypoglycemic drugs by production feature

The largest share in the range of oral antidiabetic drugs is occupied by the groups of biguanides (32.4 %), sulfonylurea derivatives (36.2 %) and combined oral hypoglycemic agents (18.1 %). A smaller number of trade names are represented by the group of dipeptidyl peptidase inhibitors (7.6 %). Sodium glucose cotransporter type 2 inhibitors and other hypoglycemic drugs, except insulin, have a small share in the assortment (1.9 % each). The smallest share of the entire assortment of the studied group of drugs belongs to α-glucosidase inhibitors and thiazolidinediones (0.95 % each). Most of the monocomponent oral antidiabetic drugs are preparations with the INN Metformin. Among combined drugs, the most common is a combination of Metformin and Glibenclamide.

Based on this information, the structure of the Russian market of oral antidiabetic drugs has been compiled in graphical form.

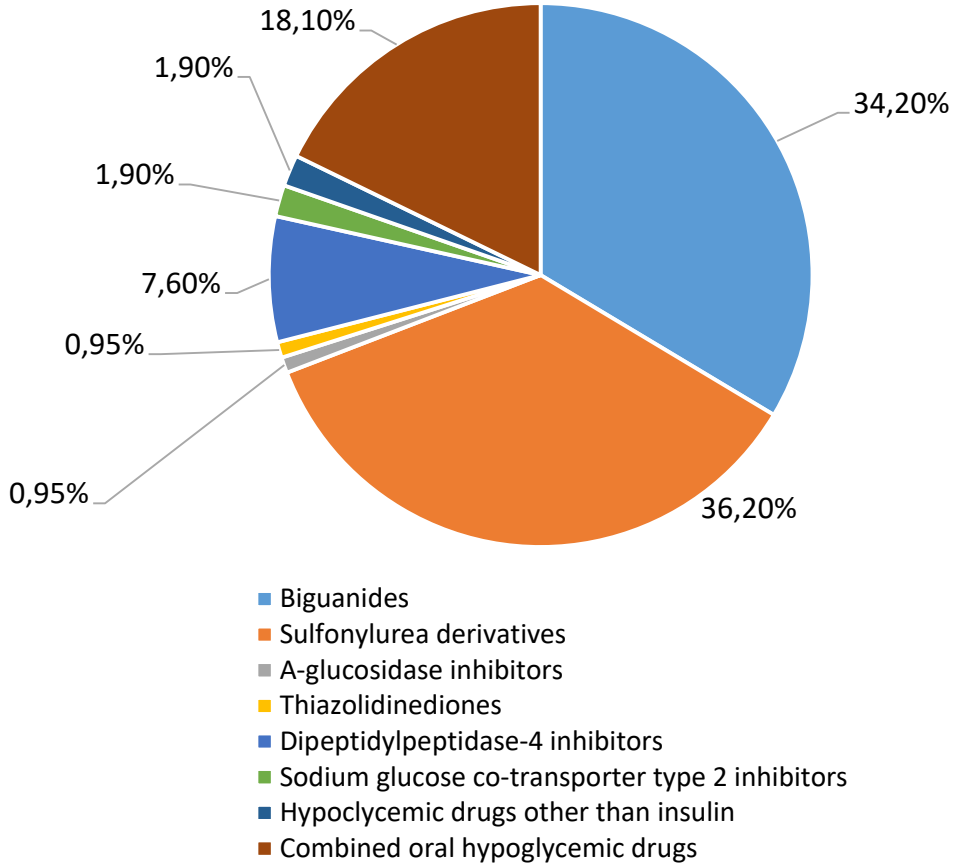


Figure 3. Structure of the Russian Market of Oral Antidiabetic Drugs

Based on the structure of the assortment of oral hypoglycemic drugs by production (Figure 2), we can see that Russian companies produce a significant share of these drugs, so it is worth highlighting the largest domestic manufacturers.

Among domestic producers we can mention "Pharmasintez-Tyumen", which is a part of "Pharmasintez" group of companies. This company brought to the Russian market a nomenclature of traditional sugar-lowering drugs.

Table 1 – List of oral blood glucose-lowering drugs by Pharmasintez-Tyumen

Trade name	*International nonproprietary name*
Merifatin	Metformin
Merifatin MB	Metformin
Glibenfage	Metformin+Glibenclamide
Golda MB	Gliclazide
Saterex	Gozogliptin
Statiglin	Glibenclamide
Yuglin	Gliquidone
Iglinid	Repaglinide
Instolit	Glimepiride

One of the key points that distinguish this Pharmasintez Group of Companies from other manufacturers in the market is that all substances for drug production are produced at BratskChemSintez plant. This plant is a part of Pharmasintez Group of Companies. The list of preparations of the plant includes active pharmaceutical substances of various pharmacological groups; every year the nomenclature of manufactured pharmaceutical substances is expanding. Thus, the company's development is aimed at import substitution of pharmaceutical substances. It is advisable and profitable for domestic manufacturers to strive for full-cycle production of drugs.

There was also an analysis of the share of antidiabetic drugs included in the List of Vital and Essential Drugs (VED). Approximately a little more than half of the oral antidiabetic drugs are included in this list. On the basis of the data obtained, a table was compiled, which indicated the drugs included in the list of vital and essential drugs, as well as which drugs were domestic and which were foreign.

Table 2 – Oral blood glucose-lowering drugs included in the List of Vital and Essential Drugs

Name of active ingredient	*Pharmacotherapeutic drug group*	*Production in the Russian Federation*
Metformin	Biguanides	+
Glibenclamide	Sulfonylurea derivatives	+
Gliclazide	Sulfonylurea derivatives	+
Alogliptin	DPP-4 inhibitors	+
Wildagliptin	DPP-4 inhibitors	+ (in Russian branches of foreign manufacturing companies)
Gozogliptin	DPP-4 inhibitors	+
Linagliptin	DPP-4 inhibitors	—
Saxagliptin	DPP-4 inhibitors	—
Sitagliptin	DPP-4 inhibitors	+ (in Russian branches of

Name of active ingredient	*Pharmacotherapeutic drug group*	*Production in the Russian Federation*
		foreign manufacturing companies)
Evogliptin	DPP-4 inhibitors	+
Dapagliflozin	SGLT2 inhibitors	+ (in Russian branches of foreign manufacturing companies)
Empagliflozin	SGLT2 inhibitors	—
Ipragliflozin	SGLT2 inhibitors	—
Ertugliflozin	SGLT2 inhibitors	—

One of the acute problems on the diabetes drugs market is the problem of import substitution. Many foreign companies are engaged in the production of antidiabetic drugs, which in recent years are also produced in Russia [4]. Foreign drugs are much more expensive. From an economic point of view, it is not profitable for the health care system if foreign drugs are purchased as reimbursable medicines. Patients also find it unprofitable to be treated with foreign-made drugs, when they buy expensive drugs themselves. But if a foreign drug is not more expensive than a domestic one, then some patients prefer foreign manufacturers [5]. This deprives domestic manufacturers of funds to develop production.

In many developed foreign countries, drug manufacturers have popular studies on the comparative effectiveness of generics with original drugs [6]. For example, the U.S. publishes the Orange Book (a list of approved drugs with therapeutic equivalence evaluations). It assigns code A to generics that have confirmed therapeutic equivalence to the original. And code B to medicines that, for some reason, cannot be considered therapeutically equivalent to the original. Unfortunately, few works of this kind are published in Russia, even though almost all sugar-lowering drugs are produced from foreign raw materials. That is, these drugs are generics. Thus, an important step for import substitution is to conduct comparative clinical trials of domestic and foreign drugs.

To date, Russia lacks its own development of original sugar-lowering drugs. However, there is a state target program "Pharma-2020", which has given impetus to the development of the pharmaceutical industry in Russia. Based on the results of this strategy, it was prolonged into the program "Pharma-2030". It is expected to continue to increase the share of domestic medicines.

Therefore, the issue of import substitution was studied. It can be concluded that at this point it is necessary to take measures aimed at the development and introduction into clinical practice of domestic effective antidiabetic drugs.

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CHEMICAL SENSORS – DEVICES FOR SAFE HUMAN LIFE

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Abstract. Chemical sensors are devices that detect the presence of certain chemicals, gases or compounds in the environment. They play a crucial role in ensuring the safety of human life by controlling and detecting harmful pollutants and toxins in the air, water and soil. Chemical sensors are widely used in various industries such as healthcare, food safety, environmental monitoring and national security. These devices provide accurate and reliable results, making them an important tool to ensure a healthy and sustainable future for everyone.

Keywords: sensors, gas, industrial conditions, safety, environment.

ХИМИЧЕСКИЕ ДАТЧИКИ – УСТРОЙСТВА ДЛЯ БЕЗОПАСНОЙ ЖИЗНИ ЧЕЛОВЕКА

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Аннотация. Химические датчики – это устройства, которые обнаруживают присутствие определенных химических веществ, газов или соединений в окружающей среде. Они играют решающую роль в обеспечении безопасности человеческой жизни, контролируя и обнаруживая вредные загрязнители и токсины в воздухе, воде и почве. Химические датчики широко используются в различных отраслях, таких как здравоохранение, безопасность пищевых продуктов, мониторинг окружающей среды и национальная безопасность. Эти устройства обеспечивают точные и надежные результаты, что делает их важным инструментом для обеспечения здорового и устойчивого будущего для всех.

Ключевые слова: датчики, газ, промышленные условия, безопасность, окружающая среда.

Modern physical systems in which human life takes place require monitoring of their condition. Sensors for various purposes are widely used for this purpose. Their main tasks are the collection, fixation, transmission, processing and distribution

of information, including chemical composition, shape, structure, position, dynamics, etc. The principles of their operation are based on certain physical or chemical phenomena and properties. It is difficult to name the direction of human activity in which sensors are not used.

Chemical sensors are devices for the identification and quantification of substances in the atmosphere or in solutions. Chemical sensors are practically not used for the analysis of solid-phase substances. The key feature of a chemical analyzer is selectivity, i. e. the ability to respond only to a certain chemical compound and not react to all others.

Chemical sensors react either to chemical reactions or to certain substances. They are widely used for solving scientific and applied tasks (monitoring of atmospheric pollution, detection of explosives), in industry (control of technological processes, gas contamination of workrooms, food quality control), agriculture (distribution of pesticides, fertilizers), medicine, military, etc.

There are several types of chemical sensors, including electrochemical, optical and mass sensors. In electrochemical sensors, a change in the electrical properties of the system is recorded; in optical sensors, a change in the absorption or emission of light; in mass sensors, changes in the mass of substances. All these changes are the result of past chemical reactions.

Gas sensors (gas analyzers), which detect gases in the environment and measure their concentration, are perhaps the most actively and widely used type of chemical sensors. Today, there are many different types of gas analyzers available on the market, each of which has unique functions and capabilities.

One of the most common gas sensors are detectors created on the basis of an electrochemical cell in which a reaction with the participation of the detected gas takes place on the surface of the electrode. As a result of this redox process, the electrical parameters of either the electrodes themselves or the electrolyte in contact with them change. Such sensors are often used to detect toxic gases such as carbon monoxide or hydrogen sulfide.

Another type of gas sensor is an infrared sensor, which works by detecting the absorption of infrared light by gas molecules. Infrared sensors can be used to detect a wide range of gases, including hydrocarbons, carbon dioxide and methane.

Catalytic gas analyzers use a catalyst that accelerates the chemical reaction between gas and oxygen, creating a measurable signal. Catalytic sensors are commonly used in gas detection systems for industrial and commercial applications, including monitoring of combustible gases in manufacturing plants, monitoring of carbon monoxide in garages and detection of gas leaks in natural gas pipelines (methane and propane).

Finally, semiconductor sensors use metal oxide to detect the presence of gas. When a gas molecule comes into contact with a metal oxide, its electrical conductivity changes, creating a measurable signal. Semiconductor sensors are commonly used in everyday life to detect gases such as carbon dioxide, nitrogen dioxide, chlorine, ozone, hydrogen chloride.

Chemical sensors are used in various fields for safety purposes to detect hazardous chemicals and gases. Here are some of the areas where chemical sensors are commonly used:

1. Industrial conditions. Chemical sensors are used in industrial environments to detect hazardous gases and chemicals such as carbon monoxide, chlorine, hydrogen sulfide and ammonia. These sensors help to ensure the safety of workers and prevent possible accidents.

2. Environmental monitoring. Chemical sensors are used to monitor the quality of air and water in the environment. They can detect pollutants such as carbon monoxide, nitrogen oxides and sulfur dioxide, which can have harmful effects on human health and the environment.

3. Medical applications. Chemical sensors are used for medical purposes to monitor the concentration of gases in the blood. For example, they are used in anesthesia to control the amount of oxygen and carbon dioxide in the patient's blood.

4. Food and beverage industry. Chemical sensors are used in the food and beverage industry to detect pollutants and ensure food safety. They can detect potential allergens, bacteria and other harmful substances.

5. Fire safety. Chemical sensors are used in fire safety systems to detect smoke and other potential fire hazards. They can also detect carbon monoxide and other gases that can form during a fire [1, 2].

In general, chemical sensors are necessary to ensure safety in various industries and applications.

Chemical sensors work by detecting and measuring specific molecules in a substance, usually through some kind of chemical reaction. There are various types of chemical sensors, but the most common types are:

1. Electrochemical sensors. These sensors use electrodes to detect and measure changes in electric current caused by the presence of certain molecules. For example, a glucose sensor can use an enzyme to catalyze a reaction between glucose and oxygen, creating an electric current that can be measured. The advantages of electrochemical sensors include high sensitivity, low cost and the ability to measure changes in real time. However, they may be affected by interfering substances, and their operation may be affected by temperature and humidity.

2. Optical sensors. These sensors use light to detect and measure changes in the absorption or transmission of light of a certain wavelength caused by the presence of certain molecules. For example, a carbon dioxide sensor can use infrared light to measure the amount of carbon dioxide present in a sample. The advantages of optical sensors include high specificity and sensitivity, short response time and low power consumption. However, they can be expensive, require special equipment and may depend on changes in temperature and humidity.

3. Gas sensors. These sensors use various methods to detect and measure the presence of certain gases. For example, a nitric oxide sensor can use a metal oxide semiconductor to detect the presence of nitric oxide molecules that alter the electrical conductivity of the sensor. The advantages of gas sensors include the ability of sensors to detect and measure various types of gases in the atmosphere, the ability to integrate with alarms or other warning systems. And the disadvantages include the

fact that some gases are difficult to detect using gas sensors, and gas sensors can also depend on environmental factors such as temperature and humidity.

4. Biosensors. These sensors use biological components, such as enzymes or antibodies, to detect and measure specific molecules. For example, a lactate sensor can use lactate dehydrogenase to catalyze a reaction between lactate and NAD+, causing a measurable change in electric current. The advantages of biosensors include high specificity and sensitivity, the ability to integrate with portable devices for on-site testing, the ability to use in various fields, such as medical diagnostics, food safety and environmental monitoring [3, 4].

Once the chemical sensor has detected and measured the presence of a certain substance, the data can be analyzed to determine the concentration or amount of the substance present. This information can be used in various applications, from medical diagnostics to environmental monitoring.

There are several limitations and problems associated with the use of chemical sensors, including:

1. Sensitivity. Chemical sensors may not detect low concentrations of certain chemicals, which may limit their effectiveness.

2. Specificity. Some chemical sensors may not be selective enough to distinguish between different chemicals, which leads to false positive or false negative results.

3. Stability. Chemical sensors can be affected by changes in temperature, humidity and other environmental factors, which over time can affect their accuracy and reliability.

4. Calibration. Chemical sensors require regular calibration to ensure their accuracy, which can take a lot of time and money.

5. Interference. Chemical sensors can be affected by other chemicals in the environment, which leads to interference and inaccurate readings.

6. Maintenance. Chemical sensors require regular maintenance and cleaning to ensure their optimal performance, which can take a lot of time and money.

Chemical sensors are an important tool for detecting and measuring various substances in air and liquids. They are used in a wide variety of industries, including the food industry, environmental monitoring and healthcare. However, the cost of various chemical sensors varies greatly depending on their technology, sensitivity and accuracy.

1. Electrochemical sensors. Electrochemical sensors are one of the most popular types of chemical sensors. They detect and measure the concentration of various substances in air or liquids. The most common electrochemical sensors include carbon monoxide and oxygen sensors. The cost of these sensors can range from $5 to $500 depending on their accuracy, sensitivity and durability.

