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***WIDENING OUR HORIZONS***

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Розглянуто нагальні проблеми економіки, інженерії, інформаційних технологій, охорони навколишнього середовища, наук про землю, гуманітарних наук. Також приділено увагу сучасному законодавству, спрямованому на вирішення цих проблем. Матеріали згруповано у розділи, що відповідають секціям форуму і відображають сучасні тенденції та інноваційні розробки молодих учених, представників різних країн світу в різних галузях економіки.

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**Section 01 Actual Problems of Sustainability of Economic Development and  
Innovative Management**

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**SMM in modern business**

The most effective channel for selling consumer goods is social networks. SMM is a new promotion tool that is gaining a larger audience every year. It fills the internet more and more every day, as sales through its tools, such as social networks, are constantly growing. However, the mechanisms of using the SMM remain poorly understood.

The abbreviation SMM stands for Social Media Marketing and literally means Social Media Marketing. In fact, SMM is a set of actions consisting of managing the community and the subscriber base. This is a story about content and active interaction with people. SMM promotion in social networks, along with other types of advertising, most often targeted and contextual, is the basis of many marketing strategies. Marketers often decide in favor of SMM alone; for some brands working with social networks, direct communication with the client is more than enough. Although targeted advertising is an integral part of SMM, it is a more mechanical part of it, in which the marketer keeps the distance from the audience. On the contrary, SMM in a broad sense implies constant interaction through updated content, encouraging users to distribute it. This is also engagement management – you need to maintain constantly the growing interest of users.

Many people believe that social networks do not promote sales, but this is not true. Users go to social networks most often not for shopping, because most of them have a sensitivity to the moment of information that interests them. By posting content that is interesting to users, companies encourage them to join their communities. Any business can adapt an SMM campaign to its specific needs. For large companies, it is typical to work on several sites; they use social networks to improve the company image, increase customer awareness and loyalty. Medium and small businesses use social media tools to increase sales, inform customers about sales and promotions, and encourage them to make repeat purchases. Social networks have made life easier for customers, and now they can easily evaluate the products and services they are interested in, read reviews and directly contact company representatives.

Social media marketing, like traditional marketing, is based on building a strategy that follows the setting of goals and objectives, and, as a result, the search for the target audience begins. Internet sites allow finding a clear and specific segment in the consumer market, and this is the most time-consuming stage of marketing in social networks. It includes the study of the target audience interests and the research

of the target audience behavior. Based on these two directions, competent content is built, thanks to which the target audience is further expanded.

Social media can be extremely useful for a company in many aspects. First, they allow the company to work in a virtual market, quickly expanding the range of potential customers. Second, profitable features that allow for additional profit, such as competitive advantages and achieving long-term marketing goals [2].

SMM promotion is successfully used in completely different directions, and the results are easily tracked in end-to-end analytical systems. This is a business of any scale used in almost all spheres of modern society: organizing and holding the events, education, culture, hobbies, science, sports, religion, politics, charity, social projects [1].

There are some SMM tasks. They include:

- Increasing the conversion rate. SMM helps promote the resource by increasing the number of unique visitors.
- Appearing in search results. Social networks are also taken into account by search engines.
- Promoting seasonal sales. Marketers are engaged in sending out letters and unique sales offers through various messengers and social networks.
- Expanding the potential target audience. Attracting new customers to the profile from other resources.
- Raising awareness. It occurs after working with the company positioning and a properly configured goal.
- Providing information on the company values. If you are engaged in charity work, then it is worth talking about it to get a positive reputation.
- Creating an attractive image of the company for the consumer. To do this, the company carefully considers and develops a content plan, demonstration of achievements, awards, reviews, and much more.

Performing these tasks together or in parts strongly affects the consumer, the business, and the company revenue. The role of the SMM should not be underestimated.

It is interesting to note that more and more companies are hiring a special employee who is engaged in SMM promotion. It does not matter whether it is a small enterprise or a large company. After all, the era of social networks obliges every brand to be present on the network, otherwise it risks going unnoticed.

The SMM specialist is responsible for creating visual and textual content and promoting it. His task is to convey information about a product or service to the target audience through social networks. He works on positioning, improves reputation, and increases reach. A good SMM specialist has such qualities as well versed in new technologies; at the same time, he knows the basics of community management; also has communication skills, as well as Instagram's knowledge of automation tools and algorithms. Such specialist applies creativity and imagination, has analytical abilities, sets up targeted advertising, works with bloggers, knows how to get people interested in the product, develops long-term strategies etc.

However, it is important that the SMM specialist initially has a strong-willed character, self-discipline and self-organization skills. Due to the dynamics of the development of the direction, changes in the algorithms of social networks, it is necessary to be aware of the latest news and increase the level of knowledge in the area of promotion. Improving the relevant skills and abilities is the key to success for the marketer [3].

There are key marketing tools in social networks:

- Content marketing is the foundation of SMM. Usually, the better the text or visual content, the more effective the other tools work.
- Working with bloggers. To do this, the marketer needs to be able to negotiate advertising. It is better to look for bloggers to save on services of an agency or intermediary.
- Facebook offer. In the offer, in the news feed, there are coupons with promotions, discounts on products that can be used by the group subscribers. It is important to set the duration of the promotion. On Facebook, this tool has virtual functionality.
- Round-robin/ circular promotion. Announcing the launch of a new channel in a popular account. For example, you have a ready-made database for e-mailing and you inform in the format of a newsletter about the opening of a new representative office.
- Contests. As a rule, they are held in order to attract subscribers.
- Hashtags. They attract the target audience.
- Video broadcasts. This good content allows you to convey important information to subscribers and increase the level of trust. It is held on Tiktok, Instagram, Twitter and other platforms.

There are some areas of SMM tools implementation to improve the strategy of increasing customer loyalty in the business sector:

1. Organizing and monitoring the social networks, that is, determining the criteria by which a social network is selected, where the active part of the consumer audience is concentrated. The implementation of this direction is possible with the help of a targeting strategy.

2. Developing a communication strategy based on contests with the participation of users and organizing a communication management system, that is organization of live, easy communication with a potential client on issues of interest.

3. Using the methodology for creating the brand platform.

4. Determining the used content by publishing messages reflecting consumers interests.

5. Attracting users to the community by posting info in similar groups, sending invitations to join the community, placing banner ads in the selected social network.

6. Organizing a monitoring results system, for example, assessing the size of the community, as well as determining the degree of audience involvement [4].

The implementation of these areas will allow the business to improve the efficiency of the strategy implementation to increase customer loyalty, and therefore, to ensure the growth of sales and profits of the company. The presented directions are

based on the use of customer support affecting the increase of the target audience loyalty, since the consumer constantly receives timely assistance at any time.

So, SMM is an interesting modern trend that works as a sales incentive. Each of us is faced with this concept every day as a buyer, but does not always understand what it is called in the professional language. Every marketer should know at least the basics of SMM, understand its tasks and methods of implementation. The Internet and social networks are increasingly penetrating into everyday life, thereby providing companies with new ample opportunities to attract the attention of potential consumers to their products. The reason for the high popularity of social networks is that it benefits not only the seller, but also the consumer. The use of SMM allows even small companies to gradually expand the circle of their target audience, build long-term relationships with consumers, convey information about their products to customers, and research customer reviews and suggestions.

So, SMM is an interesting modern trend working as a sales incentive. Every marketer should know at least the basics of SMM, understand its tasks and methods of implementation. The Internet and social networks are increasingly penetrating into everyday life, thereby providing companies with new opportunities to attract the attention of potential consumers to their products. The reason for the high popularity of social networks is that they benefit not only the seller, but also the consumer. Using SMM allows even small companies to gradually expand their target audience, build long-term relationships with consumers, communicate information about their products to customers, and explore customer reviews and suggestions.

**References:**

1. Arca, C. (2012). Social Media Marketing benefits for businesses: Why and how should every business create and develop its Social Media Sites. Aalborg University, pp. 1-90, 2012.
2. Lamminen, V. (2018). Social Media Marketing and its impact on product promotion in small enterprises, Turku University of Applied Sciences.
3. Lediard, M. (2017). Forget Traditional PR: Build your Brand through the Affiliate Channel. Journal of Promotional Communications.
4. Richardson, R. S., Choong, P., & Parker, M. (2016). Social Media Marketing Strategy: Theory and Research Propositions. Journal of Marketing Development and Competitiveness, 10(2), 24-34.
5. Smith, P. Value of Social Media in Global Marketing. *Ninety10Group*: web-site. URL: <http://www.ninety10group.com/value-social-media-global-marketing/> (accessed 29.03.2021)

## **Introduction of innovative technologies for food industry enterprises**

The food industry is important to the Ukrainian economy, but many companies use old equipment and technologies, which negatively affects their productivity. In such conditions, it is necessary to ensure the innovative development of the industry through the implementation of new projects at enterprises [4].

The food industry is a sector of the economy in which the introduction of innovations, including technological innovations, is reflected on the product markets. First of all, this is the development and promotion of new products, both modified and really new. This transforms the needs of certain segments of consumers who want to buy innovative products, which contributes to the return on investment. Thus, innovations in the food industry have a quick start, which increases the efficiency of enterprises in this area [2].

According to the current documents, innovation activities are understood as all scientific, technological, organizational, financial and commercial actions that actually lead to the introduction of innovations, or are involved for this purpose. Any new or significantly improved product or process, a new marketing method or a new organizational method can be introduced at an enterprise as innovation [3].

Innovative activity requires a qualitatively new approach. It should be strategically oriented, using a system of measures for their development, implementation, application, production and analysis of the effectiveness of innovations. The introduction of new scientific developments into production leads to the increase in the technological indicators of industrial enterprises.

Analysis of innovative activity in the food industry shows that in modern conditions, overcoming the low technical and technological level in the industry depends on:

- the formation of an effective sectoral state technological and innovation policy;
- the introduction of concessional lending for state programmes for the introduction of advanced technologies;
- the expansion of blended financing of innovative projects;
- the creation of an effective infrastructure for innovation in its various organizational forms;
- the creation of a regional mechanism for stimulating innovation.

The implementation of these measures will accelerate the market transformation of the food industry and increase the economic efficiency of its work [5].

An innovative food company can be viewed as a modern production of traditional and new food products based on the achievements of scientific and

technological progress involving the active use of new technological and technical solutions.

High productivity and efficiency of food industry enterprises is a priority in ensuring the economic stability of the state. In connection with the processes of economic integration, innovative development of the food industry is necessary. However, the current economic situation in Ukraine is at a low level of application of scientific knowledge, and the growth of innovative production is very slow [7].

Innovative activity in the food industry is directly related to the financial conditions of enterprises, since at the present stage, more than 75% of financing on innovations is carried out at the expense of enterprises' own funds. The technological backwardness of many branches of the food industry in Ukraine explains the low level of productivity, high energy consumption, etc. Thus, along with the creation of our own technologies, it is necessary to attract modern models developed in other countries.

Innovative activities of enterprises, especially in food processing, require a qualitatively new approach. This should not be a single act of introducing any kind of innovation. Based on this, the main areas of innovation in the food industry include the following:

- technological;
- product (assortment);
- sales management;
- infrastructural (organizational).

The development and building up of innovative potential in the food industry is a long-term strategic task. The market, built on the principle of competition, dictates certain standards of modern innovations (product, technological, marketing and organizational). Innovation in the food industry allows the company to generate additional cash flow. Moreover, companies maintain their competitive advantages and market positions through innovation. Innovative activity is impossible without the use of appropriate tools and measures for their implementation [2].

Nowadays, technological innovations are a must for the food industry:

- the development and implementation of storage technologies for raw materials that form the basis of food production;
- the usage of resource-saving technologies, characterized by the most useful output of finished products and a minimum of waste;
- the improvement of technological processes in order to reduce the duration of the production cycle without losing the quality of the finished product;
- the improvement of containers, packaging and transportation methods [2].

Innovative development accelerates and stimulates qualitative changes in material production, causes an increase in labour productivity and affects all aspects of society. The introduction of technological innovations in the food industry is a priority task. Its solution depends on the competitiveness of domestic food products in the global and national food markets, international recognition and the country's long-term image as a reliable exporter of quality and food safety [4].

Food industry is one of the main branches of the agro-industrial complex. In this regard, the introduction of innovations in this industry is one of the important factors in increasing the efficiency of enterprises. The introduction of scientific and technological advances in food production ensures the transition to the use of advanced technological processes. After implementing innovative activities, many problems of food production will be solved including guaranteeing the safety of raw materials, food products, and environmental protection in the production of food products.

**References:**

1. Novikova N.V., Ryapolova I.O. (2020) Problems of innovation implementation in the food industry. *Bulletin of KhNTU*. №1 (72), Part 1. pp. 117-122.
2. Radkevich L.A. (2009) Technological innovations in the food industry and problems of their implementation. *Economics of the food industry*. №2. pp 5-10.
3. Instruction on filling in the form of the state statistical supervision №1 - innovation "Survey of innovative activity of the industrial enterprise". Approved / Order of the State Statistics Committee of August 20, 2007 № 306. K., 2007. p.10. [Online]. Available at: <https://zakon.rada.gov.ua/laws/show/z1037-07>. Accessed on: February 15, 2021.
4. Paliy G.V.. (2016) Features of implementation of innovative projects at the enterprises of the food industry. pp. 1-4.
5. Antonyuk P.O., Antonyuk O.P., Analysis of the state and ways to intensify innovations in the food industry. [Online]. Available at: [http://www.rusnauka.com/DNI\\_2006/Economics/3\\_antonyuk.doc.htm](http://www.rusnauka.com/DNI_2006/Economics/3_antonyuk.doc.htm). Accessed on: February 25, 2021.
6. Bogomolova I.P. et al. (2012) The economy of the food industry (sectoral and regional features): textbook /. 3rd ed. Voronezh: VGTA, 229 p.
7. Zhurba I.O. (2016) Innovative aspects of food industry development. *Problems and prospects of economics and management*. №3 (7). pp. 14-19.
8. Komelina O.V. (2009) Directions for improving the financial mechanism for innovation in Ukraine in modern conditions. *Investments: practice and experience*. №17. pp. 21–28.
9. Deriy Z.V. (2016) Transparency of innovative activity as a necessary condition for the existence and development of the food industry of Ukraine. *Scientific Bulletin of Uzhhorod University*. №1 (47), pp. 264-267.
10. Tovsta T.L. (2008) Innovative activity of food industry enterprises. *Bulletin of Lviv Polytechnic National University*. №628. pp. 326-330.
11. Diskina A.A., Bogachenko Y.V. (2016) Directions for stimulating innovative development of food industry enterprises in Ukraine. *Global and national economic problems*. №10. pp. 582-585. [Online]. Available at: <http://global-national.in.ua/archive/10-2016/121.pdf>. Accessed on: February 28, 2021.

### **Obsolescence management**

The dynamic world in which we live today can best be described by the words of the ancient Greek philosopher Heraclitus, "Everything flows, everything changes". It has long been known that human needs are infinite, but they do not stand still: today we need many things that our ancestors had no idea about, and what was most desirable for them makes no sense today.

If there is a need, it must be met. This is one of the basic laws of the marketplace that forces companies to change. It is becoming increasingly difficult for them to survive and grow in highly competitive markets. This requires innovation, which causes new professions to emerge and the gradual disappearance of those that are no longer required by the market in the light of scientific and technological progress. Today heralds, coachmen, wheelwright, water carriers cannot be found although their services were more than in demand at one time. Webmasters, web designers, content managers, event managers, Internet coaches are in the list of new activities in the XXI century.

However, there are still activities that have not lost their relevance over time, and among them a special place belongs to management. Management can be defined as a special kind of activity related to administration. If we offer its interpretation in the context of content analysis, this type of activity is connected with planning, organization, motivation, control, coordination, and communication. The product of the activity is a management decision. Obviously, management emerges at the moment when two people come together to achieve a mutually meaningful goal together. An interesting question in this case is whether having existed for so long management has become obsolete.

In order to investigate the indicated problem, a questionnaire survey was conducted. Questions related to the relevance of the profession itself, as well as peculiarities of its content were explored. The students of Dnipro University of Technology universities and Motor Transport College of Dnipro University of Technology, as well as people who are professionally involved in management, took part in the survey.

The first question was about the demand for management today [1]. The results were distributed as follows: 56.5% of respondents believe that the profession is timeless, 30.4% do not see it as a promising profession and 13% think that everything will depend on chance (Fig.1).

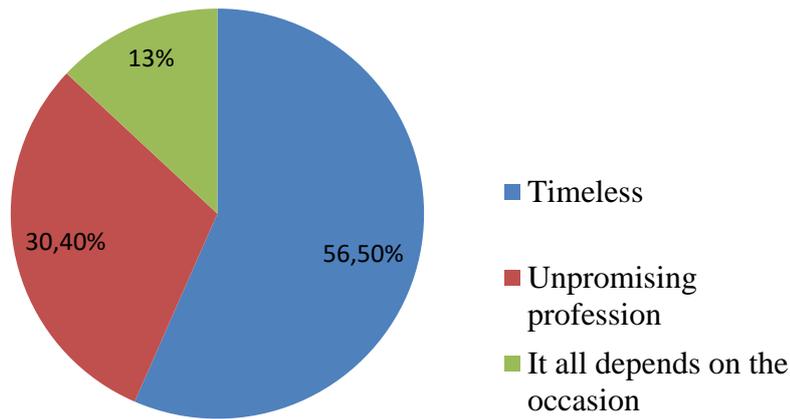


Fig. 1 Distribution of responses regarding the demand for management

Also important is the issue of the instrumentality of managerial activity and the influence of the time factor on it [1]. The adoption of a management decision requires a detailed analysis of the actual state of the management object, modelling possible alternative ways of its development, and assessing the consequences of implementing the developed decision. It is obvious that in this case it is difficult for a manager to do without knowledge in the field of financial management, as well as a number of economic and mathematical methods. Respondents were asked how in-demand these tools are in a manager's professional activity today and whether knowledge in this area becomes obsolete over time. Forty-three and a half percent of respondents answered in the affirmative (knowledge is becoming obsolete), 30.4 percent did not consider the issue of obsolescence and only 26.1 percent believed that knowledge is not becoming obsolete (Fig.2).

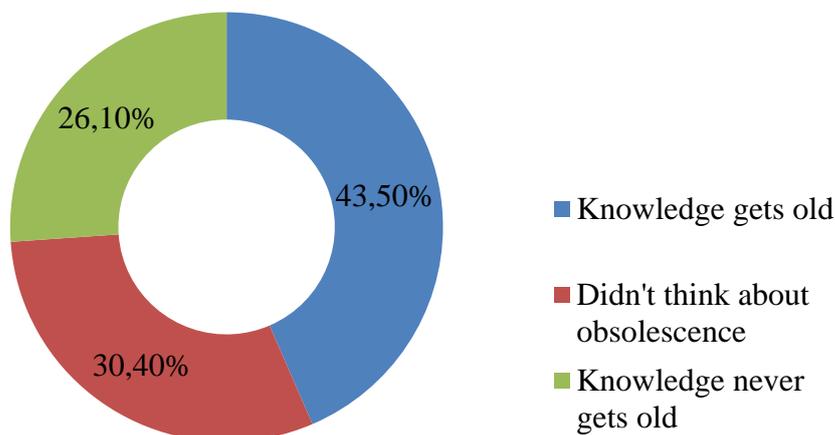


Fig. 2 Demand for knowledge of financial and economic-mathematical methods

Knowledge of management psychology is also an important tool in a manager's arsenal because whatever function a manager is responsible for, he or she achieves his or her goals by influencing the behaviour of others [1]. Responses to the question about the obsolescence of psychological methods were distributed as follows: 43.5% of respondents believe that they do not become obsolete, 39.1% are sure that only a

certain part does not become obsolete and 17.4% are sure that even these methods become obsolete (Fig.3).

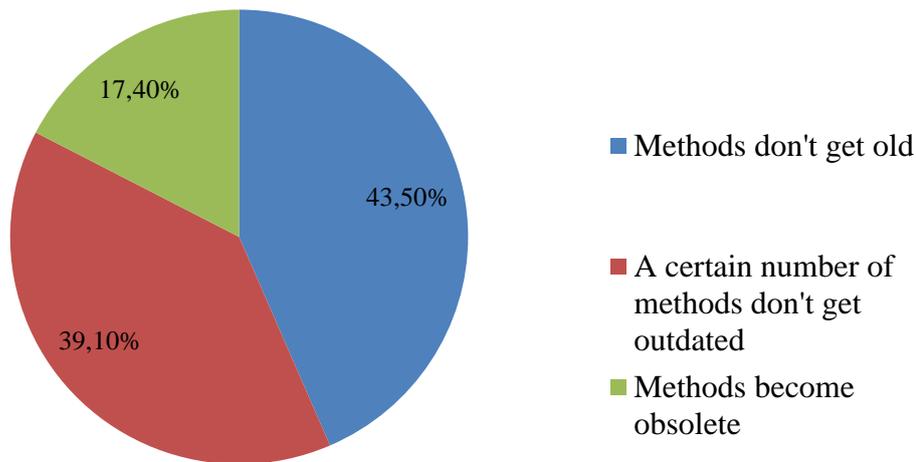


Fig. 3 Knowledge obsolescence in psychology

The results of research by a group of French scientists confirm that knowledge is now becoming obsolete very quickly. They studied publications in journals in different fields of science and found that, in economics, scientific works are no longer cited after an average of 9.4 years, and in psychology, after 7 years. In other words, knowledge becomes obsolete very quickly [2].