2. Optical sensors. Optical sensors use light to detect and measure various substances in air or liquids. They are commonly used to detect gases such as methane and carbon dioxide. The cost of an optical sensor can vary from $50 to $5,000, depending on its sensitivity and accuracy.

3. Catalytic sensors. Catalytic sensors are used to detect flammable gases such as ethanol, propane and methane. They work by using a catalyst to accelerate the

reaction between gas and oxygen, producing a measurable signal. The cost of catalytic sensors can range from $50 to $500 depending on their durability and sensitivity.

4. Ion-selective sensors. Ion-selective sensors are used to detect and measure the concentration of ions in liquids. They are commonly used in the food and pharmaceutical industries to measure the acidity or alkalinity of a solution. The cost of an ion-selective sensor can vary from $50 to $1,000, depending on its accuracy and sensitivity.

5. Gas chromatography. Gas chromatography is a method of separation and analysis of various components of a gas mixture. It is commonly used in environmental monitoring, drug testing, and food analysis. The cost of a gas chromatography system can range from $10,000 to $100,000, depending on its complexity, sensitivity and accuracy [5, 6, 7].

In conclusion, the cost of various chemical sensors varies depending on their technology, sensitivity and accuracy. While some sensors may be cheap, they may not be as accurate or sensitive as more expensive ones. Before choosing a chemical sensor, it is important to consider the specific needs and requirements of your application.

Chemical sensors are becoming increasingly important in the industry, playing a crucial role in ensuring safety, efficiency and quality control. These devices are used to detect and measure the presence of various chemicals and pollutants, providing real-time data that can be used to make informed decisions and take the necessary measures.

Chemical sensors are used in a wide variety of industries, from pharmaceuticals and the food industry to oil and gas and environmental monitoring. In the pharmaceutical industry, for example, chemical sensors are used to detect impurities in medicines, which ensures that they meet strict quality standards before being released to the market. In the food industry, chemical sensors are used to detect contamination, ensuring that food is safe to eat. The oil and gas industry is another major user of chemical sensors. These sensors are used in a variety of applications, including oil and gas exploration, production and transportation. Chemical sensors are used to detect gas leaks and other hazardous substances, helping to prevent accidents and minimize the risk of explosions.

In addition to safety, chemical sensors are also used to increase efficiency and optimize processes. For example, chemical sensors can be used to monitor the concentration of chemicals in the production process, ensuring that the product meets certain quality standards. Chemical sensors can also be used to monitor the condition of equipment, detect signs of wear and prevent breakdowns.

Chemical sensors are used in various industries and in everyday life, including:

1. Healthcare. Chemical sensors are used in medical devices to monitor basic vital signs, diagnose diseases and detect chemical imbalances in the body.

2. Environmental monitoring. Chemical sensors are used to monitor air and water quality, detect pollution and monitor the presence of hazardous materials in the environment.

3. Food and beverage production. Chemical sensors are used to monitor the quality and freshness of food, detect pollutants and ensure food safety.

4. Agriculture. Chemical sensors are used in precision farming methods to monitor soil quality, detect and prevent crop diseases, and optimize crop growth.

5. Automotive industry. Chemical sensors are used in automotive engines to control emissions, detect malfunctions and optimize fuel efficiency.

6. Industrial production. Chemical sensors are used in industrial processes to track chemical reactions, detect leaks and spills, and ensure workplace safety.

7. Security and protection. Chemical sensors are used to detect explosives, chemical warfare agents and other hazardous materials for security and defense purposes.

8. Personal hygiene products. Chemical sensors are used in personal care products such as breathalyzers, skin moisture sensors and pH sensors.

In general, while chemical sensors can be useful tools for detecting and quantifying chemicals in various applications, their limitations and challenges need to be carefully considered to ensure their correct use and interpretation of results.

In conclusion, it can be said that gas sensors are an important tool in many industries, including mining, oil and gas and manufacturing industries. Each type of sensor has its own unique capabilities, and choosing the right sensor for a particular application requires careful con

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ALLOTROPIC MODIFICATION OF CARBON. FULLERENES

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Abstract. The paper considers allotropic modifications of carbon, in particular fullerene, its chemical and physical properties, as well as its application. The study of allotropic modifications of carbon, in particular fullerenes, is very relevant due to their unique properties and potential applications in various fields, such as medicine, electronics and energy.

Keywords: carbon, atom, fullerene, structure, modification, application, physical properties, chemical properties.

АЛЛОТРОПНАЯ МОДИФИКАЦИЯ УГЛЕРОДА. ФУЛЛЕРЕНЫ

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Аннотация. В работе рассматриваются аллотропные модификации углерода, в частности фуллерен, его химические и физические свойства, а также применение. Изучение аллотропных модификаций углерода весьма актуально в связи с их уникальными свойствами и потенциальными применениями в различных областях, таких как медицина, электроника и энергетика.

Ключевые слова: углерод, атом, фуллерен, строение, модификация, применение, физические свойства, химические свойства.

Carbon is one of the most abundant elements in the universe and has a wide range of allotropic forms known as allotropes. These allotropes differ in their physical and chemical properties, which makes them useful for various applications. Fullerenes are a special type of carbon allotrope that has attracted considerable attention due to their unique properties and possible applications in various fields. Fullerenes are spherical cells composed entirely of carbon atoms. These structures

were first discovered in 1985 and have been actively studied since then because of their unusual properties.

Fullerenes have high tensile strength, high thermal conductivity and exhibit unusual electronic properties. These unique properties have led to the development of many potential applications in fields such as electronics, medicine and nanotechnology. One of the most promising applications of fullerenes is drug delivery. Fullerenes can be functionalized by various functional groups, which allow them to target specific cells or tissues in the body. In addition, fullerenes have been shown to be effective in delivering drugs across the blood-brain barrier, which is a serious obstacle in the treatment of neurological diseases. Fullerenes also have potential applications in electronics, as their electronic properties make them useful in the development of semiconductors and other electronic devices. In addition, fullerenes can be used in the development of new materials for energy storage and conversion.

Allotropy is the possibility of the existence of chemical elements in the form of two or more crystalline phases. The concept of allotropy also includes the existence of non-crystalline phases, such as oxygen and ozone, ortho- and parahydrogen.

Carbon exists in two distinct crystalline allotropic forms: diamond and graphite. Previously, it was believed that the so-called amorphous forms of carbon, charcoal and soot, are also its allotropic modifications, but it turned out that they have the same crystal structure as graphite. Polymorphic transformation of carbon crystals is an example of a monotropic (irreversible) transition. At temperatures above 1000 ° C, diamond easily and quickly turns into graphite. In contrast, it is possible to turn graphite into diamond only at temperatures over 3000 °With and pressures up to 100 MPa, i. e. under the conditions of thermodynamic stability of diamond.

Allotropic carbon modifications

- Diamond
- Graphene
- Graphite
- Carbine
- Lonsdale
- Nanodiamond
- Fullerenes
- Fullerite
- Carbon fiber
- Carbon nanofibers
- Carbon nanotubes

1. Fullerenes

1.1. Opening history

The discovery of fullerenes, a new form of existence of one of the most common elements on Earth – carbon, is recognized as one of the most important discoveries in the science of the XX century. Scientists have long known the amazing ability of carbon atoms to bind into complex, often branched and voluminous

molecular structures that form the basis of all organic chemistry. However, the actual possibility of the formation of stable framework molecules from only one carbon still turned out to be unexpected.

In 1973, the works of Japanese scientist Osawa and Russian scientists D. A. Bochvar and E. N. Halpern were published, where, according to the results of quantum chemical calculations, a theoretically existing stable form of carbon containing 60 carbon atoms in a molecule and having no substituents was described. In the same article, the form of such a hypothetical molecule was proposed. The conclusions of this work seemed absolutely fantastic at the time. No one could imagine that such a molecule could exist, and even more so how to take up its production. This theoretical work was somewhat ahead of its time and was at first simply forgotten.

In the 1980s, astrophysical studies made it possible to establish that bands indicating the existence of purely carbon molecules of various sizes were found in the spectra of some stars, the so-called "red giants".

Experimental confirmation that C60 and C70 type molecules can occur during naturally occurring processes occurred in 1985. At the same time, scientists Robert Curl, Harold Kroto, Richard Smalley, His and O'Brien studied the mass spectra of graphite vapors obtained under the impact of a laser beam, and found that there are two signals in the spectra, the intensity of which is much higher than all the others. The signals corresponded to masses 720 and 840, which indicated the existence of large aggregates of carbon atoms – C60 and C70. Mass spectra allow us to determine only the molecular mass of the particle and no more, but this turned out to be enough to make the imagination of scientists' work. As a result, the structure of a polyhedron assembled from pentagons and hexagons was proposed. It was an exact repetition of the structure proposed 12 years ago by Bochvar.

A new stage came in 1990, when a method for obtaining new compounds in gram quantities was found, and a method for isolating fullerenes in pure form was described. Very soon after, the most important structural and physical and chemical characteristics of fullerene C60, the most easily formed compound among the known fullerenes, were determined.

These compounds were called after the engineer and designer Richard Buckminster Fuller, whose geodesic structures are built on this principle. In the catalogues of chemical reagents, the substance C60 is called buckminsterfullerene, chemists often call it simply fullerene. There is another figurative name - football, because the similarity with the tire of a soccer ball is obvious. There is also a hybrid of both names – buckyball.

1.2 Synthesis

Methods of synthesis of fullerenes. The basis for the production of fullerenes are high-temperature carbon vapors. There are many ways to obtain them: heating graphite rods with electric current in vacuum, electric arc discharge between graphite electrodes in a helium atmosphere, laser evaporation of carbon, combustion of hydrocarbons and naphthalene. The synthesis results in a complex mixture containing

carbon black, a mixture of fullerenes of various compositions (C60, C70, etc.) and impurity molecules, usually polyaromatic hydrocarbons. Isolation of fullerenes is carried out by extraction with organic solvents, followed by separation into individual products. Currently used methods allow to obtain mainly C60 and C70. These compounds are commercially available. Higher and endohedral fullerenes can also be obtained, but in significantly smaller quantities. Trace amounts of fullerenes may be present in natural samples - shungites, carbon minerals, coal, carbon-containing soot. Fullerenes and fullerene-like compounds may have been formed due to a lightning strike in rocks containing carbon. Gasoline and coal can also be used for the synthesis of fullerenes. Methods of their synthesis, separation and purification are constantly being improved.

Laser evaporation of graphite

The early approach to the synthesis of fullerenes described in this section, based on laser evaporation of graphite, made it possible to obtain microscopic quantities of end products detectable only on mass spectral equipment. The experiments of Kroto and Smalley in 1985 showed the exceptional stability of carbon clusters C60 and C70, which aroused great interest of the world community in these compounds. The same experiments stimulated the search for synthesis methods for obtaining fullerenes in macroscopic, gram quantities. The installation proposed by Smalley at the very beginning of the "fullerene era" made it possible to obtain fullerenes by laser evaporation of graphite. A pulsed neodymium laser operating at a wavelength of 532 nm and giving an energy of 250 MJ in a pulse was used as a radiation source. The beam was directed at a graphite target in the shape of a disk, located in a furnace at a temperature of 1200 °C. The resulting carbon and fullerene vapors were carried away by the helium stream and deposited on the walls of the chamber. A significant disadvantage of the installation is the low yield of the final product, but it is indispensable in studying the mechanism of formation of carbon clusters, including fullerenes.

Electric arc synthesis

In 1991, German scientist Wolfgang Kretschmer discovered that carbon electrodes heated by electric current in a helium atmosphere can give gram amounts of fullerenes included in the resulting soot. This was a real breakthrough in the search for methods for the synthesis of fullerenes, their further research and use. The first such installation for the synthesis of fullerenes in macro quantities was a glass cap with devices for pumping and inlet gases. Inside there were two graphite rods: thin and pointed, which served as an evaporated anode; the other – of a larger diameter and flat shape – served as a cathode. The installation was first evacuated, and then filled with helium. When a current was applied between the electrodes, an electric arc with a temperature of 2500-3000 °C. Carbon black with fullerene molecules was deposited on the cold walls of the hood and on the trap. The yield of fullerenes reached 10 % of the soot weight. The principle of operation of the Krechmer installation has been successfully used by other researchers. Subsequently, the installation was improved by the authors themselves and their followers.the authors

themselves and their followers. Currently, an electric arc burning between graphite electrodes in a helium atmosphere at a pressure of 200 torr is the most effective way to obtain gram amounts of fullerenes in laboratory conditions. This method requires an inert gas pressure of at least 25 torr. An increase in the pressure of the inert gas contributes to the formation of fullerenes with a larger mass. The heat generated in an electric discharge between graphite electrodes evaporates carbon c, forming soot and fullerenes, which condense together on the cooled walls of the reactor.

2. Properties of fullerenes

2.1. Fullerenes are a group of carbon allotropes with a number of unique chemical properties. Some important chemical properties of fullerenes:

– They have strong covalent bonds between carbon atoms, which makes them very stable.

– Fullerenes can undergo several chemical reactions, including oxidation, reduction and addition reactions.

– They have a high affinity for the electron, which makes them excellent electron acceptors.

– Fullerenes can act as superconductors, meaning they have zero electrical resistance at low temperatures.

– They have a high surface area to volume ratio, which makes them useful in applications such as catalysis, gas storage and drug delivery.

– It is also known that fullerenes form complexes with metal ions, which can further improve their properties and potential applications.

2.2. Fullerenes are also a unique class of carbon molecules with several physical properties, including:

– Molecular weight. Fullerenes are relatively heavy molecules with a molecular weight of 720 to 960 g/mol.

– Solubility. Fullerenes are insoluble in water, but can be dissolved in organic solvents such as benzene, toluene and chloroform.

– Melting and boiling point. Fullerenes have high melting and boiling points, which makes them stable at high temperatures.

– Electrical Conductivity: Some fullerenes can conduct electricity, making them useful in electronic applications.

– Density. Fullerenes have a relatively low density, which makes them suitable for use in lightweight materials.

– Hardness. Fullerenes are very hard, which makes them useful in the production of materials requiring high strength and durability.

– Optical properties. Fullerenes have unique optical properties that make them useful in optics and photonics.

3. Application of fullerenes

As it is clear from the above, the strength of fullerenes lies in their stability, composability and the fact that they have a cavity inside. Therefore, fullerene is valuable as a relatively inert molecule, inside which there may be a "payload" – another molecule that needs to be "not tilted". That is why both fullerenes and

nanotubes can serve as ideal "capsules" or "wires" for transferring material at the nanotechnology level. At the same time, it is possible to obtain ever larger fullerenes, in which more complex molecules can be embedded. The most interesting variant of the "capsule" use of fullerenes, in my opinion, is the targeted delivery of antitumor drugs. Chemical bonds inside fullerene allow "not to spill" the drug. At the same time, biochemical "antennas" can be attached to the surface of fullerene using chemical bonds, which will lead fullerene to the tumor, as well as immune system inhibitors that will provide a therapeutic effect without massively suppressing the patient's immunity.

No less interesting are the possibilities of using fullerenes in:

1. Electronics. Fullerenes have unique electronic properties that can make them useful in the development of new electronic devices, including transistors, solar cells and batteries.

2. Catalysis. Fullerenes can act as catalysts that accelerate chemical reactions. They have been studied for their potential use in industrial processes such as oil refining and plastics production.

3. Materials Science. Fullerenes can be incorporated into polymers to improve their mechanical, thermal and electrical properties. They can be used in the development of high-performance materials for aerospace, automotive and other industries.

4. Application in the environment. Fullerenes can help in removing pollutants from the environment. They have been studied for their potential use for water and air purification.

5. Cosmetics. Fullerenes are used in cosmetics because of their antioxidant properties. They can be used in anti-aging products and skin care products.

In general, fullerenes represent a promising area of research with potential applications in various fields.

Conclusion

In conclusion, the allotropic modification of carbon has led to the appearance of various forms of carbon with unique properties and applications. Fullerenes, which are a type of carbon allotrope, have attracted considerable attention due to their unusual cellular structure and potential applications in various fields such as medicine, electronics and materials science. The discovery of fullerenes has opened up new opportunities for research and development, and their potential applications continue. Thus, the study of allotropic modification of carbon, including fullerenes, is crucial for improving our understanding of carbon and its use in various fields.