An important element of a working person's potential is their experience. However, paradoxically, experience can also be influenced by time in two ways [1]. This is confirmed by the answers received as a result of the survey. Some respondents consider experience to be timeless, because managers, exchanging information, update it and with each new experience comes new knowledge. The number of possible options for decision making increases. Another part believes that experience becomes obsolete, because over the years the principles and views of people change, respectively the experience of past years is not relevant in the new generation.

Among the aspects of management that are most prone to obsolescence the respondents cited management styles, not modern views of global trends, and the way people think.

On the whole, we can conclude that management remains a relevant profession, which is confirmed by the statistics of enrolment of Dnipro University of Technology applicants by year. Fig. 4 shows that every year the number of entrants to the specialty 073 Management increases. Over the last 3 years, more than 1800 applications have been submitted for the management specialty. In 2020, 467 applications have been submitted, the number of enrolments is around 130 students (full time), this is as for 2019 and 2018 combined.

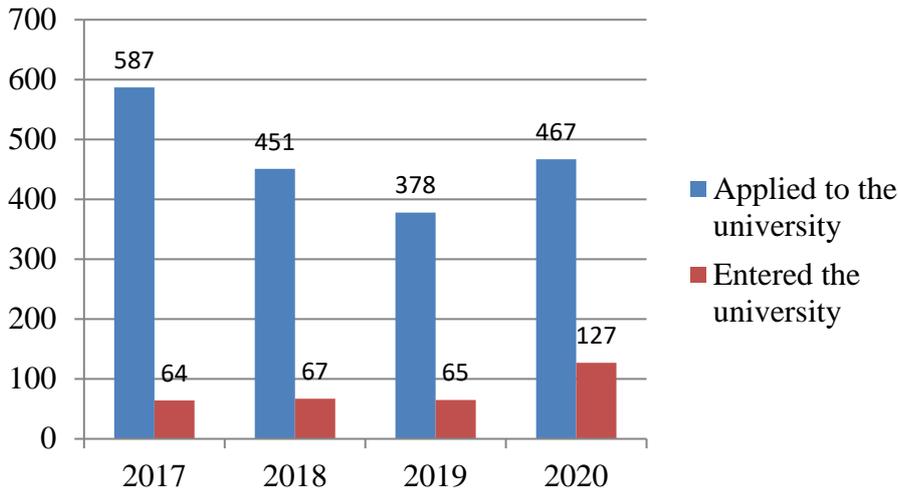


Fig. 4 Admission statistics for speciality 073 Management at NTU DP

It is worth mentioning about open vacancies for managers. There are about 2000 vacancies according to work.ua.

It is obvious that management will not lose its position in the future as the importance of collaborative work will only increase with time. Naturally, the tools that worked successfully a few decades ago have now changed, many of them obsolete. This underlines the fact that a specialist who wants to be successful in this profession needs to be in constant search, incorporating the concept of "lifelong learning" into his or her daily practice.

**References:**

1. “Устаревают ли знания менеджера?” (2010) [Online]. Available at: <http://domik.ua/novosti/ustarevayut-li-znaniya-menedzhera-n97794.html>. Accessed on: March 14, 2021.
2. Чернышев Д. (2014) «Период полураспада знания». [Online]. Available at: <https://mi3ch.livejournal.com/2716537.html>. Accessed on: March 17, 2021.
3. What is Obsolescence Management? (2020) [Online]. Available at: <https://www.gdca.com/obsolescence-management/>. Accessed on: March 19, 2021.

### **Time management: the mistakes employees make every day**

Time management was invented with the aim to help organize time and increase the efficiency of its use. It is needed to help us to have time to do what needs to be done, to be able to properly allocate time for execution and to have time to complete it on time.

The main reasons why employees constantly do not have time to do something are researched in different studies [1, 3, 4, 5, 6].

Inability to prioritize correctly happens when staff have many tasks to complete, and they do not know which tasks are the most important and need to be done first.

A person's tendency to constantly postpone even important and urgent matters, leading to life problems and painful psychological effects is a challenge in business [2]. Many people have experienced procrastination. Postponing cases of completely different importance and urgency can lead to equally serious problems.

Lots of distraction, from notifications on devices to noisy environments, interfere with concentration on the task.

Incorrect execution timeline is mostly the problem faced by people who tend to overestimate their skills. They do not do the job because they think it is too easy for them and is seen as a waste of time - it will still be done in a short period of time. However, this is what they think, and in fact, their skills may not be enough, and the execution time will be longer, which may lead to a missed deadline.

Multitasking arises from procrastination, when all things are put off for a long time, or all of the tasks need to be completed immediately. Multitasking requires the same concentration on every task, which is very difficult to do, unless an employee is a super-organized person. If not, then he/she needs to arrange things in order of importance and concentrate on each in turn.

In their desire to do everything right, to achieve some kind of imaginary ideal, perfectionists spend a very large part of their time on details, and do not see the full picture of what is happening. As a result, a lot of personal resources are wasted completely in the wrong direction.

Since all people are different, everyone has their own rhythm of life and, accordingly, the organization of time. Everyone has different mistakes that they make in their time management. To determine how well students in management are organizing their time, we have conducted a survey using Google Forms. 34 students whose field of studies is "Management" of the Dnipro University of Technology aged 17-19 took part in this survey. 18 students (53%) have an average level of academic performance, 14 of them (41%) have a high level and 2 students (6%) have a very low level of academic performance.

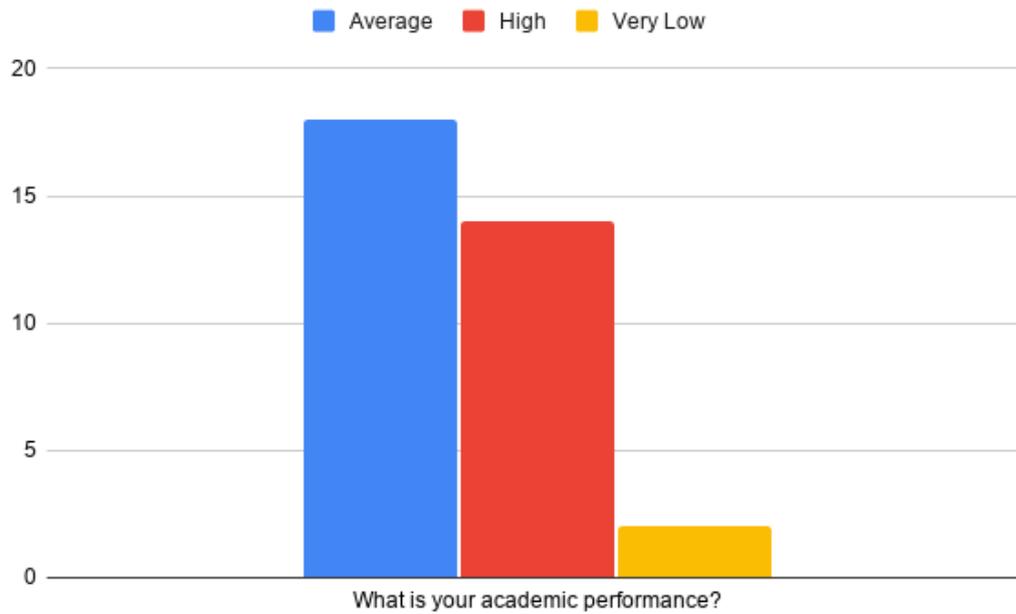


Fig.1 Academic performance of students

The results of the survey are given in Fig.2.

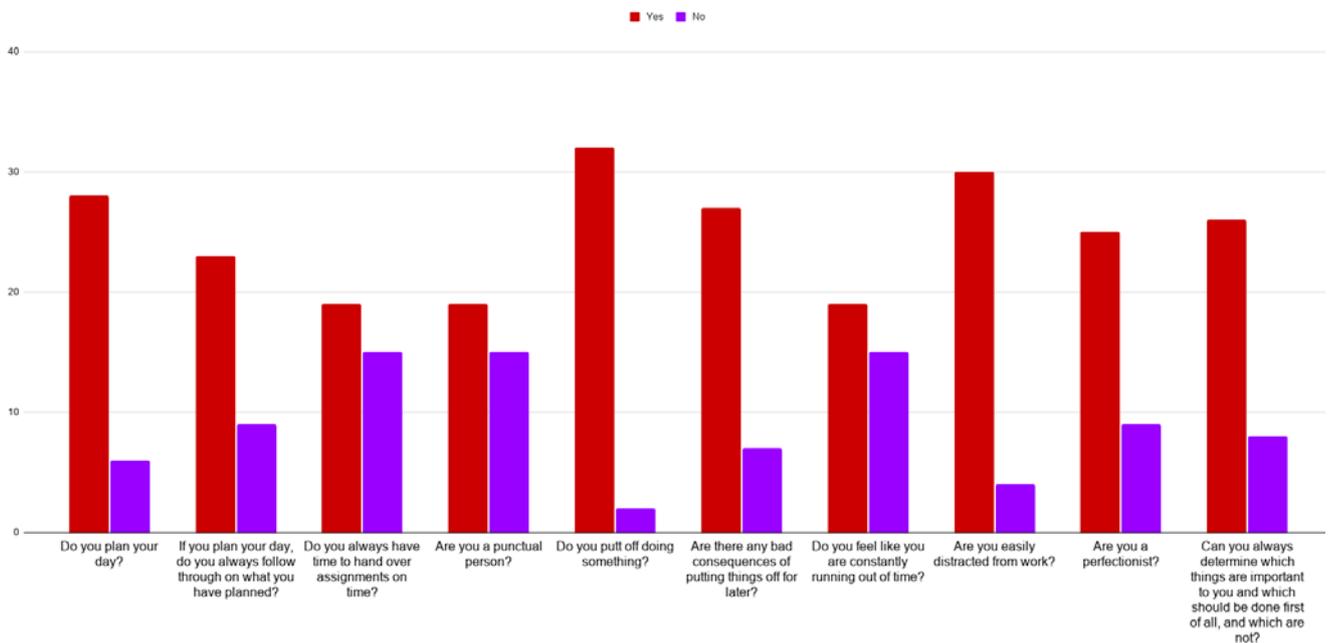


Fig.2 The results of the questionnaire

The results of the survey show that 32 students (94%) postpone doing things. 27 of them (80%) have bad consequences due to postponing tasks. A significant number of students plan their day, but often they do not fulfill everything planned. Those students who answered that they had very low academic performance, did not plan their day, and did not always follow deadlines. A significant part of students (74%) think they are perfectionists.

Time management problems are very common and can lead to various kinds of negative consequences. It is important to properly organize time and spend it effectively.

**References:**

1. Mrsic, M. (2021) 10 Common Time Management Mistakes that are Slowing You Down. [Online] Available at: <https://openviewpartners.com/blog/common-time-management-mistakes/#.YFOYR9pxfIU>. Accessed on: February 12, 2021.
2. Procrastination (2021). In Wikipedia. Available at: <https://en.wikipedia.org/wiki/Procrastination>. Accessed on: February 12, 2021.
3. Lim, S. (2021) 10 Time Management Mistakes Most People Fall Into. [Online] Available at: <https://www.lifehack.org/articles/productivity/10-time-management-mistakes-most-people-fall-into.html>. Accessed on: February 12, 2021.
4. Rampton, J. (2019) 11 Time Management Mistakes You Are Probably Making. [Online] Available at: <https://www.entrepreneur.com/article/336042>. Accessed on: February 12, 2021.
5. Derrick (2020) 6 Time Management Mistakes You're Making. [Online] Available at: <https://thewondercottage.com/time-management-mistakes/>. Accessed on: February 12, 2021.
6. Ryan, S. (2020) 7 Time Management Mistakes That You Should Take Seriously. [Online] Available at: <https://simplyrenewedliving.com/time-management-mistakes/>. Accessed on: February 12, 2021.

### **Assessment methods of enterprise international competitiveness**

An important attribute of a market economy is competition. The market as a mechanism of action cannot exist without developed forms of competition. As noted by the famous English economist F. Hayek: ‘societies that rely on competition are more successful than others in achieving their goals’ [1].

In the process of competition, there is a problem with assessing the level of enterprise international competitiveness aiming at ensuring and strengthening competitive advantages.

The assessment of the enterprise international competitiveness is a complex and multi-factorial task reducing to the interpretation and evaluation of a system of indicators characterizing various aspects of the enterprise's activities that form its competitiveness [2]. To enter the international market, a company must achieve a certain level of efficiency. These can be indicators of product quality, profit and profitability.

The assessment of the level of enterprise international competitiveness allows:

- to form managerial tasks of determining the approaches to production, technology, marketing, financing the material, information and organizational support/ maintenance;
- to make management decisions: reduce costs, focus on a specific market segment, sign contracts;
- to develop the measures for developing competitive advantages,
- to implement innovations, offensive measures to consolidate long-term advantages, protective measures to prevent the actions of participants, and to develop a program for entering new markets and attracting investors` funds;
- to adapt the company to market conditions, that in turn gives victory in the competition for consumers and sales markets [3].

It should be noted that today a number of methods are used to assess the enterprise international competitiveness, which is explained by the uniqueness of the available methodological approaches in the study. Summarizing the available researches on this issue, the main methods of assessing the enterprise competitiveness are given in table 1 [4].

The most well-known methods for assessing the enterprise competitiveness are matrix ones. They allow to analyse certain aspects of the enterprise, determine the market position and find the further directions for development.

One of the most common tools for strategic analysis of the company position in competition is the method of SWOT analysis.

SWOT (strengths, weaknesses, opportunities, threats) - analysis is a universal and simple method of strategic research, but it allows to take into account a sufficient number of market factors affecting the functioning of the enterprise in the market.

Table 1. System of methods for assessing the enterprise competitiveness

Group name	Method name
<p style="text-align: center;"><b>Matrix</b></p> <p>It determines the quantitative value of the integrated rating indicator of the individual enterprise development or to graphically determine its position on certain parameters, as well as to analyse certain aspects of the enterprise, its operating environment, market position; and to identify the main directions of further development.</p>	<ol style="list-style-type: none"> <li>1. Matrix of the "Boston Consulting Group" (BCG).</li> <li>2. The matrix of I. Ansoff.</li> <li>3. The McKinsey Matrix.</li> <li>4. Matrix of competitive strategies of M. Porter.</li> <li>5. Thompson-Strickland matrix.</li> <li>6. SWOT analysis.</li> <li>7. SPACE analysis.</li> <li>8. STEP analysis.</li> </ol>
<p style="text-align: center;"><b>Graphic</b></p> <p>It provides a clear understanding of the assessment results, interpreted in graphical objects (drawings, graphs, diagrams, etc.), to provide appropriate calculations and logical conclusions.</p>	<ol style="list-style-type: none"> <li>1. Graphs of comparisons.</li> <li>2. Analytical graphs.</li> <li>3. Illustrative graphics.</li> <li>4. Charts.</li> <li>5. Cartograms.</li> <li>6. Card diagrams.</li> <li>7. Development models based on life cycle theory.</li> </ol>
<p style="text-align: center;"><b>Index</b></p> <p>It is based on a complex characteristic of the relative changes in the elements of enterprise development in time, space, or in comparison with the standard, which, due to their functional dependence, are represented by a system of interrelated indicators based on the principle of presenting an integral result.</p>	<ol style="list-style-type: none"> <li>1. A method based on determining the competitiveness of products.</li> <li>2. A method based on the theory of effective competition.</li> <li>3. A method based on determining the strength of the reactive position.</li> <li>4. A method based on the theory of equilibrium of the firm and industry.</li> <li>5. The method of integrated assessment.</li> <li>6. Benchmarking method</li> </ol>
<p style="text-align: center;"><b>Analytical</b></p> <p>It is based on performing calculation and analytical operations with input data. At the same time, depending on the specific method of analysis, the use of these methods can include both simple arithmetic operations and rather complex calculations.</p>	<ol style="list-style-type: none"> <li>1. The method of differences.</li> <li>2. The method of ranks.</li> <li>3. The method of points.</li> <li>4. Methods of expert evaluation.</li> <li>5. Systems of differential equations.</li> </ol>

Thanks to the SWOT analysis, the company will be able to justify its goals and strategies, which will increase the efficiency of competition and, consequently, the competitiveness of the enterprise as a whole [5].

In addition, graphical methods are widely used. Such methods are based on the use of ‘competitiveness polygon’ (Fig. 1) [6]. Its essence is that the assessment is carried out according to eight criteria using a certain scale of measurement for each of them.

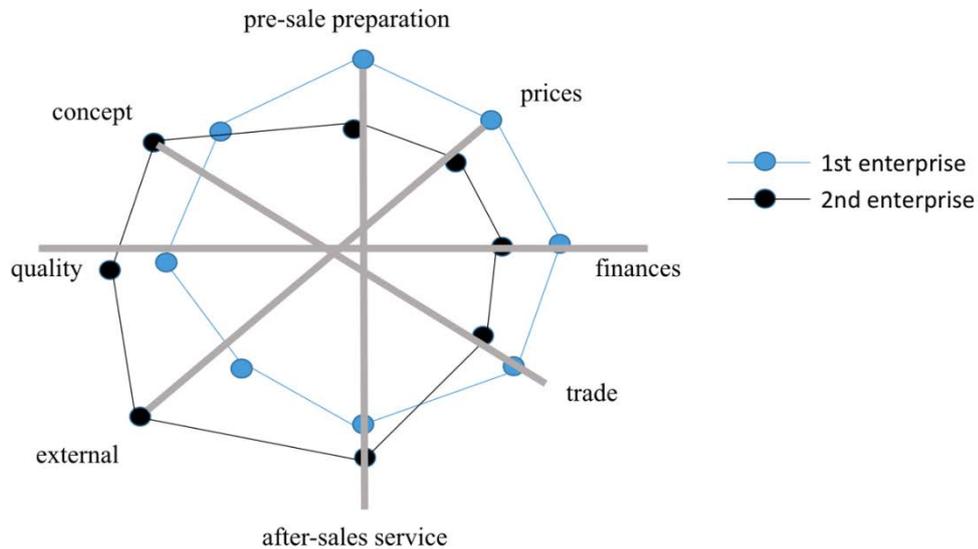


Figure 1. Example of competitiveness polygon

As for the modern approach to assessing competitiveness, Shell, a British-Dutch chemical company has developed its own model of strategic analysis and planning, called the Direct Policy Matrix (Fig. 2).

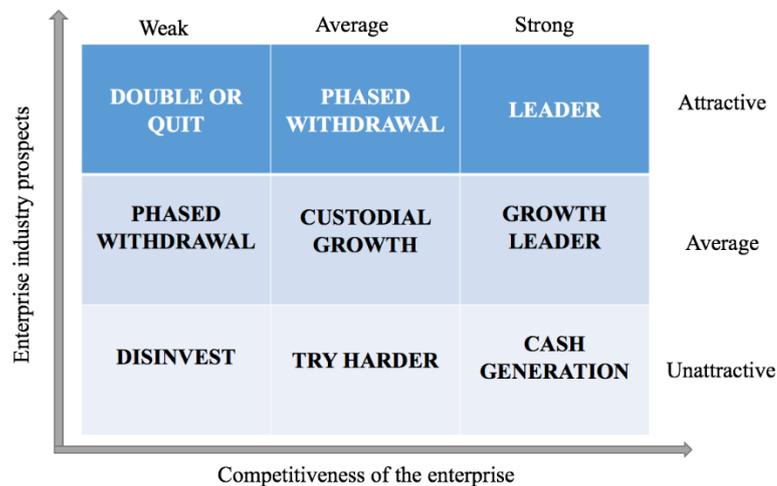


Figure 2. The model of the direct policy matrix developed by Shell

According to the model, the competitive position of an enterprise has the following criteria: relative market share, distribution network coverage, distribution network efficiency, technological skills, product line width and depth, equipment and location, production efficiency, experience curve, inventory, product quality, research capacity, economies of scale, after-sales service. The low level of epy enterprise

international competitiveness implies the implementation of certain measures aimed at improving it. The Shell's DPM model allows to choose a specific enterprise strategy depending on the life cycle of a particular product type or cash flow [7].

The results of the theoretical study show that there are many methods of assessing the enterprise international competitiveness used by enterprises around the world. In the course of the study, the choice of the most effective method for assessing the international competitiveness of an enterprise will allow to get maximum results and develop the right strategies for solving the identified problems in the future. It is important to note that managing the competitiveness of an enterprise is becoming more and more important in market relations every year and today it is the key to the successful operation of any enterprise. In such conditions, companies need to speed up the process of creating a competitiveness management system, adapt it to market relations, and strengthen methods for assessing the provision of international competitive advantages.

The use of the proposed methods requires a more detailed study, since the problem of choosing a universal indicator for assessing the international competitiveness of an enterprise remains unsolved and requires further research.

#### **References:**

1. Hayek, F., "The road to serfdom". The Institute of Economic Affairs, London, England, 2005, pp. 264-265.

2. Реутов В.Є., Вельгош Н.З., "Управління міжнародною конкурентоспроможністю підприємств". Навчальний посібник. Сімферополь: Таврія, с. 200, 2007.

3. Яцковий Д.В., "Сучасні методики оцінки конкурентоспроможності підприємства". Вісник соціально-економічних досліджень, випуск №4 (51), с. 183-188, 2013. [Електронний ресурс]. Режим доступу: [http://nbuv.gov.ua/UJRN/Vsed\\_2013\\_4\\_30](http://nbuv.gov.ua/UJRN/Vsed_2013_4_30) Дата звернення: Березень 09, 2021.

4. Сладкевич В.П., "Стратегічний менеджмент організацій". Підручник для студентів вищих навчальних закладів, с. 496, 2008.