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OSMOTIC POWER PLANTS: PURE SALT WATER ENERGY

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Abstract. This paper examines the potential of osmotic power plants as a renewable energy source. The process of electricity generation due to the difference in salt concentration in sea and fresh water, as well as the advantages and problems of this technology are discussed. The authors also highlight the current state of research and development in this area and their potential for sustainable energy production.

Keywords: osmotic power plants, alternative energy sources, hydroelectric power station, osmosis, biomimicry.

ОСМОТИЧЕСКИЕ ЭЛЕКТРОСТАНЦИИ: ЧИСТАЯ ЭНЕРГИЯ СОЛЕНОЙ ВОДЫ

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Аннотация. В работе исследуется потенциал осмотических электростанций как возобновляемого источника энергии. Обсуждается процесс производства электроэнергии за счет разницы в концентрации соли в морской и пресной воде, а также преимущества и проблемы этой технологии. Авторы также подчеркивают текущее состояние исследований и разработок в этой области и их потенциал для устойчивого производства энергии.

Ключевые слова: осмотические электростанции, альтернативные источники энергии, гидроэлектростанция, осмосис, биомимикрия.

Energy is a vital resource for modern society. Fossil fuels such as coal and oil have been the main sources of energy in the last century. However, burning fossil fuels releases greenhouse gases that contribute to climate change. Renewable energy sources, such as solar, wind and hydropower, are becoming increasingly important as a way to solve problems related to climate change. In recent years, a new form of renewable energy has emerged: osmotic energy.

Osmotic energy is a type of renewable energy that uses the power of salt water. Salt water has a higher salt concentration than fresh water [1]. When salt water and fresh water are separated by a semipermeable membrane, water molecules will move from an area with a low salt concentration (fresh water) to an area with a high salt concentration (salt water) in a process known as osmosis. This movement of water molecules can be used to generate electricity.

Osmotic power plants use the osmosis process to generate electricity. The basic principle of osmotic energy generation is to use a semi-permeable membrane to separate salt water from fresh water. Salt ions in salt water will pass through the membrane, leaving fresh water behind. This creates a pressure drop on the membrane that can be used to generate electricity. This prototype power plant operates on the principle of osmosis (Figure 1).

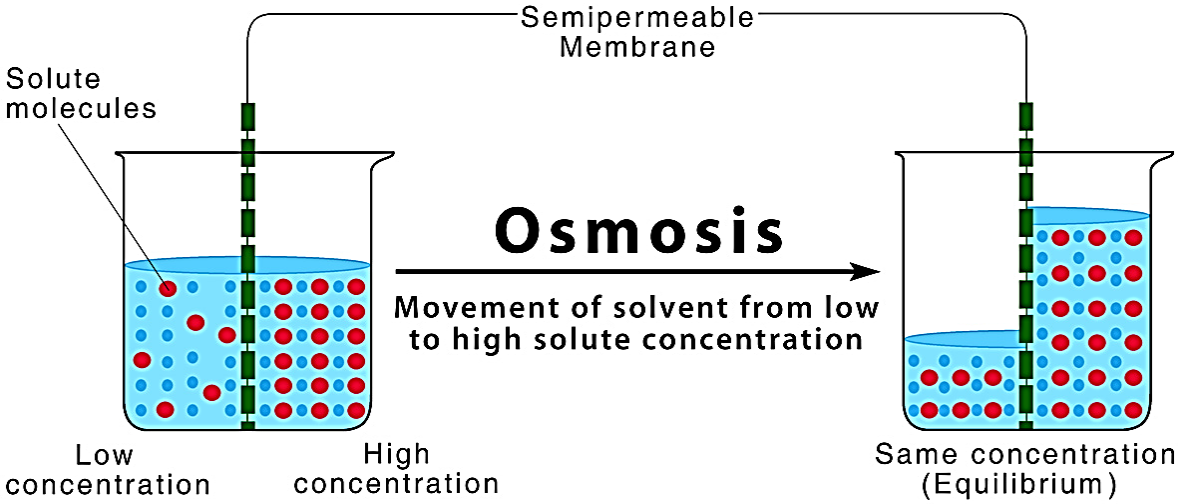


Figure 1. The principle of osmosis

There are two main types of osmotic power plants: pressure retarded osmosis (PRO) and reverse electrodialysis (RED) [2]. Pressure retarded osmosis is a type of osmotic power plant that generates electricity by exploiting the pressure difference that occurs when two solutions with different salinity are separated by a semipermeable membrane. In the PRO, the membrane allows water molecules to pass through, but blocks the passage of ions and other dissolved substances. As a result, water from a solution with a lower salinity diffuses through the membrane into a solution with a higher salinity, creating a pressure drop and a flow of water through a turbine that generates electricity. The energy generated by the turbine depends on the difference in salinity of the two reservoirs, as well as on the water flow.

The PRO process is relatively slow and requires a large membrane area to produce a significant amount of energy. However, the advantage of PRO is that it is more efficient than other osmotic energy technologies, such as PRO, which requires higher pressure and energy costs to operate. The PRO can be used in coastal areas with access to seawater, where it can become a source of renewable energy without the need for fuel or emissions.

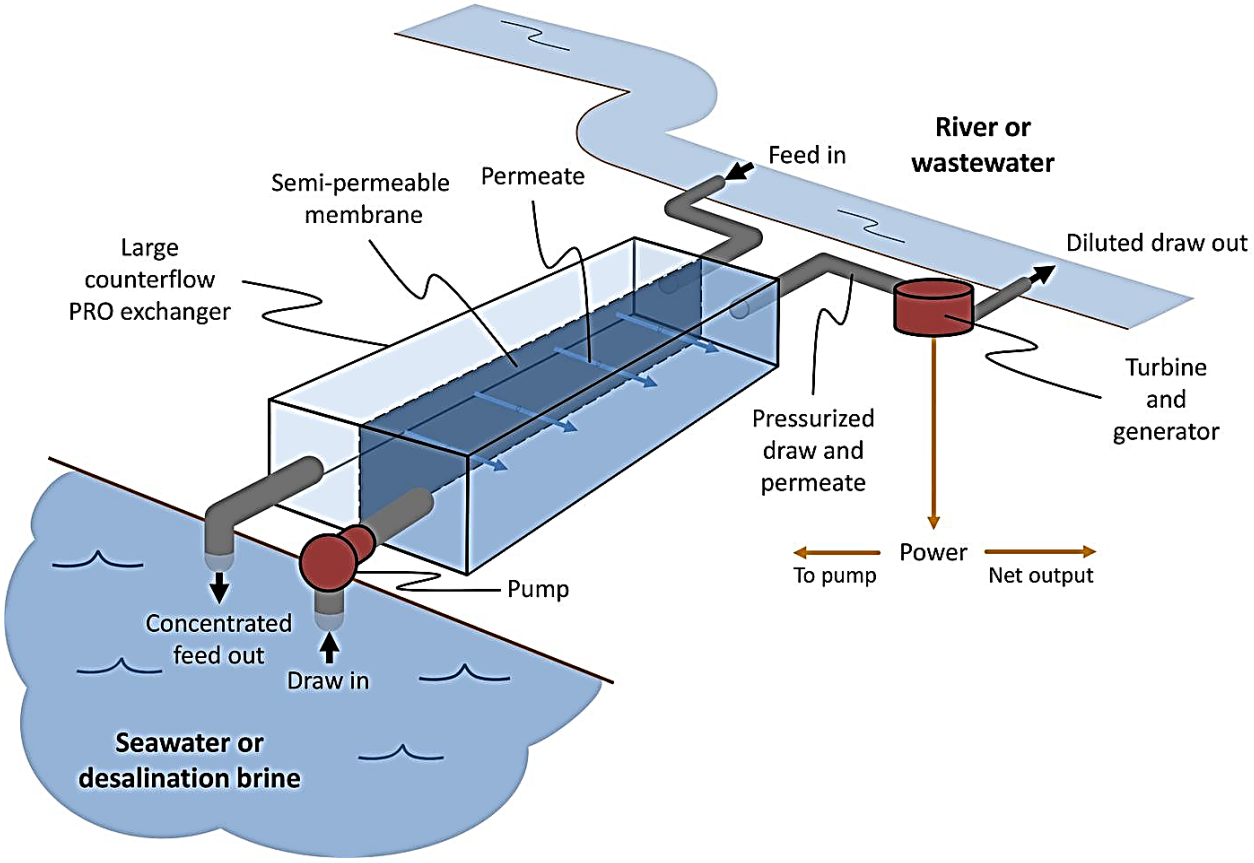


Figure 2. The principle of operation of an osmotic power plant

In the osmotic power plant RED, two different types of membranes alternate. Salt water passes through one set of membranes, and fresh water passes through another. Salt ions in salt water are attracted to the opposite charge on the other side of the membrane, creating a potential difference. This voltage difference can be used to generate electricity [3].

Osmotic energy can become an important source of renewable energy [4]. Unlike solar and wind energy, which act intermittently, osmotic energy can be generated continuously. Osmotic energy also does not depend on location – it can be generated wherever there is salt and fresh water. Since two-thirds of the world's population lives near the coast, osmotic energy can bring clean energy to millions of people.

The osmotic membrane is a selectively permeable barrier that allows solvent molecules to pass through, but prevents the flow of solutes. This membrane is commonly used in the reverse osmosis process to purify water. The membrane consists of a thin layer of polyamide or cellulose acetate placed between two layers of supporting material (Figure 3). The pores in the membrane are small enough to prevent the penetration of dissolved pollutants, but large enough to allow water molecules to pass through. When water passes through the membrane, it is cleaned and concentrated impurities are removed. The use of osmotic membranes has revolutionized the water treatment industry and made clean drinking water more accessible to people around the world.

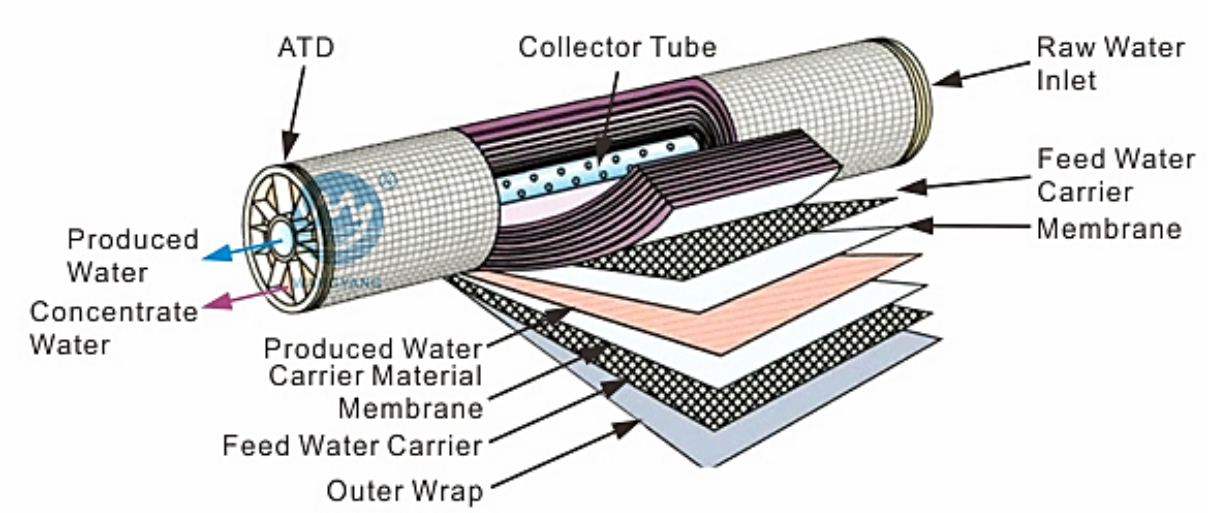


Figure 3. The structure of the osmotic membrane

There are several criteria that are taken into account when choosing a suitable location for an osmotic power plant.

Sources of salt and fresh water: The plant requires a source of salt water, which is usually found in the ocean or other large bodies of salt water [5]. It also needs a fresh water source, such as a river or lake, which can be used to dilute salt water.

The flow of water. The flow of water between salt and fresh water sources is crucial for the efficiency of the installation. The larger the water flow, the more energy can be produced.

The distance between the salt and fresh water sources: The distance between the two water sources should not be too large, as this may reduce the efficiency of the installation.

Water quality: the quality of sea and fresh water must meet the requirements of the plant. Seawater should have a certain level of salinity, and fresh water should be relatively clean and free of pollutants.

Environmental impact: The plant should be located in a place where its impact on the environment and wildlife will be minimal.

Infrastructure: The site must have the necessary infrastructure, such as roads and power lines, to support the construction and operation of the plant.

Cost. The cost of construction and operation of the plant is also an important factor. The site should be cost-effective and provide a good return on investment [6].

One of the new developments of osmotic power plants is the use of biomimicry to increase the efficiency of the process. Biomimicry is the practice of using structures and processes found in nature to solve engineering problems. In this case, scientists and engineers are studying how certain organisms, such as mangroves and mussels, are able to extract nutrients from salt water without expending a lot of energy. By simulating these natural processes, the researchers hope to increase the efficiency of osmotic power plants. In addition, researchers are exploring the possibility of using more selective membranes that can provide more efficient and sustainable desalination of salt water and electricity generation. The researchers

looked for inspiration in the membrane systems of living organisms, such as the cells and gills of fish.

For example, fish gills have a highly efficient membrane system that allows gas exchange while maintaining the balance of ions and water. By studying this system, the researchers were able to develop new membrane materials that are more durable and efficient than traditional materials.

Overall, biomimicry has played a key role in the development of osmotic power plants, helping to create a new source of sustainable energy that can significantly reduce our dependence on fossil fuels.

One of the problems of osmotic energy is the low efficiency of modern technologies. Most osmotic power plants have an efficiency of less than 10 percent, which is lower than other forms of renewable energy, such as solar and wind energy. However, research is underway to improve the efficiency of osmotic power plants. One approach is to develop new membrane materials that more effectively separate salt water from fresh water. Another approach is to optimize the design of osmotic power plants to minimize energy losses.

Another problem of osmotic force is the impact of salt water discharge on the environment. When salt water is discharged back into the ocean, it can create local areas with high salinity that can harm marine life. However, the impact of salt water discharge can be minimized by distributing the discharge over a large area or diluting the salt water with fresh water before discharge.

One of the advantages of this technology is that no fuel is required for its operation. In addition, the osmosis process is a natural and sustainable process that does not produce harmful emissions or waste. However, osmosis power plant is still a relatively new technology, and there are some problems that need to be solved. Currently, this process is not very efficient, and the technology is still quite expensive to implement. In addition, large-scale deployment of major power plants can have an impact on marine and freshwater ecosystems if they are not carefully designed and implemented.

Despite these problems, osmotic energy can become an important source of renewable energy. Osmotic energy can be used to power desalination plants, providing communities that currently do not have access to clean water. Osmotic energy can also be used to power remote settlements that are currently powered by diesel generators, which reduces their dependence on fossil fuels.

In conclusion, osmotic energy is a promising new form of renewable energy using the power of salt water. Osmotic energy can become an important source of clean energy that can be generated continuously and does not depend on location. Despite the fact that the problems that need to be solved still remain, research is continuing aimed at improving the efficiency and reducing the impact of osmotic power plants on the environment.

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DISADVANTAGES AND DANGER WHEN USING FERTILIZERS ON THE EXAMPLE OF EDTA

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Abstract. Obtaining high and stable yields on an industrial scale of all, without exception, agricultural crops, any natural and climatic zone of the globe, is impossible without using a number of chemicals. Among them, the most important place is occupied by fertilizers, which assume full, timely and, most importantly, full support of the needs of plants in products that are a building and energy source for their development and growth.

Keywords: fertilizers, inorganic salts, trace elements, chelates, ethylenediaminetetraacetic acid.

НЕДОСТАТКИ И ОПАСНОСТЬ ПРИ ИСПОЛЬЗОВАНИИ УДОБРЕНИЙ НА ПРИМЕРЕ ЭДТА

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Аннотация. Получение высокой и стабильной урожайности в промышленном масштабе всех без исключения сельскохозяйственных культур любой природной и климатической зоны земного шара невозможно без использования целого ряда химических препаратов. Среди них наиболее важное место занимают удобрения, которые предполагают полную, своевременную, а главное, полноценную поддержку потребностей растений в

продуктах, являющихся строительным и энергическим источником для их развития и роста.