5. Шляхта О.М., "SWOT-аналіз як інструмент стратегічного менеджменту підприємства". Економічний простір, випуск №68, 2012. [Електронний ресурс]. Режим доступу: <http://www.irbis-nbuv.gov.ua> Дата звернення: Березень 09, 2021.

6. Кирчата І.М., "Сучасні методики оцінки конкурентоспроможності підприємства: аналіз та систематизація". Електронне фахове видання, Миколаївський національний університет імені В.О. Сухомлинського, випуск №8, 2015. [Електронний ресурс]. Режим доступу: <http://global-national.in.ua/issue-8-2015/16-vipusk-8-listopad-2015-r/1464-kirchata-i-m-metodi-otsinki-konkurentospromozhnosti-pidprijemstva-analiz-ta-sistematzatsiya> Дата звернення: Березень 09, 2021.

7. Князев С.В., "Матрица стратегического позиционирования бизнеса Shell/DPM и ее применение для разработки маркетинговых стратегий филиалов страховой компании". Журнал "Технологии управления маркетингом", 2006.

### E-economy: myth or future reality

Emergence of new digital infrastructures, development of computer technologies and digital communications create new opportunities in the field of information technologies [1]. Nowadays, the world is facing the challenge of a breakthrough in digital technologies [6]. It has been more than five years since the digital economy has been integrated into economic practice as the digitalization of various aspects of human life, and the simultaneous digitalization of society as a whole [8].

The use of computers, the Internet, mobile phones, smartphones etc., and in the long term, quantum computers and neural networks (Neuronets) has brought institutional changes into the functioning of the economy as a whole.

The use of the Internet and gadgets should be regarded as a kind of consumption, industrial and individual. The digital economy can be represented as a part of economic relations mediated by the Internet, cellular communications, ICT etc. The phenomenon of real digital enterprises emerges [8].

The rapid development of IT and the active use of the World Wide Web and the Internet in business lead to new economic relations in all areas of the economy, including commerce [3].

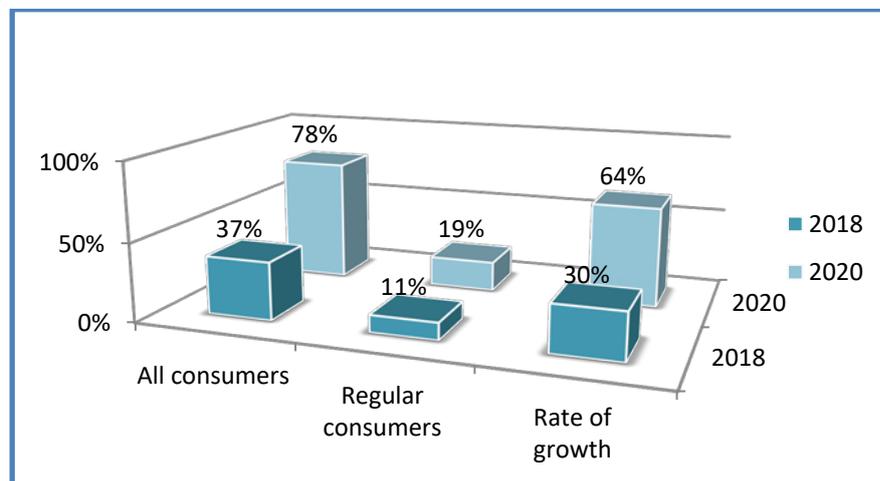


Fig. 1. E-commerce consumers in Ukraine (2018-2020)

If comparing the chart of 2018-2020, we see that in 2018 the share of Ukrainian consumers who buy goods in online stores is only 37%, and in 2020 the number of such buyers increases to 78%. At the end of 2020, we have 19% of regular consumers. We can conclude that e-commerce is gaining momentum and growth among consumers. The figures for 2018 show the increase by 30% (77.9 billion

UAH), the next two years by 17% each, 97.4 billion UAH and 114.9 billion UAH.) respectively (Fig.1).

Thus, the number of consumers continues to grow every day. Even in connection with the pandemic in the world, banks give preference to remote provision of services. The government of Ukraine launched an electronic application "Diya" in 2020, with the help of which we can use public services without leaving our homes.

Traditional commercial practice is giving way to a new form of all-channel sales business - through the wider involvement of market agents in e-commerce and through the development of multi-channel commerce formats [2]. E-commerce is an environment that is constantly changing and improving as technology improves, and companies compete with each other to win more of the pie [5].

In turn, e-commerce is based not only on automated business processes, but on a single market strategy, which is determined by the following principles:

- coincidence of the range of goods and loyalty programmes;
- price set for goods and services regardless of the distribution channel;
- wide choice of payment options (cash, credit card, e-wallet);
- effectively organized logistics;
- customer databases, including individual proposals and forecasts of consumer behaviour) [2].

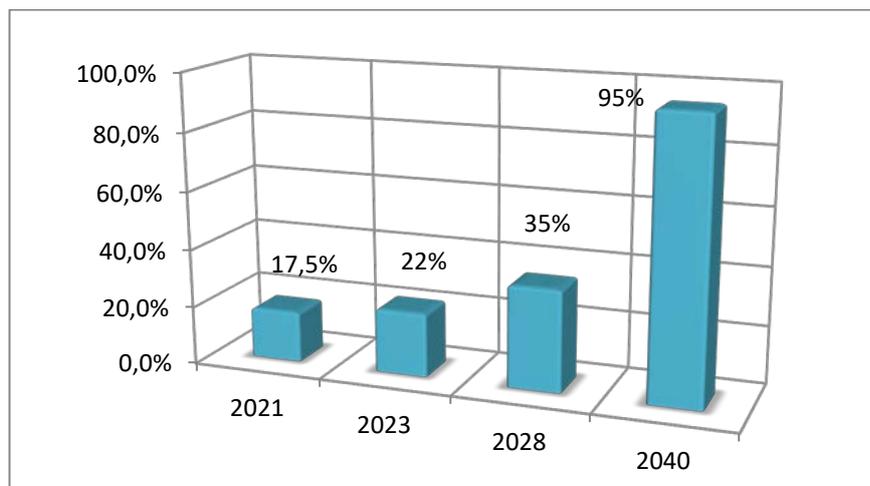


Fig. 2. E-economy forecast

The forecast for the growth of demand for the e-economy shows the increase of the e-commerce purchases from 17.5% to 22% by 2021, and from 22% to 35% in future period. These estimates are very optimistic, and they show that e-commerce as a business has not yet reached its potential (Fig.2).

Statistical data show that by 2040, almost 95% of all purchases will be made through e-commerce, which is certainly food for thought for all business owners [6] .

All the statistical data included in this paper point to the fact that e-commerce is likely to continue to grow and prosper in the future [4]. To stay up to date with the competition, it is very important to keep up with new trends to avoid falling behind.

**References:**

Andreeva A.N., Mizova E.M. (2018). Digital economy: new business opportunities, Journal of Economy and Business. Available at: <https://cyberleninka.ru/article/n/digital-economy-new-business-opportunities>.

Accessed on: March 4, 2021.

1. Antipin (2017). It in e-commerce and omni-channel sales in Russia. International journal “Innovative Science” №02-1/2017 ISSN 2410-6070. Available at: <https://cyberleninka.ru/article/n/it-in-commerce-e-commerce-and-omni-channel-sales-in-russia>. Accessed on: March 2, 2021.

2. Data is giving rise to a new economy (2017). The Economist, May 6th 2017. Available at: <https://www.economist.com/special-report/2020/02/20/a-deluge-of-data-is-giving-rise-to-a-new-economy>. Accessed on: March 2, 2021.

3. Kolodko W. (2019). The new pragmatism or the economy of the future. Available at: <https://www.jstor.org/stable/24857747>. Accessed on: March 9, 2021.

4. Snopok E.V. (2015). Online commerce: advantages and disadvantages. Electronic bulletin of the Rostov Social and Economic Institute Issue No. 3 - 4. Available at: <https://cyberleninka.ru/article/n/online-commerce-advantages-and-disadvantages>. Accessed on: March 8, 2021.

5. The Future of E-commerce (2020). Available at: <https://ecommerceguide.com/guides/ecommerce-future/>. Accessed on: March 11, 2021.

6. Young J. (2020). US e-commerce sales grow 14,9% in 2019. Available at: <https://www.digitalcommerce360.com/2020/02/19/us-ecommerce-sales-grow-14-9-in-2019/>. Accessed on: March 9, 2021.

7. Yudina T.N. (2018). Digital segment of the real economy: digital economy in the context of analog economy. St. Petersburg State Polytechnical University Journal. Economics, 7–18. DOI: 10.18721/JE.12201. Available at: <https://cyberleninka.ru/article/n/digital-segment-of-the-real-economy-digital-economy-in-the-context-of-analog-economy>. Accessed on: March 3, 2021.

### **Strategic directions for sustainable development of Ukraine**

Toward the start of the 21<sup>st</sup> century, there was a particular origination framed, which contains the advanced thought of the global network on ways about conveying supportable development. A large portion of these needs have been detailed and made by the general population and government officials, preservationists, financial analysts, sociologists, scientists, and different experts, demonstrating the thorough idea of the issue and its significance to society.

A basic condition for manageable financial and social advancement of Ukraine is the ecological safety, productive utilization of common assets, natural security of human life. In any case, because of anthropogenic effect on the climate present natural circumstance in the nation stays exceptionally muddled.

A trademark highlight of Ukraine is a high populace thickness and urbanization of the domain, proven by the high extent of metropolitan lodging. All in all, the extent of metropolitan lodging in Ukraine is over 64%. In the most urbanized the Donetsk area, this marker equivalents to 89.5%, and in the Luhansk locale - 86%, Dnipropetrovsk and Zaporizhia areas the extent of metropolitan lodging is individually 83.4% and 73.1% [1].

The advanced city with its ground-breaking designing and specialized framework is the wellspring of progress development and simultaneously, the urban communities got one of the principle purposes behind ecological debasement. From one viewpoint, the urban areas comprise of the fundamental specialized offices, logical, instructive and social focuses, and on the other – modern creation, landfills, progressed transportation organizations and perpetual ones becoming the quantity of transport units.

An extraordinary assortment of urban areas – from little towns to huge urban areas of the XXI century causes a wide scope of ecological issues. For the most part, huge urban communities – a city over-burden with creation structure and basic environmental issues. Confounded utilities are centered around incorporated frameworks, and in numerous huge urban areas of Ukraine, collective frameworks are on the restrictions of the assessed timing of the activity, which compounds the natural circumstance and requires impressive monetary costs on upkeep and fixes. In unassuming communities and country regions, the issue isn't so intense because of the underdevelopment of designing organizations and correspondences [1].

Toward the finish of the XX century in Ukraine, there was endorsed the state "idea of economical human settlements advancement". This paper comprises of a specific meaning of maintainable (adjusted) improvement of settlements, which ought to be perceived as «socially, financially and naturally supportable advancement of metropolitan and rustic settlements, which is pointed toward making their

monetary potential, complete living climate for present and people in the future from the levelheaded utilization of resources» [2]. This idea is intended for long haul usage (15–20 years) and includes the improvement of procedures for feasible development for explicit regions, particularly urban areas.

Compromise of the urban areas' financial advancement errands with the natural security and solace of inhabitants living in metropolitan zones depends on the acknowledgment of the fairness of the three parts of practical turn of events: monetary, ecological, and social.

Ukraine's possibilities in accomplishing European key pointers in environmental change and energy to a great extent rely upon the present status of the arrangement and chances of the natural issues to determine the current ecological insurance issues.

These days, the circumstance with the decrease of ozone harming substance emanations in Ukraine doesn't look awful. As per the Fifth National Communication on Climate Change, the review performed by a worldwide group of specialists affirmed the base figuring of 1990 for Ukraine in the measure of 920.8 million tons of CO<sub>2</sub> equal [3].

The monetary slump in the early long periods of autonomy of Ukraine has prompted a huge decrease either in energy utilization or in CO<sub>2</sub> discharges. Somewhere in the range of 2000 and 2007, CO<sub>2</sub> discharges were balanced out with a slight inclination to increment. The expansion of CO<sub>2</sub> emanations in this period was because of financial development yet had no immediate relationship with the patterns in monetary turn of events. This was because of the rebuilding of the economy, critical development in exchange, administrations, and the account area with no correlation with mechanical creation, which gave a huge commitment to GDP development during this period.

Another significant factor that essentially influences of CO<sub>2</sub> emanations pattern in this period is the modernization of creation, which diminished the energy utilization of significant items. Patterns in CO<sub>2</sub> outflows in 2008-2010 were dictated by the worldwide money related monetary emergency, indications of which are a clear decrease in item creation in significant fare situated ventures, including metallurgy and synthetic industry.

Ukraine is an individual from the second time of the Kyoto Protocol and has subscribed to diminish ozone harming substance outflows by 20 % contrasted with discharges in 1990 by 2020 [4].

Today, Ukraine has figured out how to lessen ozone harming substance outflows by more than 50 % contrasted with the 1990 benchmark.

The intelligent continuation of earth agreeable strategy is by all accounts embracing more yearning objectives, for example decreasing emanations by 10 % from the level accomplished, not on base 1990. The official objective of emanation decrease by 20 % (from 1990 level) by 2020, truth be told, gives a critical development of GHG outflows in Ukraine.

The development of the economy, temporarily, will unavoidably prompt more significant levels of natural contamination. In this manner, officially the key marker

will be reached. Be that as it may, actually, a critical increment in ozone harming substance emanations may occur. In addition, Ukraine may arrive at the key pointer of lessening ozone depleting substance discharges, so it is more than sensible, in any case, simultaneously, the natural state might be more regrettable, so it will impact the ecological circumstance in the nation and on worldwide environmental change pattern.

It is conceivable to keep away from it simply by compelling ecological arrangement execution and its harmonization with mechanical approach and energy sparing.

In December 2010, has been embraced the Act of Ukraine "On the State Environmental Policy Fundamentals (system) of Ukraine by 2020" [5]. The motivation behind the National Environmental Policy is to settle and to improve the condition of the climate in Ukraine through the joining of ecological strategy into the financial advancement of Ukraine to guarantee a sheltered climate forever and wellbeing just as for a biologically adjusted natural administration framework and protection of characteristic environments execution.

Among the fundamental targets for the assurance of air is to diminish basic toxins outflows by:

- fixed hotspots for 10 % by 2015 and for 25 % by 2020 of versatile sources pattern by setting up content standards of toxins in the fumes gases by 2015, as indicated by the principles of Euro 4, 2020 – Euro-5;
- streamlining of the public economy energy area structure by expanding the utilization of fuel sources with low carbon dioxide outflows by 2015 by 10% and by 2020 by 20%, and to guarantee the decrease of ozone harming substance discharges following the proclaimed Ukraine's worldwide commitments under the Kyoto Protocol to the Framework Convention of the United Nations Convention on Climate Change.

There are two stages referenced to accomplish the objectives of the Strategy. By 2015, it is important to settle the ecological circumstance, to hinder the anthropogenic effect on the climate, to make conditions for improving public natural security, starting the harmonization the ecological norms with the European Union guidelines, to build up the applicable legitimate demonstrations of public exercises in the field of natural assurance.

During 2016–2020 Ukraine needs to execute the European natural norms and do the biological system arranging, to actualize basically monetary impetuses environmentally situated basic changes, to accomplish a harmony between financial needs and difficulties in safeguarding the climate, to guarantee the advancement of earth compelling association between the administration, business, and the general population, to spread the ecological mindfulness [5].

Examination of the ecological parts of economical advancement prompts the end that the presence of some advancement in diminishing ozone harming substance emanations and energy-sparing approach initiation, the natural circumstance in the nation stays troublesome. The significant energy shoppers are modern regions and mechanical settlements. The volume of utilization is continually expanding, not just

due to energy-serious businesses and hefty enterprises yet in addition on account of the advancement of transport and metropolitan turn of events, the developing requests for lodging and public administrations. For this situation, one of the most squeezing issues of metropolitan improvement is the supportable use and energy investment funds.

Prospects for further research is to find tools for sustainable development components of urban areas combination in the context of the 2020 strategy identified priorities.

**References:**

1. Довкілля України у 2012 р. Доповідь Державної служби статистики. [Електронний ресурс]. – Режим доступу: [www.ukrstat.gov.ua/operativ/operativ2012/ns\\_rik/analit/dop\\_dov\\_12.zip](http://www.ukrstat.gov.ua/operativ/operativ2012/ns_rik/analit/dop_dov_12.zip).
2. Постанова Верховної Ради України № 1359-XIV від 24.12.1999 р. «Про Концепцію сталого розвитку населених пунктів» [Електронний ресурс]. – Режим доступу: <http://zakon1.rada.gov.ua/laws/show/1359-xiv>.
3. П'яте національне повідомлення з питань зміни клімату [Електронний ресурс]. – Режим доступу: [www.necu.org.ua/wp-content/.../ghg-potential\\_summary\\_ukr\\_101122.p](http://www.necu.org.ua/wp-content/.../ghg-potential_summary_ukr_101122.p).
4. Кухар В.П. Концепція переходу України до сталого розвитку / В.П. Кухар, Б.В. Буркинський, М.А. Голубець та ін.// Вісник НАН України. – 2007. № 2. – С.14–44.
5. Закон України «Про основні засади (стратегію) державної екологічної політики України на період до 2020 року» від 21.12. 2010 р. № 2818-VI. [Електронний ресурс]. – Режим доступу: <http://zakon2.rada.gov.ua/laws/show/2818-17/page2>.

### **How sustainable development can help business prosper**

Over the past 30 years, the world has seen huge social improvements and technological progress. We have experienced unprecedented economic growth and lifted hundreds of millions of people out of poverty. We are benefiting from a life-changing digital revolution that could help solve our most pressing social and environmental challenges.

Unfortunately, despite this success, our current model of development is deeply flawed. Signs of its failure and imperfections in today's markets are everywhere. Natural disasters triggered by climate change have doubled in frequency since the 1980s. Violence and armed conflict cost the world the equivalent of 9 % of GDP in 2014, while lost biodiversity and ecosystem damage costs can be estimated as 3 % consequently. We continue to invest in high-carbon infrastructure at a rate that could commit us to irreversible, immensely damaging climate changes. Social inequality and youth unemployment are worsening in countries across the world, while on average women are still paid 25 % less than men for comparable work.

Four economic divisions, namely, food and agriculture, cities, energy and materials, health, and well-being representing around 60 % of the real economy are critical to meet the global goals. These vitally important indicators were examined by the Commission and it was concluded that achieving these goals opens US\$12 trillion of market opportunities.

These seventeen Global Goals and their 169 component targets have been designed from the bottom up to build the kind of future that most people want, where there is no poverty, the planet is protected, and all people enjoy peace and prosperity. The goals fall into two main areas – social and environmental. Some of the social goals aim to meet basic needs. They include ending extreme poverty and hunger and ensuring universal access to healthcare, clean water and sanitation. Others advance required human rights, empowering people through quality education, gender equality, employment and decent work, reduced inequalities, and innovations in industry and infrastructure to make people prosper and feel valued. Sustainable development could result in creating almost 380 million jobs thus making effect on our economy and social life, promoting diversity without splitting the people on classes.

If we look at this sustainable development from the business perspective, we can absolutely assume, that it will help develop more opportunities in terms of business promotion and growth. From one side it looks like just a simple marketing. For example, Adidas conducted a new body positivity campaign whose main goal a progressive society defined as delivering gender equality and diversity. The company

was sure to be success, but the main underlying target was to get more consumers, that could buy their stuff and generate the finance flow.

We could create better society and better life for our future generations and achieving these Global Goals for human society is a business imperative too. However, without making necessary improvement in such areas as health and social protection, law and education, the business opportunities arising from sustainable development will not be implemented.

It should be emphasized that businesses could use their influence on policy in a responsible, transparent, and accountable way. Unfortunately, the scale and possibilities of global businesses to impact on government policies are not always applied in a proper way. Moreover, with the help of the global goals, most of the businesses are trying to get rid of mistrust caused by using their power to enrich themselves than to provide help to the society. If they start implementing into the society, they will receive more profit as well as their potential consumers.

The biggest challenge is to elaborate a strategy that could promote sustainable development of the company to reach a more competitive edge. The company is required to be convinced that sustainability is a more successful way of doing business. Many companies fail to find or fully understand this connection and management plays a key role to make a right decision. If a top management does not do this, the company will never leverage sustainability to its full potential.

Another factor of failure is misguided communication or a lack of communication. If the vision and the strategy are not communicated at all levels within an organization over the specific period, then the transition takes longer or can even fail since the people working there are not aware or do not understand why sustainability is being pushed. If there is no understanding, the quality and outcome of actions will always be at lower levels.

To sum up, the goals aimed at sustainable development will help businesses improve their image brand, raise finance flow, and attract new customers. Since the business is improved, it can make impact on government policy and affect the society and current life situation. All these actions lead to a highly developed economy, which results in creating more possibilities for a better life.

### **References:**

1. "Better Business, Better World. The report of Sustainable Development Commission",2017 [Electronic resource] Available at [/https://sustainabledevelopment.un.org/content/documents/2399BetterBusinessBetterWorld.pdf](https://sustainabledevelopment.un.org/content/documents/2399BetterBusinessBetterWorld.pdf).
2. "How to Build Your Sustainable Business Strategy", Sphera Research January 17, 2020 [Online]. Available at [https://sphera.com/spark/how-to-build-your-sustainable-business-strategy/?utm\\_source=Google&utm\\_medium=Text&utm\\_campaign=Spark&keyword=sustainable%20business%20strategy&matchtype=b&device=c&gclid=Cj0KCQjwrsGCBhD1ARIsALILBYoV4FTmoM-3xmQ5lZP4sf-zCSmsy9u9OPHMuI602QbCxPg3IZGrh0aAr6lEALw\\_wcB](https://sphera.com/spark/how-to-build-your-sustainable-business-strategy/?utm_source=Google&utm_medium=Text&utm_campaign=Spark&keyword=sustainable%20business%20strategy&matchtype=b&device=c&gclid=Cj0KCQjwrsGCBhD1ARIsALILBYoV4FTmoM-3xmQ5lZP4sf-zCSmsy9u9OPHMuI602QbCxPg3IZGrh0aAr6lEALw_wcB).