Ключевые слова: удобрения, неорганические соли, микроэлементы, хелаты, этилендиаминтетрауксусная кислота.

In most cases, the plant takes macronutrients containing nitrogen and phosphorus, potassium, but the full development and growth of the plant is absolutely impossible without trace elements such as calcium, magnesium, zinc, copper, iron, boron, sulfur, manganese, molybdenum, cobalt and other trace elements. Initially, trace elements were used as traditional fertilizers or as their components, and they have shown effectiveness in solving issues to improve the growth of yields and the quality of the products obtained. At the same time, the chemical elements had the form of inorganic salts, which required their use in considerable quantities per unit area due to the low percentage of assimilation by plants. Thanks to the expansion of research, many methods have been invented that repeatedly improve the efficiency of the use of chemical elements, turning them into physically significantly accessible forms for plants. In the forties of the last century, a new form of micro-fertilizers chelates appeared on the world market of plant nutrition products. This form of fertilizer got its name from the Greek word chele – crab claw, which is due to the spatial form of the compound, which has the ability to bind ions of certain elements (especially metals), forming with them especially stable complexons.

The widespread use of chelates is associated with their ability to transform inaccessible elements into more mobile and biologically active forms, thanks to this, full nutrition of plants is ensured, significantly increases soil fertility, increases plant resistance to negative environmental factors, increases plant immunity, reduces stress levels when using protective equipment, etc.

Ethylenediaminetetraacetic acid or EDTA was the first to appear on the market. EDTA was patented in Germany in 1935 by F. Munz. The molecule is a substituted diamine (Figure), usually sold in the form of its sodium salts.

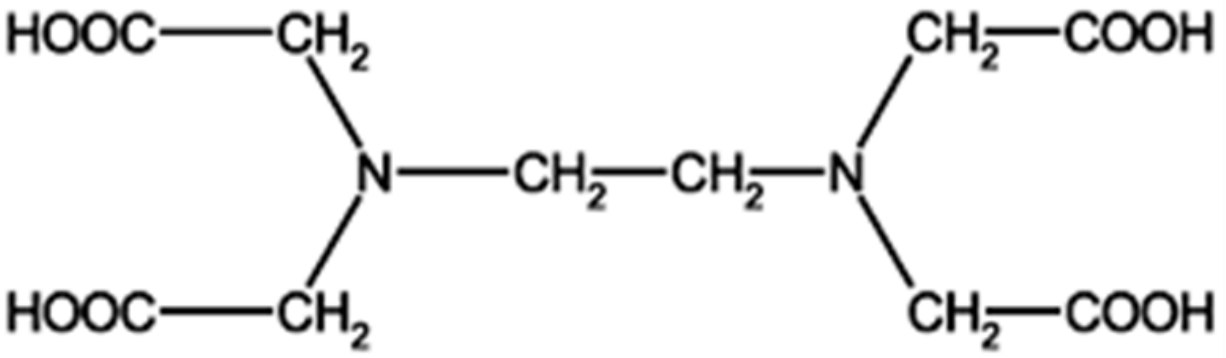


Figure. EDTA structural formula

Oxyethylenediphosphonic acid, nitrilotrimethylphosphonic acid, diethylenetriaminepentaacetic acid, dihydroxybutyldiaminteraacetic acid and amber acid derivatives are also common in agriculture. Despite the fairly wide range of chelators, many manufacturers of microfertilizers today continue to use EDTA as the main chelating element, pursuing the only goal – reducing the cost of the final product and success in the competition.

It is a powerful metal complexing agent and a highly stable molecule that provides significant versatility in industrial and domestic use.

At the same time, the use of this compound has caused not only considerable concern in the world for a long time, but also a direct protest against its use. There are quite a lot of reasons for this attitude to EDTA, and they are all quite weighty.

The developed countries of the world have been drawing the attention of the world community to the issue of the use of this compound and the limitations of its use for many years. Most countries of the European Union have completely banned the production of EDTA at the legislative level or significantly limited the norms of the content of this substance in food of plant and animal origin. Already in 1991, the Federal Ministry of Environmental Protection, the Federal Ministry of Scientific Research and the Federal Ministry of Health of Germany signed a Declaration on Reducing EDTA Water Pollution. Today, the use of this compound in Australia is completely prohibited.

Ecotoxicological risks of edta

There is growing concern about the direct or indirect potential impact of the presence of EDTA on the environment. Numerous field studies have shown that complexation with EDTA can mobilize polluting metal ions. EDTA can prevent the deposition of heavy metals in solution or, conversely, cause the effect of dissolution of heavy metals adsorbed in precipitation. Consequently, the result is an increased mobilization of heavy metals. Attention was also drawn to the fact that EDTA can dissolve radioactive metals and increase their mobility in the environment. A particularly dangerous factor is the possibility of the formation of complex compounds of EDTA with radioactive elements (present in the soils of certain contaminated areas, for example, as a result of the accident at the Chernobyl nuclear power plant and other nuclear facilities). The results of the study indicate the possibility of the formation of stable compounds of EDTA with isotopes of iron-59, cobalt-60, yttrium-9 [1, p. 14].

Although the isolated molecule does not pose a risk of bioaccumulation, ligand-metal complexes can significantly increase the bioavailability of extremely dangerous heavy metals. The dissolution and bioavailability of heavy metals are phenomena that deserve more attention. Studying the role of EDTA in the consumption of lead in various mustard plants, scientists have found a concentration effect of 75 times, which is very significant, considering that this is a potentially dangerous phenomenon from the point of view of the processes of biomagnification of metals. Enhanced uptake of heavy metals by plants has been widely studied due to

its potential use in heavy metal phytoextraction technologies, but special attention has been paid to their concomitant leaching and migration phenomena.

However, there are arguments against a significant increase in bioavailability of heavy metals as a result of their interaction with EDTA. Compared to other chelators, the efficiency of EDTA is small: it is a synthetic molecule that the plant is not able to use under normal natural conditions. Chemical elements chelated with this compound can be used only on soils with a limited acid-alkaline index (pH) less than 8, while stable compounds of each chemical element require their own pH value, and iron and molybdenum compounds are so chemically unstable that they show a tendency to break down even before they get into the plant [2, p. 276].

It is generally accepted that after performing its function as a transport agent for delivering the desired element to the plant, EDTA actively forms other compounds with new metal ions found in the soil, which leads to the accumulation of harmful compounds first in the soil, and then in reservoirs, then in groundwater, and eventually to environmental pollution and sources of drinking water [3]. The use of EDTA causes the formation and accumulation of significant concentrations of bimetals (often harmful to the environment) and, as a result, the destruction of natural ecosystems. An example of such a negative impact is the situation in the Mississippi River Delta, where an ecological catastrophe occurred due to the uncontrolled use of EDTA and other chemicals – a zone dead to living organisms, unsuitable for life, was formed.

Surprisingly, although the literature provides evidence of the persistence and low natural degradability of chelate, the study of its toxicity is mostly documented for acute toxicity biological assays, and there is insufficient information to assess chronic toxicity.

The decay products of EDTA are also harmful to agricultural plants. According to scientists, the splitting of complexes based on EDTA leads in most cases to the formation of more toxic products than the original form, which has an extremely negative effect on soil-forming microorganisms, soil fertility decreases, and as a result, plant yields and the quality of the products obtained decrease.

Effects on the mammalian and human body

The issue of the effect of EDTA on the human body is extremely important, where the compound also enters through food and beverages (including with crops grown using chelated trace elements based on EDTA). The source can also be water contaminated with this compound (through the chain "fertilizer – plant – soil – water"). Despite the fact that EDTA in small doses is a low-toxic compound for humans, its ability to accumulate and remain active for a long time remains dangerous. This compound poses a particular threat to the filters of the human body – the liver and kidneys; an irritating effect on the mucous membranes of the eyes and respiratory organs is also noted [4].

Studies on the cellular toxicity of chelates indicate, in general, harmful effects usually associated with deficiencies in metals essential for various cellular functions. Of particular interest are the findings of Hoogenschmidt and others. They track the

effects of chronic exposure to low levels of EDTA in cultured rat kidney cells, leading to high rates of cell death. In addition, inhibition of DNA, RNA, and protein synthesis due to zinc and manganese chelation in rat liver cells after EDTA-Ca (II) administration has been reported.

Regarding oral exposure in humans, Fe (III)-EDTA salts are considered safe and are used as a source of iron supplementation. However, free EDTA has been shown to have adverse effects on mammalian reproduction and development. Nevertheless, it is considered a safe substance when applied externally, which is significant given that EDTA is a common ingredient in cosmetic preparations.

EDTA is also a cytotoxic substance that negatively affects the activity of the body's cells and creates a risk of metal fixation in the DNA of living organisms, including humans (D. Williams, 1975; N. Kasyanenko ta in., 1989; S. Paston, A. Mikolaev, 2016). In addition, a characteristic feature that has a negative effect on plants is a characteristic that also affects humans. It consists in the ability of EDTA to bind calcium and remove it from the human body, causing such pathology as osteoporosis (bone fragility). The same feature of EDTA is observed in the binding of iron, which can lead to a deficiency in the human body of this vital element.

It is possible to produce fertilizers based on less stable chelating agents or compounds of natural origin. But it should be taken into account that stable chelate complexes remain stable in the soil solution at a much wider range of soil pH than the weaker and inorganic ionic forms. "Protected" cations are generally not subject to precipitation as insoluble hydroxides. For example, when inorganic iron salts are applied to carbonate soils, iron is bound and transferred to a form inaccessible to plants.

However, in the field, in contrast to the vegetative experience, EDTA does not have a direct, but an indirect effect on mobilization. The metal-chelate complex diffuses into the root cell, where metal ions are absorbed, leaving the chelating agent for re-diffusion and mobilizing other metal ions from soil solids. So, weaker chelates, such as lignosulfonates, are less stable and less mobile in soil than EDTA chelates because they form weak bonds and have a higher molecular weight. Thus, they are unable to release metal ions.

More than 80 years have passed since EDTA was invented, but the debate over the advantages and disadvantages of its use has only intensified in recent years. Based on studies showing the dangers of EDTA entering the environment, there are publications about the dangers of using chelated microfertilizers, which often have no scientific basis.

In general, it can be seen that EDTA behaves as a persistent environmental pollutant, increasing the mobility and bioavailability of heavy metals. Under natural conditions, studies reveal poor biological decomposition of the ligand [5].

The mechanisms of interaction of EDTA with living organisms are not sufficiently elucidated, and the range of their potential risks is unknown. Studies evaluating the toxicity of free heavy metals and complexes with EDTA do not allow us to predict what the effect of the presence of chelate will be. The effects of EDTA

vary depending on the type of organism being studied, the concentration of EDTA and the metal being analyzed.

There is an urgent need for additional research on the bioaccumulation of heavy metals in the EDTA-stimulated trophic chain and the effect of metal remobilization in waters and soils. Studies on the potential risk of increased bioavailability of heavy metals by edible plant species exposed to metal-EDTA complexes are also lacking.

Given that agriculture uses micro-fertilizers on a large scale, it is a significant source of environmental pollution of EDTA with all the ensuing consequences for human health and the biological diversity of the planet.

To summarize, the following advantages and disadvantages of using EDTA as fertilizer components can be identified:

- There is a risk of environmental contamination through accumulation in soil and water bodies, but the volume of EDTA use in agriculture is incommensurably small compared to industrial use. Toxic effects are possible only when applying 300 to 1,000 times higher rates of EDTA than those actually used in crop production, organic farming, which indicates the safety of the use of these substances;

- The low biodegradability of EDTA and the high stability of its complexes is rather an advantage of this chelating agent, since the repeated binding of the chelating agent provides a prolonged effect and increases the inflow of trace elements from the soil solution;

- The chelating agent EDTA (ethylenediaminetetraacetic acid) is a compound widely used worldwide for domestic and industrial purposes, being one of the anthropogenic compounds with the highest concentrations in inland European waters. This review describes the uses of EDTA and its behavior after it has been released into the environment. Decomposition of EDTA has been achieved on a laboratory scale; however, in vivo studies reveal poor biodegradability. It is concluded that EDTA behaves as a persistent substance in the environment and that its contribution to the bioavailability and remobilization of heavy metals in the environment is a major concern;

- Until recently, the concentration of free metals in solution was thought to be the main factor in the bioavailability and toxicity of metals. It has also been proven that heavy metals in complex with EDTA (as well as with humic acids) are bioavailable and toxic.

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THE IMPACT OF THE SOPHIA ANTIPOLIS TECHNOLOGY PARK ON THE SOCIO-ECONOMIC DEVELOPMENT OF THE PROVENCE – ALPES – CÔTE D'AZUR REGION (FRANCE)

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Abstract. The dialogue of cultures is an integral part of cooperation, and cooperation contributes not only to the development of relations, but also to the socio-economic sphere of states. In this article, we would like to illustrate our point of view by the example of the Sophia-Antipolis Technology Park, which is located in France. It is based on the fact that Sophia-Antipolis has become one of the most advanced technology parks in Europe thanks to cooperation with international companies.

Keywords: France, technopark, international cooperation, socio-economic development, innovation.

ВЛИЯНИЕ ТЕХНОЛОГИЧЕСКОГО ПАРКА СОФИЯ-АНТИПОЛИС НА СОЦИАЛЬНО-ЭКОНОМИЧЕСКОЕ РАЗВИТИЕ РЕГИОНА ПРОВАНС – АЛЬПЫ – ЛАЗУРНЫЙ БЕРЕГ (ФРАНЦИЯ)

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Аннотация. Диалог культур является неотъемлемой частью сотрудничества, а сотрудничество способствует развитию не только отношений, но и социально-экономической сферы государств. В данной статье авторы раскрывают свою точку зрения на примере технологического парка София-Антиполис, который расположен во Франции. Она основана на том, что благодаря сотрудничеству с международными компаниями София-Антиполис стал одним из самых передовых технопарков Европы.

Ключевые слова: Франция, технопарк, международное сотрудничество, социально-экономическое развитие, инновации.

Assessing regional economic development

In 2019, Provence-Alpes-Côte d'Azur had a GDP of €171 billion, making it the third wealthiest regional economy per capita after Ile-de-France and Auvergne-Rhône-Alpes. Despite having a significant number of high-value-added businesses and skilled jobs, unemployment rates remain relatively high, and territorial disparities are noticeable [1].

Territorial disparities are also very noticeable. In some areas, employment is sustained by advanced and innovative services (e.g., Sophia-Antipolis), well-known industrial enterprises (e.g., the aerospace industry in Marignane, in Cannes), and active activities related to the needs of the population.

The analysis and evaluation of France's economic space looked at indicators such as the density of the economically active population, GRE per capita, capital investment, output and public revenues. The Provence-Alpes-Côte d'Azur region was ranked 3rd, behind only the Ile-de-France metropolitan area and the Auvergne-Rhône-Alpes region. This result illustrates the rather high economic development of the region. However, Table 1 illustrates a comparison of the main indicators of the Provence-Alpes-Côte d'Azur region with the national average, and it can be seen that the poverty rate in the region is higher than the national average [2].

Table 1 – Comparative characteristics of the economic indicators of the region with the national average, 2018

	GDP (in euros)		Average standard of living (in euros)	Poverty rate (in %)
	In millions	Per inhabitant		
Provence-Alpes-Cote d'Azur	166 443	32 997	21 350	17,3 %
FRANCE	2 360 687	35 252	21 650	15,1 %

The employment structure in Provence-Alpes-Côte d'Azur is dominated by micro and large companies, with an average rate of company creation compared to other provincial regions. The service sector employs the majority of the population at 50 %, while a third of the population works in the non-market sector. Figure 1 illustrates the distribution of employment by sector, revealing a lack of developed industrial infrastructure as only 8 % of employment is in industry. Agriculture makes up only 2 % of employment in the region [2].

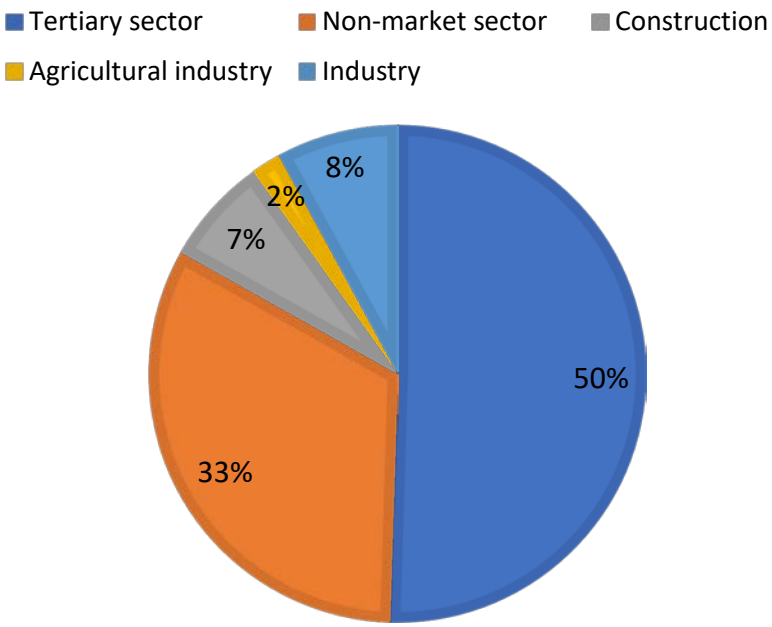


Figure 1. Distribution of employed by economic sectors in the Provence-Alpes-Côte d'Azur region, 2019

In comparison to the previous year, employment in Provence-Alpes-Cote d'Azur region grew by 1.7 % in 2019. The region is highly active and dynamic in mainland France, ranking second after Occitania and the Ile-de-France.

The Provence-Alpes-Cote d'Azur region was assessed using the integral assessment method to determine the most promising and developed departments. The analysis considered various indicators, including population, working-age population, unemployment rate, proportion of people with higher education, average wages, and number of businesses. The study revealed that the Busch du Rhône department was the most socio-economically advanced in the region, with the lowest rates of unemployment and proportion of people with low or no qualifications. The Alpes Maritimes department followed closely behind, being home to the Sophia Antipolis technopolis.

Table 2 – Integrated assessment of socio-economic development of the departments of the Provence-Alpes-Cote d'Azur region

Department	**Population**	**Able - bodied population**	**Unemployment**	**Education**	**Average salary**	**Number of enterprises**	**Integral indicators**	**Rank**
The Alps of Haute - Provence	0,194	0,187	0,963	0,947	0,88	0,178	0,558	VI
Upper Alps	0,167	0,164	1,337	1,034	0,874	0,177	0,626	V

Maritime Alps	1,292	1,282	1,043	1,053	1,054	1,604	1,221	II
Bouches du Rhone	2,413	2,478	0,963	1,049	1,021	2,207	1,689	I
Var	1,271	1,231	0,963	0,987	0,944	1,229	1,104	III
Vaucluse	0,663	0,658	0,85	0,931	1,227	0,605	0,822	IV

Impact of the Sophia-Antipolis Technology Park on the socio-economic development of the region

The Sophia-Antipolis Technology Park, situated in the Maritime Alps, is a remarkable accomplishment and is regarded as a model for technology parks worldwide. Despite economic downturns, this technology park has grown consistently and has exhibited favourable economic results – it currently boasts a cluster of 2,500 businesses that provide over 40,000 employment opportunities, with approximately 40 % of them dedicated to scientific research and innovative advancements [3].

Despite being located away from major urban areas in the Provence-Alpes-Côte d'Azur region, the Sophia-Antipolis Technology Park was established due to several prerequisites linked to the region's advanced transport infrastructure that supports international tourism and congress activities. The region's infrastructure is attractive for both large companies and their employees, as it offers a high quality of life. For instance, the marina of Antibes is only 10km away, the Palais des Festivals in Cannes is 12km away, and Nice Airport, France's second-largest airport, is 20km away from Sophia Antipolis. Additionally, it is worth noting that the Alpes-Maritimes department has a significant number of hotels and accommodations suitable for both tourists and participants in economic forums, scientific conferences, and congresses.

The Sophia-Antipolis Technopark's location in the Alpes-Maritimes department has also been facilitated by the pleasant climate in the region. As previously mentioned, the Provence-Alpes-Côte d'Azur region is situated in south-eastern France, providing access to both the Alps and the Mediterranean coast, resulting in a mild Mediterranean climate with limited rainfall and consistently warm summers.

The Technopark Sophia Antipolis is an appealing investment location for foreign enterprises due to its focus on highly sought-after sectors such as pharmacology, cyber security, healthcare, bioengineering, IT, financial technology, and smart cars. The technopark is also involved in various projects related to digital education, real estate technology, sports, and yachting. With an annual turnover of €5.6 billion, Sophia Antipolis hosts major companies such as Air France, Samsung, Huawei, Amadeus, American Express, Dassault System, Intel, and Toyota. The R&D cluster includes pharmaceutical companies like Genevrier, Theradis Pharma, Galderma Research&Development, Boron, Elaiapharma, and Laboratoire Cevidra,

whose total turnover was €346.7 million in 2018. The companies in the technology park have modernized and innovative production facilities that manufacture high-demand products for both domestic and foreign markets [6, 7].

Technopark Sophia Antipolis is actively involved in 165 innovation and technology projects, which receive funding from both French authorities and various European countries. The majority of funding comes from Germany, Italy, and Spain, as shown in Figure 2. However, the technopark also receives investment from non-European countries such as the US, Israel, Turkey, Taiwan, and Hong Kong for its projects [6].

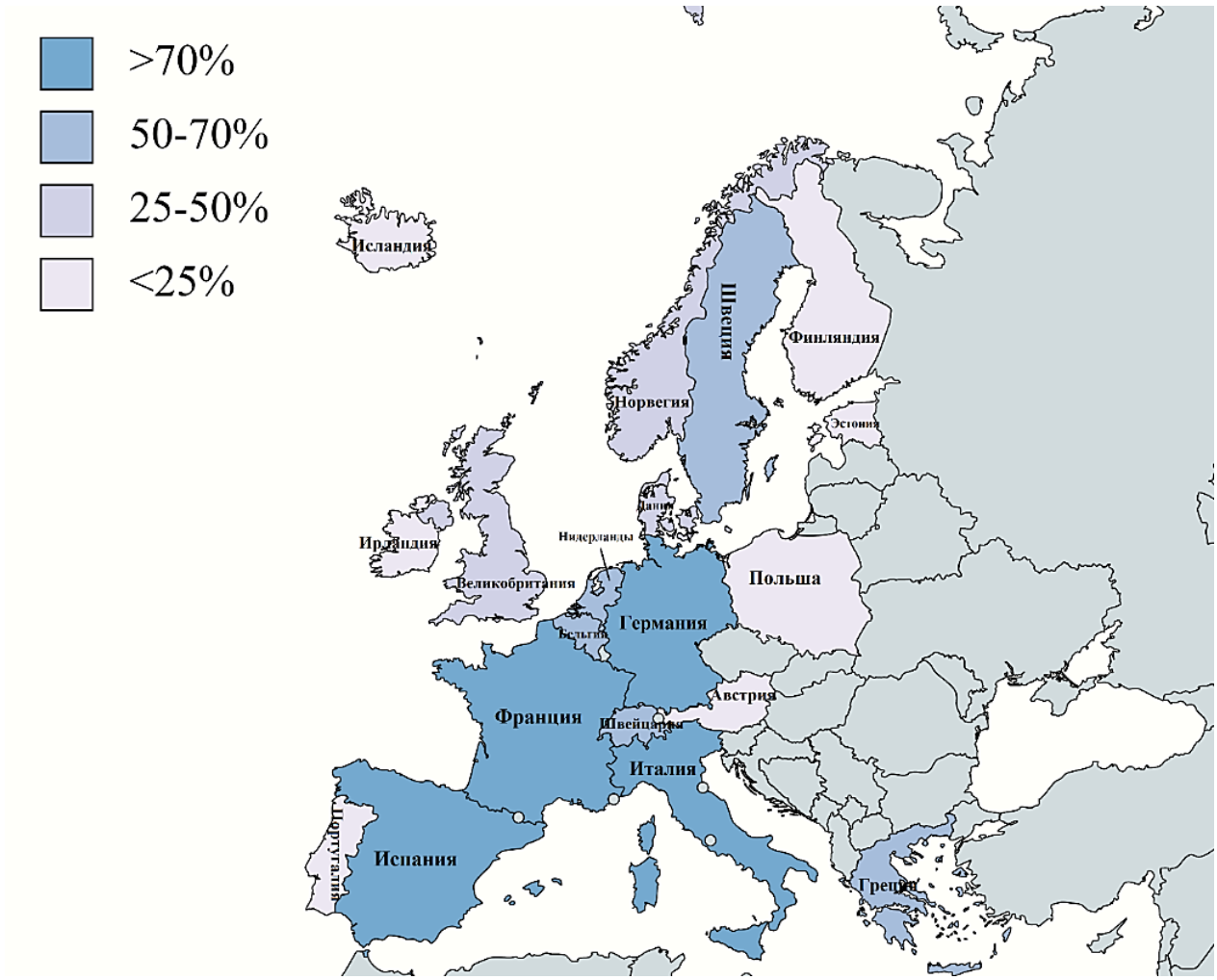


Figure 2. Participation of European countries in the financing of research projects implemented by the Sophia-Antipolis Technopark

This factor shows that Sophia Antipolis is indeed one of the most sought-after research zones not only in Europe, but also in the world. Not only Franche authorities, but also by Italy, Germany and the Netherlands, coordinates projects developed by the technology park. One of the projects has also been implemented in Turkey. The projects are based on research in IT, healthcare and cybersecurity. These facts have led to a large flow of foreign direct investment not only into the technopolis, but also into the region and into the country as a whole.

It is also worth noting that the department in which Sophia-Antipolis Technopark is located has one of the lowest unemployment rates in the region, a high proportion of working-age people with higher education and, in terms of the integral assessment of key indicators, the Maritime Alps comes second, indicating that Sophia-Antipolis does have a major impact on the socioeconomic development of the Provence-Alpes-Côte d'Azur region by providing a huge number of jobs, locations of higher education establishments and the development of the region.

Conclusion

Thus, the Sophia Antipolis technopolis is a significant contributor to the socio-economic development of the Provence-Alpes-Cote d'Azur region due to several reasons.

Firstly, it hosts numerous international innovation projects that are financed by various European and global countries, making it an essential element in the region's investment appeal and elevating France's research sector on the international stage.

Secondly, it frequently hosts scientific conferences, congresses, and forums, which increases the flow of tourists to the region and leads to the development of transportation and social infrastructure.

Lastly, it provides a vast number of job opportunities, preventing an increase in the unemployment rate in the region, particularly in the Alpes-Maritimes department, as evidenced by the integral indicators' calculations. Moreover, Sophia Antipolis is the largest technopolis in Europe, making it a crucial player in the region's economic growth.

Sophia Antipolis has great potential for development and growth with effective management by the French government. However, the lack of clear administrative boundaries and unfinished business in some municipalities within the technopark have slowed down its territorial development. If the state separates the technopark from the administrative-territorial units of the region, this can accelerate its development.

Additionally, integrating the tourist potential of nearby cities such as Nice and Marseille could lead to increased revenue for the technopark and the entire Provence-Alpes-Cote d'Azur region. With three exhibition complexes that are currently underutilized, establishing tourist shuttles from these cities could help commercialize Sophia Antipolis' scientific activities and boost its economic growth.

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RUSSIA AND CHINA. PROBLEMS OF INTERCULTURAL NONVERBAL INTERPRETATION

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Abstract. This article is devoted to identifying problems in the field of intercultural non-verbal interpretation on the example of countries representing two major civilizations – Western and Eastern, between which communication is integral, but requires some preparation and knowledge of the characteristics and traditions of each of the participants in intercultural relations, since ignorance of the problems that arise in the process of non-verbal interpretation, can lead to serious conflicts.

Keywords: non-verbal interpretation, non-verbal communication, intercultural communication, China, culture.

РОССИЯ И КИТАЙ. ПРОБЛЕМА МЕЖКУЛЬТУРНОЙ НЕВЕРБАЛЬНОЙ ИНТЕРПРЕТАЦИИ

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Аннотация. Данная статья посвящена выявлению проблем в сфере межкультурной невербальной интерпретации на примере стран-представителей двух крупных цивилизаций – западной и восточной, между которыми коммуникация неотъемлема, но требует определенной подготовки и знания особенностей и традиций каждой из участников межкультурных отношений, так как незнание проблем, которые возникают в процессе невербальной интерпретации, могут привести к серьезным конфликтам.

Ключевые слова: невербальная интерпретация, невербальная коммуникация, межкультурная коммуникация, Китай, культура.

At all times, people have wondered how to know other people's thoughts, how to anticipate the reasons for their behaviour. In constantly interacting with society, people have always wanted to read other people's thoughts in order to interact with

them. How do you know if a person is lying, if they are telling the truth, if they are unhappy? Knowing the answers to all these questions could help us avoid many unpleasant situations. The answer to many of the above questions can be non-verbal cues coming from that particular individual. Non-verbal communication is an aspect of communication where individuals do not use words or other linguistic means to convey information. In non-verbal communication, gestures, posture, facial expressions, etc. serve to convey information. An important feature of this so-called "body language" is that it is almost always unconscious, and therefore it conveys the true condition of the person. Non-verbal communication differs from verbal communication mainly in its great multivalence, situationality (often expresses belonging to a certain situation), syntheticity (considered only in sum), and spontaneity. The relevance of the study lies in the fact that modern people need to communicate with people from other cultures who have a different lifestyle. And today's fast pace of life does not allow time to get to know a person well enough to determine his or her intentions correctly. Knowledge of non-verbal communication allows us to get maximum information about the other person in a short time [1, p. 3].

People can exchange different types of information at different levels of understanding. It is known that communication is not limited to oral or written messages. Emotions, manners of partners, gestures play an important role in this process. Psychologists have found that in the process of interaction of people from 60 to 80 % of communications are carried out through non-verbal means of expression and only 20 or 40 % of information is transmitted through verbal. These data make us think about the meaning of nonverbal communication for mutual understanding of people, pay attention to the meaning of gestures and facial expressions of a person [2, p. 7].

The official definition of the basic concept of research is as follows: Nonverbal communication is communication between individuals without the use of words, that is, without speech and language means, presented in a direct or any sign form.

The purpose of the study is to identify problems that arise during the interpretation of non-verbal behaviour. To understand the reasons why the same gestures, signs and other non-verbal signals may have very different meanings in different cultures.

To show the differences in non-verbal interpretation, two countries will be compared. China and Russia have rich cultures and lifestyles that differ between the two countries. Russia is representative of Western culture; China is representative of Eastern culture. Chinese culture is dominated by tradition, so it can be difficult to understand non-verbal modes of communication when interacting with representatives of this country.

All nonverbal means of communication have excellent functions:

First, they complement the verbal message by conveying the same meaning. For example: "Please pass this book" + pointing gesture);

Second, replace the missing verbal component ("Will you go to the seminar today?" – a negative gesture);

Third, add additional information (sometimes contradicting the meaning of verbal, for example, a positive verbal text, pronounced appropriately, may acquire a negative connotation);

Next, regulate verbal communication (for example, when finishing a sentence, you lower your voice, turn away, letting your partner know that you have said everything, now it's his turn to speak);

Further, express emotions (for example, lowered eyebrows, wrinkles curved on the forehead, narrowed eyes, closed lips, clenched teeth indicate anger);

Finally, show the attitude towards the interlocutor (for example, the interlocutor likes – a smile, a long look; the interlocutor does not like – a glance to the side, an indifferent tone, the body is turned to the other side.

In addition, an important feature of nonverbal means in comparison with verbal ones is their situativeness. Nonverbal messages reflect what happens to people in the process of interaction "here" and "now", within a specific situation, a certain context.

Non-verbal communication includes aspects such as:

1. Kinesics – a field of knowledge studying the external manifestations of human feelings and emotions: facial expressions, gestures, pantomimicry (gait, posture, etc.)
2. Prosodica – a field of knowledge studying rhythmical-intonational form of speech (intonation, accents, speech tempo, etc.)
3. Takesics – a field of touch in the course of communication
4. Proxemics is a discipline of social psychology which studies the disposition of people in space.
5. Physiognomy – a method of understanding a person's character based on his or her appearance – facial features and figure (unscientific).