## **The problems of modern Ukrainian management**

Management is the most important part of any company. It controls all the current company processes, helps to analyze the potential prospects and choose the vector of development. Also, it makes the company employees feel themselves like one big family and this friendly ambience can help businesses reach more than they expected.

The success of any company is connected with the effective management, which means that it needs to pay its attention to solving some problems using effective approaches. Scientific and technological revolution and the development of the information society make businessmen change old methods and learn something new to be useful for their business and country. It is often necessary to try something unknown and implement latter-day experience into business environment. Frequently, it is very hard to start something you have never tried to do, but in modern conditions it is required to take all the bravery to unite strength and change some old habits.

Ukrainian management is a sphere which requires new solutions. But let us first identify its main problems.

*Old workers.* It is the biggest challenge of Ukrainian management because companies mainly hire adult people. There is a stereotype, that if you are older, you have more experience and you are more useful, but, sometimes it can be a fatal mistake. The point is that young people can easily learn something new, try themselves in modern methods, remember more information, master actual PC programs and find the solution faster than their parents.

*No planning.* Some companies do not think about their far future and are focused only on present issues. It causes troubles not only for this enterprise and its workers, but also for the suppliers and marketing intermediaries. As a result, they spend the part of the capital to solve some problems rather than develop the business.

*The conservatism of leaders.* Some directors do not use modern methods and approaches but prefer something traditional. Such behavior of top officials, for example, in Ukraine, makes our country less developed than other European countries. If we want to provide services at the highest level, we should risk. You will never guess, what is behind the door until you open it.

*No team-building.* Most people avoid contacts with those, whom they do not know or know badly, but, being a part of a big company, employees should easily communicate with colleges to make the life easier and work more useful. But some people can be too shy or busy to communicate with their colleges in a free time, so the company must organize some corporate events to help their workers find a mutual language. In result, it will increase the work efficiency.

*Owner-manager.* The trouble is that some owners want to control all the processes inside their companies, but it is unreal. While the owner works with documents, managers can analyze the service market and look for the weaknesses of competitors, find the ways of solving some problems, organize some events for the company and give some advice for a new worker. But lust for power removes the company from the desired level of development, because one person cannot find all disadvantages and predict all risks of some action.

*Enlargement crisis.* It is a very common problem in companies, where the director has unlimited power and does not need to explain his steps to anyone. If things go well, the director can single-handedly decide to expand the company and open some new branches, but all actions have a result and, in this situation, the infrastructure can suffer or the company can become unprofitable.

*Immutability of directors.* In most companies in our country the directors have not been changed for a very long time. Some of them are very old, but their lust for power does not let them go and sometimes it causes the impairment of economic performance of the firm, and even leads to bankruptcy.

*The greed.* Indeed, some directors do not want to pay for the education for their workers, but seminars, conferences and meetings with foreign colleagues can help them provide service at the highest level and reach more.

It is obvious that Ukrainian businesses have been facing these challenges for a long period of time, and now it is time to develop some solutions and explain what changes they may introduce.

*Managers should be more thoughtful.* They ought to pay more attention to their employees and their education. They need to make a friendly ambience, where the employees feel like one big team, know what they should do to have the better result, can cooperate and work more effectively.

*Do not work alone.* It is necessary keep contact with managers and employees to get some pieces of advice how to make the company more successful. Sometimes the outside perspective on current problems can help to solve them. What is more, top managers should have some assistants, who they can rely on in any situation.

*CEO should be open for something unknown.* It is hard to add some new experience and make unexpected decisions, but it can help upgrade skills and develop some helpful ideas.

*Young blood.* Companies should not be afraid to employ students and young people, because they can introduce some new methods and bring some knowledge, that will positively affect the success of a company.

*Make way.* It is difficult to realize and tell yourself, that you are not as smart as before and this work is too stressful for you, but this responsible step can help the company. Someone young, ambitious and resolute will take your place and reach new heights.

So, some urgent problems of modern Ukrainian management have been described and some pieces of advice how to solve them have been given. Actually, these steps look easy, but it is necessary to make them to change the situation. It can

be difficult in the beginning, but Ukrainian business will see a great result in the end and realize that all risks were acquitted.

**References:**

1. Івах С. Сучасні проблеми українського менеджменту [Електронний ресурс] / С. Івах, О. Коханова // Наукові конференції. – 2013. – Режим доступу до ресурсу: <http://oldconf.neasmo.org.ua/node/1431>.
2. Ковальчук І. І. Сучасні проблеми менеджменту [Електронний ресурс] / І. І. Ковальчук // НТУУ "КПІ" УС-61 – Режим доступу до ресурсу: [http://www.rusnauka.com/35\\_PWMN\\_2008/Economics/38615.doc.htm](http://www.rusnauka.com/35_PWMN_2008/Economics/38615.doc.htm).
3. Михайлович П. Основні проблеми менеджменту на підприємстві та шляхи їх усунення / П. Михайлович, О. Л. наук. керівник Тоцька. – Волинь: Східноєвропейський національний університет імені Лесі Українки, 2017. – Режим доступу до ресурсу: <http://www.spilnota.net.ua/ua/article/id-1947/>

### 4Ps of green marketing

Over the last fifteen years, there has been a change in marketing concepts and the dominance of the green marketing paradigm. Green marketing or eco-marketing is the practice of using environmentally friendly technologies in production, production of environmentally friendly products by the company in order to significantly increase sales of its products, increase customer loyalty, as well as to promote greater brand awareness. The purpose of environmental marketing is to meet the needs of consumers while maintaining and improving the environment, as well as offering products with the least negative impact on the environment.

Currently, many companies and firms are serious about ways to produce their own products, relying on how to minimize the harmful effects on the environment. Therefore, companies which try to promote their products and brands, and at the same time care about environment, build appropriate production concepts and marketing systems.

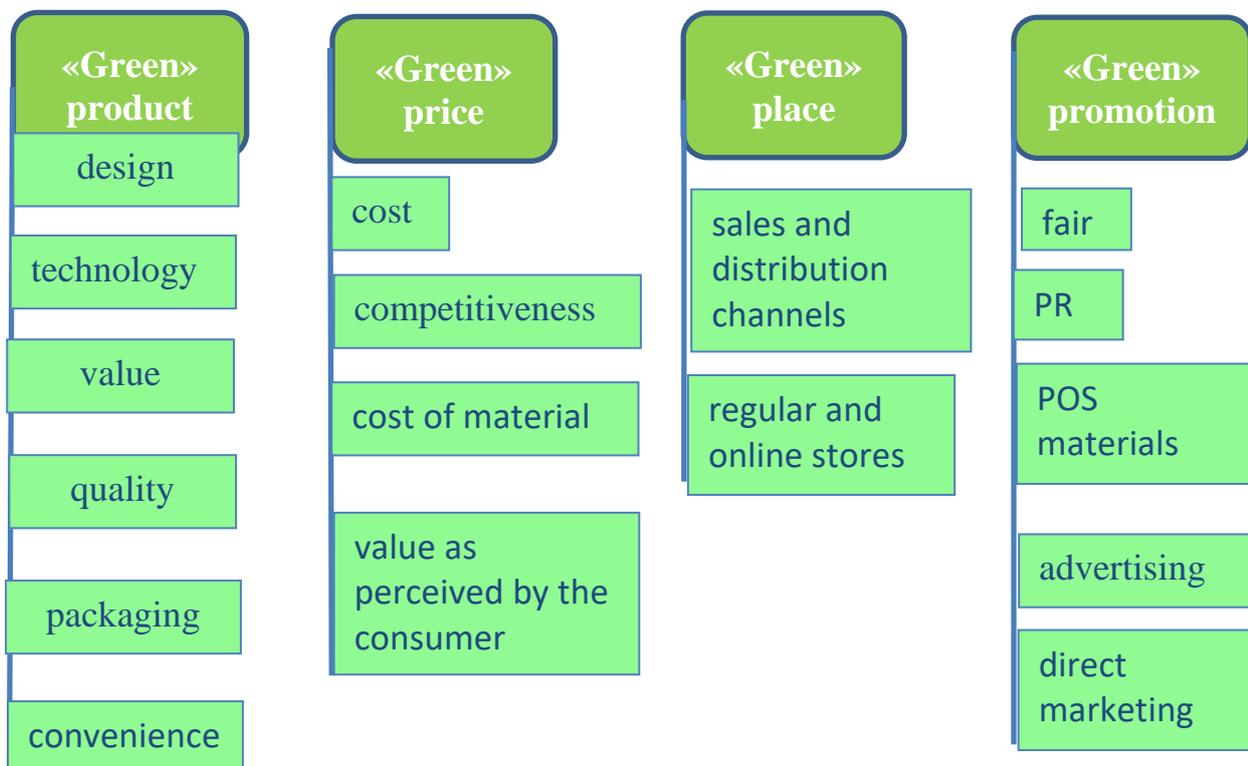


Fig.1. The marketing mix of eco-marketing

«Green» product covers product design, technology, value, quality, packaging, and convenience. Product design is one of the most important components. It is the design that attracts the attention of the consumers, makes them interested in a particular product and, consequently, influences consumer decisions to choose and

buy the product. The design should be user-friendly and use ecological stylistic solutions. Technology must be environmentally friendly and in no way pollute the environment or harm nature. Nowadays, there are many modern varieties of such technologies that are used by companies in the production process in various fields.

Value is about how consumers perceive the benefits and importance of a product. A product that is highly efficient, meets consumer needs and requirements and can even exceed consumer expectations in a good sense must be developed as organic and without any harm to the environment. The value is individual to each consumer because for everyone it has a certain level. For example, if a buyer is very sensitive to prices and price changes and ignores brands, he/she will choose cheaper products that will have the same quality as others.

Quality is the parameter which is extremely important because every consumer prefers to buy the highest quality product. Therefore, the product must be organic and of high quality.

Packaging is used not only to protect goods, but also to increase the value of products. Most companies are now trying to use environmentally friendly packaging for their product. Packaging is one of the most important aspects of a «green» product as most modern products have plastic, not recycled, not subject to biodegradation packaging. Moreover, plastic emits dangerous gases into the atmosphere. Therefore, even if a product is «green» but has «non-green» or plastic packaging, it cannot be considered «green».

Convenience is also an important component because the product must bring comfort to the consumer and be accessible and easy to use.