As a rule, in the process of nonverbal communication there are several aspects at once, which were listed above. One of the simplest options for interaction is a dialogue. Aspects of nonverbal communication are also constantly present in it. Next, the basic aspects of nonverbal communication used in the dialogue will be considered. Greeting gestures, which are different in Chinese and Russian culture, will be considered [3, p. 13].

Comparative analysis of aspects of non-verbal communication in Russia and China

Table – Comparative analysis of aspects of non-verbal communication in Russia and China

Hand gestures	
Russia	China
Handshake	
Gesture of greeting, mostly used between men	Is accepted only among socially equal partners. A handshake is not common among close, knowledgeable people.

A slight bow	
	A gesture used in Chinese culture for non-verbal communication when saying goodbye to a person of higher social status or an older person.
Gestures of doubt	
In a situation of doubt, the communicant puts his index finger to his head. The scratching of the head also expresses uncertainty.	Repeated demonstration of the tip of the tongue and a simultaneous shrug
Gestures of discontent	
Arms folded at the sides.	Pointing fingers.

A comparison of several basic gesture options and what communicators may encounter and how they are interpreted has been shown. It can be concluded that gestures in Russia and China have significant differences and inattention to the use and understanding of gestures can lead to problems [4, p. 6].

This table has been compiled as an example to show that differences in non-verbal interpretation do exist, and that they do not only exist in the area of gestures. Among other things, you need to be able to listen and hear the intonation of the interlocutor, as well as pay attention to the pace of speech and tone of voice.

Further problems will be identified by analysing the results of a survey conducted among Russian and Chinese culture representatives.

Ethnic stereotypes and prejudices are a well-known source of difficulties, barriers and even conflicts in interethnic communication. The most frequently studied stereotypes, related to the features of personality, character and social behaviour of representatives of different ethnic groups. In our opinion, the study of ethnic perceptions study (stereotypes) of non-verbal communication deserves attention, as they can influence the processes of intercultural communication and, consequently, adaptation. On the one hand, we expect from members of other ethnic groups to express themselves in one way or another or restraint in the process of communication. On the other hand, as communicators, we ourselves are not likely to conform to the stereotypical perceptions of our ethnic group's non-verbalism that exist in the interlocutor's mind [5, p. 4]. Consequently, the study of specific perceptions and stereotypes of non-verbal communication from different ethnic groups provides an opportunity to:

- first, find out the cause of such stereotypes;
- second, contribute to overcoming barriers in communicating and understanding others;
- thirdly, to optimise inter-ethnic communication;

During life, it is not uncommon for an unprepared person to face problems with nonverbal communication. Often this problem manifests itself in the incorrect

interpretation of the actions or words of the interlocutor. To understand this, examples from the life of ordinary people will be considered.

The study analysed examples from the field of intercultural communication, through which we will highlight the problems of intercultural non-verbal interpretation.

There are concrete examples of Russians not understanding Chinese. For example, we interviewed two female students who went to China for an internship. We asked them to tell us what are the differences in intercultural communication in Russia and China. One of the students identified the main problems of intercultural communication Attitude to communication: according to her, Russian people are much more straightforward and open in communication, the Chinese can be much more secretive and are distinguished by the ability to politely get rid of "sharp" topics. And the Chinese are quite cunning. Always ask a Chinese citizen no more than 2 questions at once if you want an answer. Often, they simply do not answer, pretending not to notice the question, the blogger explained. Also, according to her, the Chinese also tend to respectfully address older and higher-ranking people. Attitude towards authorities: Russian people are often skeptical about authorities, and they have a tradition of expressing their opinions and criticism even of senior officials and government bodies," the blogger assures. The Chinese have a much more hierarchical view of social structure and tend to better respect for authority and authority. Also, another student mentioned that the Chinese are quite noisy and get up quite early.

These differences in mentality can manifest themselves in various aspects of life, including work, business, personal relationships and cultural norms. However, it is worth noting that people's mentalities can be very individual and there are big differences within each culture and society," the blogger added.

In conclusion, we came to the conclusion that non-verbal interpretation concerns everyone. Russia and China are representatives of two different cultures: Russia – Western culture, and China – Eastern. Culture has influenced the traditions and habits of the representatives of the above cultures. Based on the characteristics of communication, representatives of different cultures may have difficulties and problems that need to be identified and resolved.

Based on the results of the study, we can say that the problems of intercultural interpretation are as follows:

1. Mentality: culture and consciousness. Any cultural element is associated with knowledge, values, traditions, that is, with what we call mentality.

2. Behavior control. Different cultures have different methods of control.

3. Patterns of behavior. The difference in the actions of representatives of different linguistic cultures in similar situations.

4. Perception of representatives of another ethnic culture in terms of stereotypes.

In order to overcome these difficulties, we need to eliminate indifference towards representatives of another culture that has a rich history and identity.

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SEISMIC ISOLATION SYSTEMS FOR LARGE PANEL BUILDINGS

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Abstract. The paper considers methods of seismic isolation of large-panel buildings. As a result of the analysis, six types of structures are considered: kinematic supports, sliding belt, rubber-metal and rubber-plastic compression supports, pile foundation, flexible floor, adaptive seismic protection systems. Each technology corresponds to specific indicators of seismic hazard in a certain area.

Keywords: earthquake, seismic isolation, non-return structures, large-panel buildings, kinematic supports, sliding belt, adaptive structures.

СИСТЕМЫ СЕЙСМОИЗОЛЯЦИИ КРУПНОПАНЕЛЬНЫХ ЗДАНИЙ

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Аннотация. В работе представлены способы сейсмоизоляции крупнопанельных зданий. В результате анализа рассматриваются шесть видов конструкций: кинематические опоры, скользящий пояс, резино-металлические и резино-пластиковые опоры сжатия, свайный фундамент, гибкий этаж, адаптивные системы сейсмозащиты. Каждая технология соответствует конкретным показателям сейсмоопасности в определенном районе.

Ключевые слова: землетрясение, сейсмоизоляция, невозвратные конструкции, крупнопанельные здания, кинематические опоры, скользящий пояс, адаптивные конструкции.

Throughout history, people have had to deal with different cataclysms which destroy their usual life. The level of industrial development hasn’t made the process of support and reconstruction of buildings easier. By contrast, to keep the integrity of a whole, heavy multi-storey apartment building isn't an easy task, especially, when the threat comes from the earth because the building stands here. Seismic support is an important aspect of building construction, and one of the key parameters in most dangerous seismic zones.

Earthquakes are vibrations of the earth's surface due to sudden shifts and breaks in the earth's crust or upper mantle. Ground vibrations in seismic waves excite vibrations of buildings and structures, causing inertial forces in them. With

insufficient strength (seismic resistance) of structures, they are damaged to varying degrees or destroyed.

So, large-panel buildings are the safest during an earthquake thanks to:

- the stiffness of structural configuration;
- the manufacturing of some elements at factories. Thus, their durability is increased;
- high resistance to seismic ground motions. Panel buildings wouldn't fully collapse if exposed to earthquake forces;
- the appearance of cracks at panel joints. It is a specific feature of panel buildings which helps to save the integrity of the building.

As we said before, large-panel buildings have a high level of shear rigidity. Their self-induced vibration period ranges from 0,2 to 0,3 s. Oftentimes, these buildings are used for the implementation of different types of seismic isolations. The central principle of seismic isolation is the introduction of spring between building construction and earth thus protecting a building or non-building structure's integrity.

Seismic isolation is a reduction of seismic loads on the structure due to the use of special structural elements, such as:

- increasing the flexibility and periods of natural vibrations of the structure
- increasing absorption (dissipation) of seismic vibration energy.

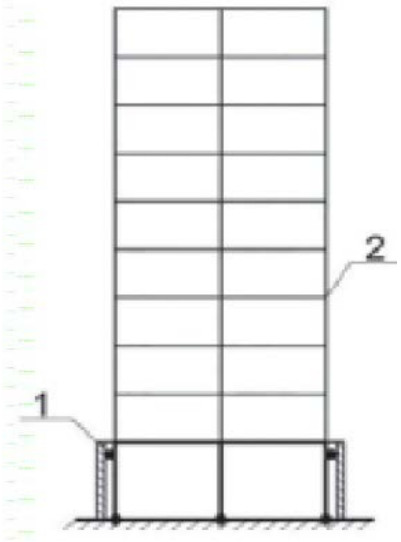


Figure 1. Construction of a large-panel building with flexible substructure:
1 – flexible building part; 2 – staff building part

I. L. Korchinsky did one of the first scientific studies on large-panel buildings with seismic isolation. His invention was designed for areas with high-frequency, short-duration vibrations, because the longer-lasting seismic activity of an area with less frequent vibrations would put large-panel buildings at risk. This type of action on the substructure causes more harm to construction (Figure 1) [1].

At this moment, there are many different types of seismic isolation that are applied to large-panel buildings. Rocking columns sliding belts and adapting systems of seismic isolation are the most popular ones.

It should be noted that rocking columns are an example of stationary seismic isolation systems in the presence of restoring gravity. One of the examples of this seismic protection method is the rocking columns of Y. D. Cherepinsky. The rocking columns foundation of Y. D. Cherepinsky is a system of seismic isolation which is called gravitational seismic protection. It is based on the fact that during earthquakes, the center of gravity of the supports rises, and, as a result, a gravitational restoring force is formed. In this case, the vibrations of the building occur near the equilibrium position, and their initial frequency and period depend on the geometric dimensions of the columns. The rocking column construction is trapezoidally shaped, with a rounded underside, which is put on a solid foundation (Figure 2) [2]. The hinge connection between the rocking column and the building underside is responsible for activities on the horizontal plane. This construction is made of concrete and a reinforced steel net [2, p. 48].

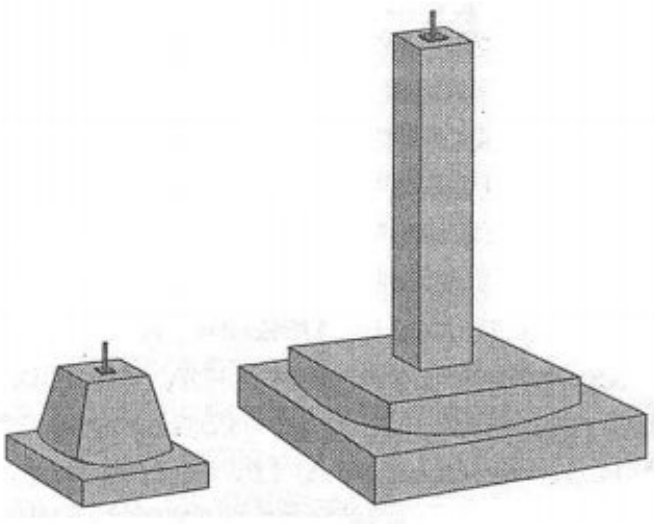


Figure 2. Rocking column construction

Also, the hinge connection is a motion limiter, because the anchor creates resistance to the vibration motion of the rocking column.

The sliding belt (Figure 3) [3] is construction with surfaced which increases the friction force between the building construction and its substructure, due to the creation of a strong kinematic connection [1, p. 180-186]. Unless the sum of inertial forces exceeds a concrete number, which depends on the surface texture and the amount of force bringing them together, this technology process supports structural integrity. The sliding seismic isolation may be divided into two types: non-returnable and construction with gravitational restoring force [3, p. 270].

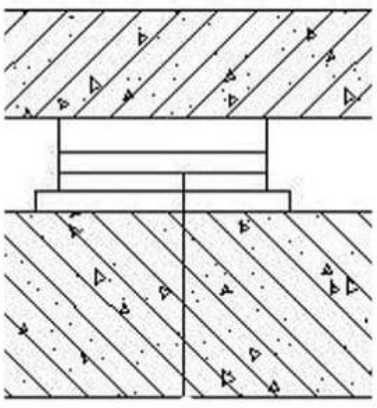


Figure 3. Sliding belt:
left – non-returnable, right – construction with gravitational restoring force

The sliding mechanism with horizontally flat elements refers to the non-returnable type. Despite the emergence of movement in construction, the potential energy between the elements of a structure doesn't change. The system stays in stable equilibrium (if its center of mass is directly over its base of support).

The second type, due to gravitational restoring force which is created by seismic activity, is not horizontally levelled to return the construction to its original position. The gravitational restoring force is either fixed (with an inclined surface) or fluctuates depending on the position of the elements of the structure (with a bent surface).

Foundation specifications of adapting systems were described by J. M. Eisenberg. As an earthquake-resistant construction, adaptive systems have become quite widespread. In these systems, the dynamic characteristics of the structure change irreversibly during the earthquake, adapting to the seismic effect. The main idea is that the dynamic characteristics of the structure change during an earthquake by disconnecting the connection elements. Hereupon, high-frequency vibration is reduced, and its duration is increased, therefore the influence of the earthquake force on the building is lessened. In construction terms, the adapting support system may be divided into two types: with disconnecting coupling and with connecting coupling.

The system with connecting couplings is represented by structural elements (such as braces, panels, etc.) with a low level of rigidity, which is destroyed during an earthquake (Figure 4 (a)) [1]. Without that system, the building construction loses part of its rigidity, and therefore, the natural frequency decreases. Despite its advantages, that system is applied in areas with infrequent earthquakes, not frequent ones. If another one takes place, the building isn't protected. [4, p. 319], [5, p. 232].

The system with disconnecting coupling is a connection which resists seismic isolation during an earthquake, when the building vibration achieves a concrete level (which is calculated beforehand) (Figure 4 (b)) [1]. Also, this system doesn't work on the building at other times. That coupling consists of special elastic elements or special flexibility ties. [6, p. 48].

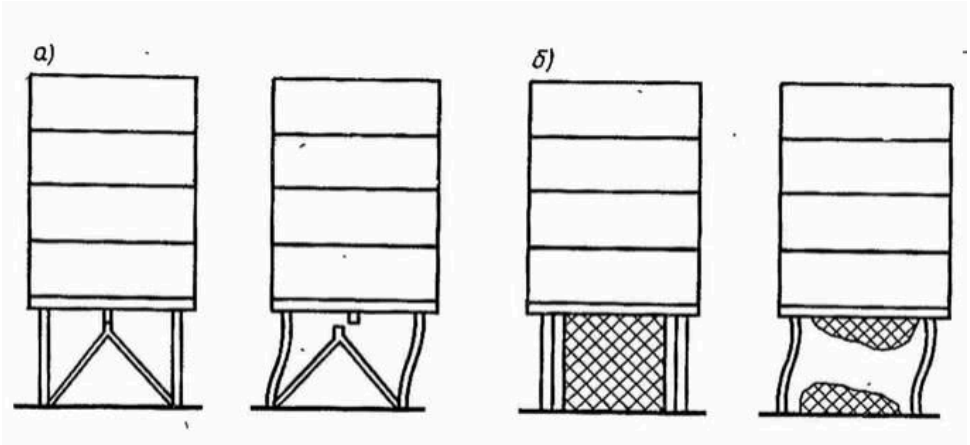


Figure 4. Adapting system:
a – with connecting coupling; b – with disconnecting coupling

Building with rubber-metal and rubber-plastic supports are widely used. Nowadays, there are numerous types of rubber-metal constructions, including French, New Zealand, American and Italian ones. The supports are made the staff on vertically place and flexible on horizontally place, for preventing the most foundation settlement (Figure 5) [1]. Due to the flexible character of rubber, rubber-metal supports have high strength when squeezed, stretched or turned. However, the cost of this substructure can be up to 30% of the building cost. Also, rubber-metal and rubber-plastic insulators have a short lifespan [4, p. 320], [1, p. 180-186].

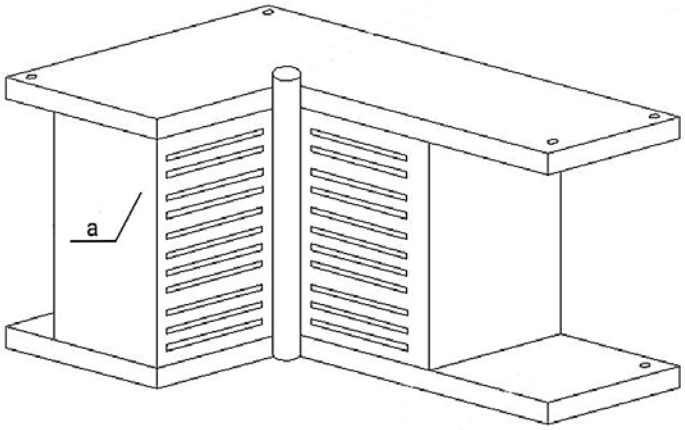


Figure 5. Rubber-metal or rubber-plastic support
(a – flexible material)

Pile foundations are long, thin elements generally made of steel or reinforced concrete (Figure 6) [1]. They transfer the load through weak, compressible material onto more compact, less compressible, firmer soil or rock at greater depths. Of course, pile foundations are resistant to seismic influence due to their high loadbearing capacity (the maximum ability of a structural element or material to take the load before failure occurs) during earthquake, and piles have a positive effect on the dynamic characteristics of a building. Therefore, pile foundations are a good design solution for building foundations. This technology is effectively applied in seismic areas with soft soil. There are many types of isolation or vibration absorbers

to minimize the seismic action on foundation. Based on the description above, it is logical to assume that the pile foundation with a base plate is more rational. A base plate is a space filled with inert materials. [1, p. 180-186]

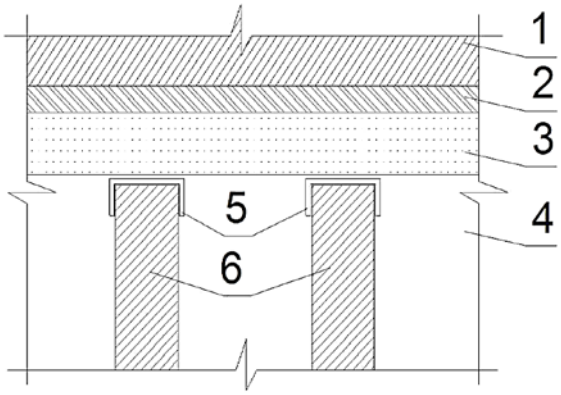


Figure 6. Pile foundation:
1 – building wall, 2 – grillage, 3 – base plate, 4 – soft soil,
5 – protection cap for pile, 6 – piles

Consideration of the seismic threat is an important aspect of any construction process. The development of this area of building continues. Thus, at present a lot of types of seismic isolation are available. The best and most suitable are to be chosen depending on the given place.

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PROSPECTS FOR THE USE OF AMYLASE ENZYME TO IMPROVE THE EFFECTIVENESS OF BLEACHING

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Abstract. The article discusses the use of enzymes in the process of bleaching cellulose to replace chlorine and its derivatives in order to reduce the harmful effects on the environment. In particular, the use of amylase as a delignifying reagent for the removal of residual lignin in the bleaching of cellulose with hydrogen peroxide in the presence of alkali is discussed. This technology is more environmentally friendly and safe.

Keywords: enzymes, amylase, delignification, lignin, bleaching, cellulose, pulp and paper production.

ПЕРСПЕКТИВЫ ПРИМЕНЕНИЯ ФЕРМЕНТА АМИЛАЗЫ ДЛЯ ПОВЫШЕНИЯ ЭФФЕКТИВНОСТИ ОТБЕЛИВАНИЯ

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Аннотация. В статье рассматривается применение ферментов в процессе отбеливания целлюлозы для замены хлора и его производных, чтобы снизить вредное воздействие на окружающую среду. В частности, обсуждается использование амилазы в качестве делигнифицирующего реагента для удаления остаточного лигнина в отбелке целлюлозы пероксидом водорода в присутствии щелочи. Данная технология является более экологичной и безопасной.

Ключевые слова: ферменты, амилаза, делигнификация, лигнин, отбелка, целлюлоза, целлюлозно-бумажное производство.

The use of chlorine compounds at various stages of bleaching leads to the formation of toxic chemicals that are part of the adsorbed organic halides (AOH), which, getting into the environment with wastewater, lead to its pollution. In

addition, AOH worsens the quality of cellulose products. The latest innovations in pulp bleaching processes eliminate the use of chlorine and its derivatives in order to minimize the environmental impact. The current trend towards bleaching kraft pulp without elemental chlorine free (ECF) technology and totally chlorine free (TCF) technology has increased interest in new and effective substitutes. A possible alternative to chlorine is oxygen-containing reagents for delignification (for example, ozone or hydrogen peroxide) or the use of microorganisms and enzymes [1].

The applied importance of enzymes as reagents for technological processes is growing with the attention being drawn to the problems of the ecology of production, the development of "green" technologies and biotechnologies. Search and application of biocatalysts for use in various industrial sectors trends in the development of modern biotechnology. Enzymes, biocatalysts of chemical processes, are biologically active proteins that function in conditions favorable for the life of the organisms from which they are isolated.

The main producers of industrial enzyme preparations are fungal cultures and bacteria. Along with the isolation of enzymes from wild strains, technologies for the production of individual types of enzymes or whole enzyme complexes based on recombinant microorganisms are being widely developed [2]. This makes it possible to design proteins of directed catalytic action, directly changing the genetic apparatus of the producing cell, as well as to regulate the volume of synthesis of the selected metabolite. Modern biotechnologies make it possible to obtain pure enzyme preparations of highly specific action in an amount sufficient for industrial use.

The protein nature of the enzymes provides mild operating conditions for the catalyst, allows you to regulate the technological process by varying the operating parameters of production, contributes to resource and energy conservation. The expansion of the specificity and range of action of enzyme preparations significantly increases the interest in biocatalysts as technological reagents in various industries, and biodegradability at the disposal stage, the absence of toxicity improve the environmental safety of production [3].

During the bleaching process, lignin, which is the source of brown coloring, is removed to whiten the paper. The indicator of the amount of residual lignin is the Kappa number. Many enterprises producing bleached sulfate cellulose use xylanases. The treatment of cellulose with xylanases before bleaching intensifies the removal of lignin and allows the use of fewer delignifying and bleaching chemicals, including chlorine-containing reagents. This technology is successfully used in Russian enterprises. An important role is assigned to the partial destruction of sorbed xylan, which ensures greater availability of cellulose lignin to the action of reagents. To improve the whiteness of cellulose, it is sufficient to remove an insignificant part – less than 10 % of the residual xylan sulfate cellulose. It is believed that the transition of residual lignin into solution increases after the destruction of the bonds between xylane and lignin. The removal of some part of the lignin sulfate cellulose directly affects the reduction of the consumption of bleaching reagents. Cellulose delignification is indicated by a decrease in the number of Kappa and an increase in the lignin content in the filtrate. The average molecular weight of lignin dissolved

after enzyme treatment suggests that the dissolution of lignocarbon complexes with a high lignin content occurs [4].

The beneficial effect of enzymes during bleaching depends on the bleaching scheme used, the content of residual lignin in cellulose, the desired final whiteness and the environmental interests of the enterprise. The main purpose of cellulose bleaching with the participation of enzymes is aimed at reducing the consumption of chlorine-containing chemicals in the bleaching process and reducing the content of AOH in wastewater.

One of the enzymes that is proposed to be used as a pre-delignifying reagent is amylase. Amylase is an enzyme of the hydrolase class that cleaves a-1-4-glycoside bond, i. e. starch to oligosaccharides. α-Amylases are found in animals (in saliva and pancreas), in plants (sprouted grain of wheat, rye, barley), they are produced by mold fungi and bacteria. All these enzymes hydrolyze starch, glycogen and related α-1,4-glucans to form mainly dextrins and a small amount of disaccharide – maltose. α-amylases hydrolyze α-1,4 bonds inside the starch molecule, breaking the bond between the first carbon atom and oxygen, which binds this carbon to the neighboring glucose molecule. The rate at which α-amylases hydrolyze glucans of varying degrees of polymerization decreases rapidly as it decreases. Amylose is a linear starch fraction, hydrolyzed faster than amylopectin, which has a branched structure. The rate of hydrolysis by α-amylase depends on the type and condition of starch (native or gelatinized starch), as well as on the effectiveness of the amylases themselves. Based on parallel experiments (in some cases, amylase preparations were used on gelatinized starch, and in others, equivalent concentrations on native starch grains), it was shown that the effectiveness of amylases of various origins decreases in the following order: pancreatic, malt, bacterial, fungal.

A characteristic feature of all α-amylases is the presence of one Ca atom per enzyme molecule. The role of calcium is that it stabilizes the secondary and tertiary structure of the α-amylase molecule, thus ensuring its catalytic activity and at the same time protecting the enzyme from the action of proteolytic enzymes and thermal denaturation.

The influence of temperature and pH on the stability of amylases is of great practical importance. The rapid destruction of grain α-amylase at a pH of 3.3-4.0, for example, makes it possible to bake rye bread from flour that contains an excess of α-amylase at low pH values in order to prevent excessive starch dextrination and the formation of sticky substances in the bread crumb.

Speaking about the thermal stability of α-amylases of various origins, they can be arranged in the following row as the resistance to heating decreases: bacterial amylases – grain amylases – fungal amylases. Recent work in the field of amylase studies has shown that two types of α-amylase are present in plant seeds: α-amylase of maturation and α-amylase of germination [5].

The leaders of the global enzyme market are proteases and amylases, which account for 25 % and 15 %, respectively. Over the past five years, the global carbohydraz market, which mainly includes amylases, cellulases and xylanases, has been the fastest growing segment of the enzyme market with a cumulative average annual growth rate of more than 7.0 % [6]. Amylase is already used in the pulp and

paper industry for the destruction of dissolved starch, followed by the removal of its degradation products, improves the dehydration of the mass. A mixture of amylolytic enzymes is able to gradually completely destroy starch macromolecules. Treatment with a mixture of a-amylase and cellulase accelerates the filtration of a sample of industrial recycled water, this is mostly ensured by the destruction of colloidal and dissolved substances. In addition, a-amylase can be used to destroy starch used to coat office paper [7].

The aim of the study was to study the ability of the enzyme amylase to increase the effectiveness of bleaching. To assess the effect produced by the enzyme preparation on the degree of cellulose delignification, the Kappa number was determined by a method based on the iodometric determination of potassium permanganate spent on the oxidation of lignin. The study consisted of several stages. The first stage was the processing of cellulose with enzyme preparations at various parameters. The parameters varied as follows: the concentration of the enzyme preparation from 0.5 to 5 % by weight, the processing temperature from 20 to 80 ° C, and the reaction time from 30 to 120 min. This stage is called the pulp pretreatment stage before bleaching. At the second stage, the samples were treated with a solution of hydrogen peroxide in the presence of sodium hydroxide - the bleaching stage. After each stage, the Kappa number was determined according to the ISO 3202015 methodology. The scheme of the experiment is shown in Figure 1:

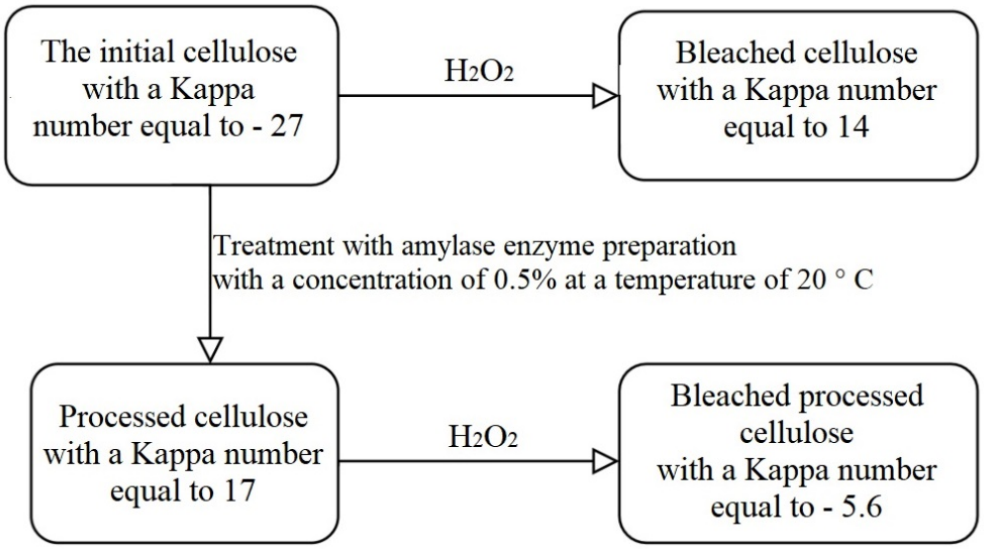


Figure 1. The scheme of the experiment

In the course of the study, it was revealed that the enzyme amylase is able to increase the degree of cellulose delignification, and the optimal values of the parameters of cellulose pretreatment with enzyme preparations were determined.

The optimal values are:

- concentration – 0.5 % by weight,
- time – 120 min.,
- temperature – 20 °C (Figure 2), (Figure 3)

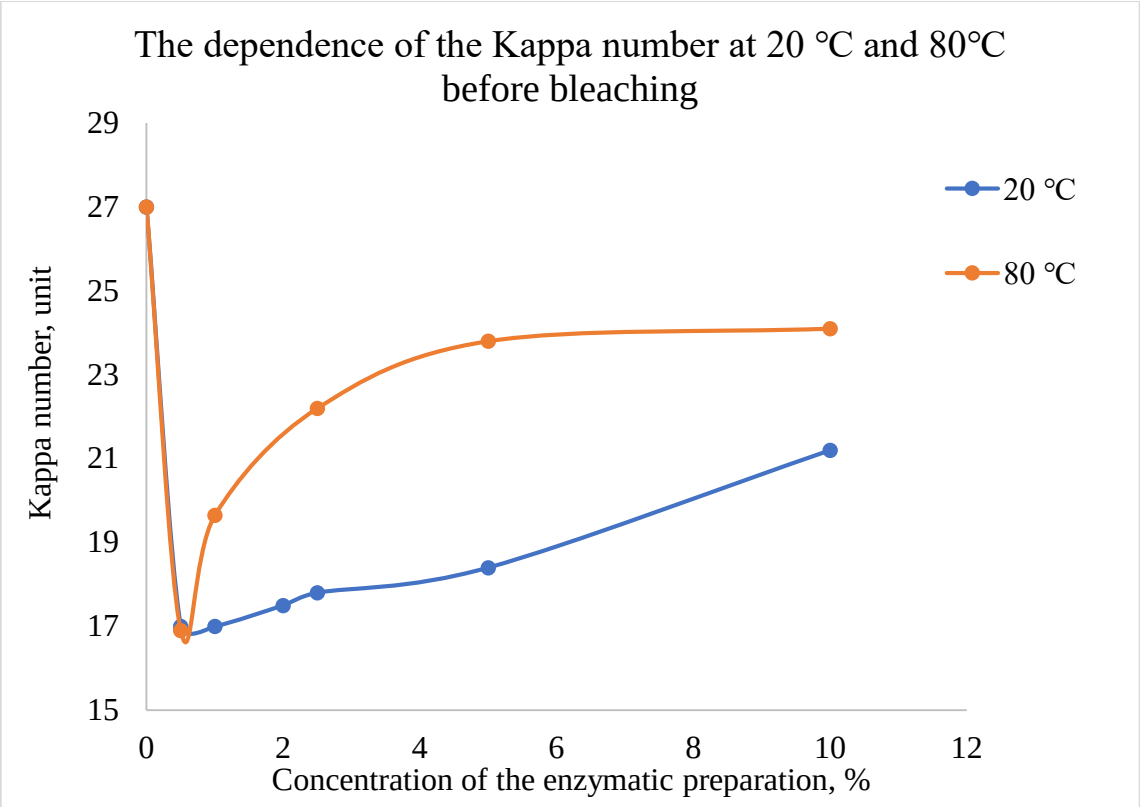


Figure 2. The dependence of the Kappa number at 20 °C and 80 °C before bleaching

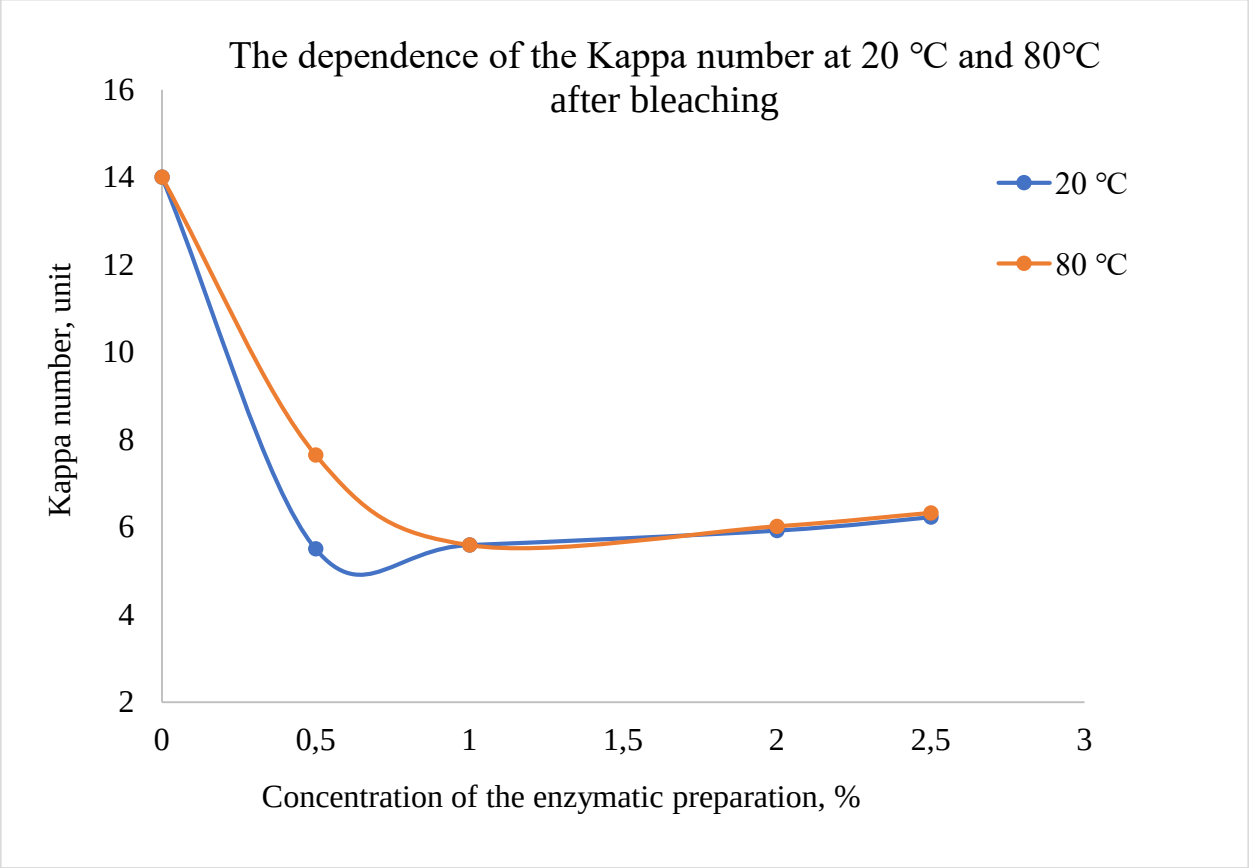


Figure 3. The dependence of the Kappa number at 20 °C and 80 °C after bleaching

At the same time, the decrease in the number of Kappa was 12 units. Thus, amylase enzymes can be used as a delignifying component, since it allows to reduce

the number of Kappa, which will lead to a reduction in the consumption of bleaching reagents by 20-30 %.

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COMPARISON OF THE BOOK "CLOCKWORK ORANGE" BY ANTHONY BURGESS WITH THE FILM ADAPTATION

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Abstract. Anthony Burgess is a famous British writer, poet and musician, author of many novels, among which the most famous is *A Clockwork Orange*, which was written in 1962. The novel follows the life of the protagonist Alex and his gang who engage in violence and crime in a future society. In Burgess' book, the reader can see the inner world of the main character and understand why he does what he does. Stanley Kubrick's feature film based on the novel-antiutopia "A Clockwork Orange" also evokes an interesting comparison with the book. While the film adaptation of A Clockwork Orange has its merits, it cannot convey the depth and complexity of Burgess' book. The book remains classical for postmodernistic literature that is worth reading and feeling on your skin.

Keywords: novel, A Clockwork Orange, Anthony Burgess, Alex.

СРАВНЕНИЕ КНИГИ «ЗАВОДНОЙ АПЕЛЬСИН» ЭНТОНИ БЁРДЖЕССА С ЭКРАНИЗАЦИЕЙ

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Аннотация. Энтони Бёрджесс – британский писатель, поэт и музыкант, автор множества романов, среди которых наиболее известен «Заводной апельсин», написанный в 1962 году. Роман рассказывает о жизни главного героя Алекса и его банды, которые занимаются насилием и преступлениями в будущем обществе. В книге Бёрджесса читатель может увидеть внутренний мир главного героя и понять, почему он делает то, что делает. Художественный фильм Стэнли Кубрика, снятый по мотивам романа-антиутопии «Заводной апельсин», также вызывает интерес. Несмотря на то, что экранизация романа имеет свои достоинства, она не может передать всю глубину и сложность книги Берджесса. Книга остается классикой современной литературы, которую стоит прочитать всем.

Ключевые слова: роман, «Заводной апельсин», Энтони Бёрджесс, Алекс.

Anthony Burgess is an English writer and literary scholar, born February 25, 1917, in England. His best-known work is the psychological novel, the dystopia A Clockwork Orange. Burgess wrote his novel after doctors diagnosed him with a brain tumor and said he had about a year to live. The author later told the Village Voice: "This bloody book is a painful work... I was trying to get rid of the memories of my first wife, who had been brutally beaten by four American army deserters during World War II. She was pregnant and lost a child after that. After everything that had happened, she fell ill with depression and even tried to commit suicide. Later she quietly drank herself to death.

The stylistic solution to the novel finally took shape during a summer vacation Burgess and his wife spent in Leningrad. For his novel, Burgess invented a peculiar Nadsat slang. A Russian vocabulary was added to the English words. The Russian reader saw in the text the usual words written in Latin (for example, moloko, korova, babushka). Now it is worth to understand the meaning of the title of the novel "A Clockwork Orange". The author of the novel said that he borrowed the title from an expression often used by English commoners: "outlandish, like a clockwork orange". As understood by the filmmakers, the name has a different, deeper meaning. This "clockwork orange" or unwilling clockwork toy was Alex, over which a special experiment was conducted, consisting of the effects on the body and psyche.

The narrative is told from the main character – Alex. It is interesting that despite the deeds of the main characters, who are the anti-heroes of the novel, by the end of the work the reader does not feel hatred for Alex. Alex is a schoolboy bully and the leader of a small gang. He is quite a violent leader, everything he likes to do is taken by force, he takes pleasure in violence. But the most interesting is that Alex is not badly educated, he likes classical music. The bandit has a special love for the creations of the great Ludwig Van Beethoven.

Violence has become commonplace in England. Criminal gangs intimidate the population and, incidentally, wage irreconcilable war among themselves. The viewer first gets to know the fifteen-year-old protagonist Alex, when he has already become the leader of one of the gangs. Sitting in a dairy bar called "Korova", he quietly sips moloko, in which special substances are mixed in. This is his way of setting up for the next outing. What does the gang do? Criminals-teenagers can fight with competitors, beat up a down-and-out person, and they have also invented their own fun game "wolves and sheep", which consists of crazy races on a stolen car. Most of all, they like to unexpectedly break into the homes of ordinary civilians and arrange promiscuous games with unhappy female householders. One such game ended in the death of a raped woman and the disability of her spouse. In another act of violence, Alex kills the unfortunate woman. The actions of a teenager, leads him to prison for quite a long time. There is the possibility of early release, but one must undergo a personality reformation experiment, where a violent attempt triggers a vomiting reaction [1].

Alex can be compared to the hero of Dostoevsky's novel Raskolnikov. Both consider themselves "rightwing" and are inspired by great people. This is how Raskolnikov compares himself to Napoleon, and Alex to Alexander the Great (calling him Alexander the Great). The result is that having lost the ability to violence, he

understands that it was a necessity that allows him to survive in society. He assumes the role of a victim of circumstances and tries to adapt.

Anthony Burgess deliberately left some aspects of the social structure unclear. However, the novel is still a continuation of the dystopian genre following Orwell and Huxley. In their works, the conflict is built on the confrontation of man and totalitarianism, Burgess also adheres to this concept. But as the hero of the work, he chooses not an ordinary citizen who opposes the system, but a sociopath who realizes his freedom in cruel and immoral acts.

Burgess very intelligently separates the chapters, of which there are only three. The first is Alex's life in society, where he is the dominant, the second is prison and the asylum, where he gets rid of his vices, and the third is the exit from the asylum, where Alex himself is already a victim. Each chapter makes you think and allows you to make a comparison. The work itself touches on such important topics as the propensity of young people to violence, society at the bottom, the lack of aggression in a person, what it entails when you can't even stand up for yourself.

"A Clockwork Orange" is a 1971 dystopian crime film directed by Stanley Kubrick and based on the 1962 novel of the same name by Anthony Burgess.

Kubrick's adaptation of the Anthony Burgess novel, which he took on after failing to direct "Napoleon," brought an obvious edge to the director's filmography. "A Clockwork Orange showed the public a sinister grin as soon as it was released: the film was accused of nihilism, of dithyrambs to violence and incitement to hatred. No other Kubrick film was attacked with the same ferocity with which A Clockwork Orange was branded for its amorality and cruelty. Kubrick did not go wrong in his attempt to put a rebellious youth cinema, which he was not forgiven by the conservatives and the censorship committees – for 30 years, if the British and watched a picture of Kubrick, then only illegally.

Images of the recent Vietnam War were circulating in the media, a wave of student riots shook the world, the peacefulness of "flower children" was losing credibility points (especially after the Manson Gang murder), and the intelligence services continued to test mind-control techniques – the reality that A Clockwork Orange broke into, pushing Western society's anxiety and skepticism to its limits.

Kubrick's path to Burgess' novel is in itself dramatic: having abandoned the screen version in the midst of his work on Dr. Strangelove, the director revised his views and realized the appeal of the material: in response to the novel's complex syntax, Kubrick offered an equally cunning visual language. The familiar grotesque, the abundance of black humor, the atmosphere of suspense and the vivid musical counterpoints: on this collision Kubrick built his story of the oddities of Alex, a young scumbag who first rapes and kills people, and then the social institutions do the same to him.

Kubrick never shied away from crude generalizations, especially in philosophical anthropology. He has always argued about humanity as a wound-up puppet that exists in a situation of struggle for free will. Humans have fallen in the face of historical change ("Barry Lyndon"), alien and divine forces ("2001 Space Odyssey"), military discipline ("Full Metal Jacket") or even their own sexual fantasies and frustrations ("Eyes Wide Shut"). "A Clockwork Orange is Kubrick's

central and undoubtedly darkest statement on the vicissitudes of free will, the mechanisms of coercion and the natural human urge for violence.

"A Clockwork Orange" is also widely regarded as a masterpiece of cinema, with Kubrick's bold visual style and striking use of music contributing to its lasting impact on popular culture. The film's iconic imagery, including Alex's distinctive white outfit and bowler hat, has become a symbol of rebellion and youth culture.

"A Clockwork Orange" is a complex and thought-provoking film that explores themes of violence, free will, and the role of government in controlling individual behavior as in the book.

Stanley Kubrick was the director of "A Clockwork Orange," and his vision was essential to the film's success. Kubrick was known for his meticulous attention to detail and his willingness to push boundaries in terms of visual style and subject matter.

Certainly, A Clockwork Orange would not have turned out to be such a colorful film if Kubrick had not been an inveterate formalist. Centered composition, brightly lit spaces, camera movement, whether it was the legendary dolly out with the departure of the hero or manual shooting (which, by the way, Kubrick always controlled himself), the combination of slowed and accelerated scenes - this is the style diversity of the director, who could achieve a counterpoint clash of emotions and moods. It is terribly funny, but at the same time insanely frightening in its cynicism.

Kubrick's direction of "A Clockwork Orange" is marked by his signature use of wide-angle lenses, carefully composed shots, and striking visual imagery. The film is shot in a stylized, almost surrealistic style, with bold colors and unusual camera angles creating a sense of disorientation and unease.

Kubrick was also heavily involved in the casting and performances of the film. He hand-picked Malcolm McDowell for the role of Alex DeLarge, recognizing the actor's ability to convey both the charm and the brutality of the character. Kubrick's direction of McDowell's performance is a masterclass in psychological nuance, with the actor conveying Alex's complex emotions and motivations with remarkable subtlety.

Malcolm McDowell, who played the leading role in his life at age 27, claimed that A Clockwork Orange is much easier to watch with a sense of humor today than it was in 1971. Indeed: the viewer is more experienced and ready to absorb unexpected, redemptive ideas, capable of complex social diagnosis and polystylistic subtlety in the direction. "A Clockwork Orange" turned out to be a terribly modern film: in the '70s it looked at a society of comfort and plenty, laughing gloatingly at it. Today, with the media crackling with visual pleasures and Ludwig's music blasting from every smartphone, Alex's smile becomes even more sinister.

In addition to his role as director, Kubrick was also one of the co-writers of the screenplay, working closely with author Anthony Burgess to adapt the novel for the screen. Kubrick's adaptation makes some significant changes to the source material, most notably the inclusion of the controversial Ludovico technique and the film's ambiguous ending [2].

Overall, "A Clockwork Orange" is a powerful and thought-provoking film that continues to be a controversial and influential work of cinema. Its exploration of themes such as free will, government control, and personal responsibility make it a timeless classic that resonates with audiences even today.

Despite the fact that Burgess was involved in the work on the script, the film and the book have certain differences. Where the writer refers to fleeting maximalism and rampant hormones (in the novel Alex becomes a well-to-do member of society), Kubrick takes his pessimism to its conclusion: the dark, irrational nature of man is inescapable, and disciplinary methods of correction serve an even greater evil than the free will of the individual. Kubrick's "A Clockwork Orange" leaves people no chance ("I really am cured!"), while continuing the symphony of the kitschy violence – the aesthetic and the spirited.

High and low, ideals and vices – they coexist not only in the grid of postmodern culture, but also within the individual. This is how Kubrick constructs the paradoxical imagery of Alex and the film itself: the spiritual highs of Beethoven and his "Ninth Symphony" stimulate the orgiastic pleasure of murder and violent sex. Kubrick removes the shackles of notorious idealism by reminding us that spiritual culture often calls to life violent instincts. The choice of the Viennese classical repertoire here is determined by the intention: it is worth recalling that among Hitler's henchmen the music of Mozart, Beethoven, Bach, and Wagner was also in vogue.

The book provides more background on Alex's life before he became a droog, including his love of classical music and his parents' overbearing behavior. The film, on the other hand, is more focused on Alex's relationship with his droog companions and the violent acts they commit.

Additionally, the book includes a final chapter in which Alex decides to give up his violent ways and become a responsible member of society, while the film ends on a more ambiguous note, with Alex undergoing the Ludovico Technique but ultimately returning to his old ways.

In both the book and the film, Alex is the central character and narrator. However, the two versions of the character are somewhat different. In the book, Alex is presented as more of an antihero, with his violent behavior portrayed as a result of societal and parental neglect rather than pure malice. In the film, on the other hand, Alex is portrayed as a more charismatic but deeply troubled young man who revels in violence and destruction.

The other characters in the book and film are also somewhat different. In the book, Alex's droog companions are given more backstory and are more fully fleshed out as characters. Additionally, the prison chaplain and the doctor who treats Alex after the Ludovico Technique are given more prominent roles in the book, while their film counterparts are more minor characters [3].

The book and film versions of "A Clockwork Orange" are also different in terms of their style and tone. The book is written in a distinctive, invented language called "Nadsat," which is a mixture of Russian and English slang. This style gives the book a unique and unsettling tone, while also making it more challenging to read.

The film, on the other hand, is notable for its stylized, almost surrealistic visual style. Kubrick's use of wide-angle lenses, bold colors, and unusual camera angles creates a sense of disorientation and unease that is similar to the tone of the book.

Both the book and the film explore similar themes, including the nature of free will, the role of government in controlling individual behavior, and the consequences of violence. However, the book places more emphasis on the importance of free will and personal choice, while the film is more focused on the dangers of government overreach and the dehumanizing effects of technology [4].

Overall, while the book and film versions of "A Clockwork Orange" share many similarities, there are also significant differences between the two. Both are challenging and thought-provoking works of art that continue to resonate with audiences today.

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