«Green» price refers to a certain amount of money that the consumer pays for the purchase of the product. The pricing of a «green» product depends on a number of certain factors, the main of which are the cost of material, cost, competitiveness, and value as perceived by the consumer.

It can be argued that the cost of a «green» product is higher than the cost of a traditional, non-organic product. However, this does not mean that the production of «green» products is unprofitable because the price of a «green» product fluctuates and is different in different industries and areas. Therefore, when the consumers intend to buy a «green» product, the price of this product is not decisive for them. Consumers are well aware of the fact that to make a «green» product the manufacturer must use the highest quality materials of natural origin which will not bring harmful consequences for the environment, and at the same time are not the cheapest. In addition, the production of «green» product will be dominated by advanced technologies, so the product will certainly be the latest and most technological one. Also, there are currently many companies that manufacture «green» products. It leads to significant competition. Therefore, the consumers understand that the value of the ecological product is higher, so it is quite convincing for them that the price is higher. Furthermore, prices for «green» products should be affordable for the general public.

«Green» place includes mainly sales and distribution channels. The place is also a regular store or shop in the Internet space. In general, the «green» place

includes everything that minimizes the efforts of both producers and consumers in the purchase and sale of the product. Therefore, Internet platforms are most often used as a place. Without a doubt, the Internet provides considerable comfort for the buyer and also for the company. It does not add unnecessary costs for the commissions and intermediaries. There is no need to look for a special «green» place. It is sufficient to ensure an adequate level of competencies (a set of unique features and resources of the company that ensures its success and competitiveness on the market) for the movement of goods by sales channels. Problems with sales in the «green» place can occur with high-tech products that require testing and consumer visits to the place of manufacturing the product. For «green» promotion, companies conduct a variety of marketing activities to increase consumer awareness and recognition of their products, and for subsequent purchases. In «green» promotion you need to reach the optimal level which is achieved with the optimal advertising budget and different ways to influence the promotion process. These methods include:

- choice of environmentally friendly materials for advertising (for example, cardboard or bags that are recyclable, not plastic materials that are harmful to nature);
- choice of advertising message: the content must be ethically acceptable and moral and must be of interest to different groups of society and audiences.

Consequently, «green» marketing should be an integral part of any modern production of both products and services. Eco-marketing is not a means of propaganda. It must be seen as an important aspect of corporate social responsibility in order to ensure the sustainability of the planet as a whole and to meet the needs of future generations. In order to achieve a holistic approach to «green» marketing, it is necessary to introduce its principles into the marketing mix. Then, «green» marketing will be a full-fledged strategic process that meets and anticipates the needs of target consumers without having any negative impact on natural and human well-being.

### **References:**

1. [Rohit Vishal Kumar \(2013\). Green marketing and the 4 P's: a discussion. Proceedings of the 6th International Congress of Environmental Research, Aurangabad. Available: https://www.researchgate.net/publication/263967250\\_Green\\_Marketing\\_and\\_the\\_4P's\\_A\\_Discussion. Accessed on: April 11, 2021.](https://www.researchgate.net/publication/263967250_Green_Marketing_and_the_4P's_A_Discussion)
2. [Pandey V. \(2016\). Green marketing and sustainable development-challenges and opportunities. \*International Journal of Current Research\*, Vol.8, Issue 09, p.p. 38226-38232. Available: https://1library.net/document/zgwx062y-green-marketing-sustainable-development-challenges-opportunities.html Accessed on: April 9, 2021.](https://1library.net/document/zgwx062y-green-marketing-sustainable-development-challenges-opportunities.html)
3. [Green marketing strategy and the four P's of marketing. Available: https://saylordotorg.github.io/text\\_the-sustainable-business-case-book/s10-01-green-marketing-strategy-and-t.html. Accessed on: April 10, 2021.](https://saylordotorg.github.io/text_the-sustainable-business-case-book/s10-01-green-marketing-strategy-and-t.html)

### **Influence of the OCEAN model on the company's performance**

Personal qualities currently have become one of the main criteria in the selection of personnel. HR specialists pay special attention to the soft skills of employees, particularly communication, desire to achieve goals, desire to learn new things, and other qualities. If the employees' hard skills can be determined by testing their professional skills and abilities, then recognizing soft skills can be quite a difficult task.

To solve this problem, the Big Five model of personality traits is used. This is one of the most common approaches for a company to recruit and make psychological research.

The Big Five personality traits model, also known as the OCEAN or CANOE model, has evolved over time. The beginning of this model was laid by G. Eysenck, who initially identified three main factors: psychotism, extraversion and neuroticism. This is how the PEN (Psychoticism, Extraversion and Neuroticism) test appeared. Another name for the same test is EPQ, or Eysenck Personality Questionnaire [1]. In subsequent years, the model was refined and supplemented by many scientists. The final version of the Big Five was proposed by Lewis Goldberg, and the wide development of the model began in the 80s of the XX century [2].

The Big Five personality traits model measures five key dimensions of human personality:

- openness to experience;
- conscientiousness;
- extraversion;
- agreeableness;
- neuroticism [2].

It should be borne in mind that each of the listed qualities is a combination of many personal characteristics.

So, openness to experience is characterized by the originality of a person's thinking, the breadth of his range of interests, as well as a desire to learn something new. People with this quality will be in demand in organizations with a rapidly changing environment, as well as in companies where innovation is welcomed. To effectively manage such personnel and reveal its strengths, it is necessary to reduce the restrictions on their actions as much as possible.

Conscientiousness reflects the caution, persistence of a person and the desire to achieve goals. Conscientious people are organized and disciplined. Such employees are important in every field of activity.

Extroversion, or a positive emotional attitude, is a character trait due to which a person experiences positive emotions, feels well in society and thinks of others in a positive light.

The predominance of extraversion or introversion allows you to determine the degree of sociability. Extroverts easily find a common language with people and work easily in large teams. Introverts, on the other hand, have hard times interacting with other people.

Agreeableness allows you to measure how well a person gets along with other people, can be attentive to others, comes to his aid, can put others' needs above his own. Lack of this quality will lead to the lack of trust in the team and a deterioration of the climate in the organization.

Neuroticism, or negative emotional attitude, suggests that a person is prone to negative emotions, depression and, in general, perceives himself and others negatively. Also people with high level of neuroticism are able to think critically, which allows them to be more self-critical, as well as to evaluate the actions of other employees.

All of the above qualities are interconnected. Researches have shown that Big Five traits develop with age throughout life. In youth, people are more open to experience, ready to take risks and experiment, however, as they grow up, people become more conscious, stress-resistant, react more calmly to external stimuli.

According to Simine Vazire, psychology professor at the University of California at Davis, the OCEAN model is evidence-based and scientifically researched [3]. It has produced results that can be shown to remain largely consistent across a person's lifespan and that can be used to predict at least some part of a person's likely academic achievement [4], behaviors and even dating choices.

As the Timothy A. Judge & Cindy P. Zapata research indicates, the CANOE's personality traits can be performance-dependent. Different job roles and tasks can activate specific traits, and understanding who possesses those traits compatible with a position's roles and responsibilities enables you to build a high-performing team [5].

For example, you may discover individuals in roles desiring innovations and creativity (graphic designers, creative directors, digital content developers, etc.) who incline to candidness rather than traditionality. Such traits as imagination and curiosity may be decisive for the success and engagement of these team-members in their workplace.

Creating team culture players high in extroversion may prefer social group activities (e.g. happy hours; sport events sponsored by the company). Some prefer private talks to develop individual and team goals.

You won't be able to use a universal approach in your leadership style if you have a diverse team, as you have to find out strengths of each member and consider some balance. For example, one of your team members always focuses on a team approach but it's important to make sure their collaboration and sympathy aren't used by those who are considered to be assertive and self-confident.

As a leader, you should also understand where in the Big Five model your personality falls. A leader with unstable emotions can badly influence team's work. If you are quite open, be careful communicating with those with great conscientiousness. Your creative process and abstract thinking may displease a more detail-oriented subordinate.

Your team's place in the Big Five model will help you to discover and guide possible leaders, reconcile tasks with the team-members who will be most ready to manage them. People will take the positions where they will be successful and this will bring success to your team. As a leader, you should be sure you have an elastic management approach helping to adapt your style and strategies to the Big Five personality traits [6].

Thus, this model helps to identify the necessary personal qualities of employees, which, in turn, makes it possible to organize properly the work of personnel and the selection of employees.

**References:**

1. Ruch, W., Heintz, S., Gander, F., Hofmann, J., Platt, T., & Proyer, R. T. (2020). The long and winding road: A comprehensive analysis of 50 years of Eysenck instruments for the assessment of personality. *Personality and Individual Differences*, 110070. DOI: <https://doi.org/10.1016/j.paid.2020.110070>.
2. Rothmann, S., & Coetzer, E. P. (2003). The big five personality dimensions and job performance. *SA Journal of Industrial Psychology*, 29(1), 68-74. DOI: <https://doi.org/10.4102/sajip.v29i1.88>.
3. Most Personality Quizzes Are Junk Science. I Found One That Isn't | FiveThirtyEight (January, 2, 2018). Retrieved from <https://fivethirtyeight.com/features/most-personality-quizzes-are-junk-science-i-found-one-that-isnt/>.
4. Melissa C. O'Connor, Sampo V. Paunonen (2007). Big Five personality predictors of post-secondary academic performance. *Personality and Individual Differences*, 43 (5), 971-990. DOI: <https://doi.org/10.1016/j.paid.2007.03.017>.
5. Judge, T. A., & Zapata, C. P. (2015). The Person–Situation Debate Revisited: Effect of Situation Strength and Trait Activation on the Validity of the Big Five Personality Traits in Predicting Job Performance. *Academy of Management Journal*, 58(4), 1149–1179. DOI: <https://doi.org/10.5465/amj.2010.0837>.
6. Lead Your Team with the Big Five Model (May, 31, 2019). Retrieved from <https://www.michiganstateuniversityonline.com/resources/leadership/lead-your-team-with-big-five-model/>.

## HR management in remote work era

COVID-19 has not only changed the world, but has changed the workplace ecosystem in many ways. Leaders and managers must also change themselves to perform effectively their duties. The pandemic experience has shown that management is important, perhaps even more than ever. Employees and organizations in general need clear leadership decisions to calm, encourage and reassure subordinates about the future.

Nowadays, due to a pandemic, many organizations are just forced to implement a remote work format. With the introduction of lockdown, this format of work allows some employees to perform their usual duties at home, reducing the risks to their health. Thus, in March 2020, the number of people working from home increased from 31% to 62% of all workers in the United States [1]. In the European Union, the indicators were slightly lower - in the same period in Germany, a quarter of the total employed population worked at home [3], while in the Czech Republic and Poland there were almost one third of such workers [7].

According to the research by the Sociological Group “Rating”, in March 2020, 29% of the adult population of Ukraine worked remotely (Fig.1). In April 2020, 40% of residents from Ukrainian cities with a population of over 50,000 worked part-time from home [2].

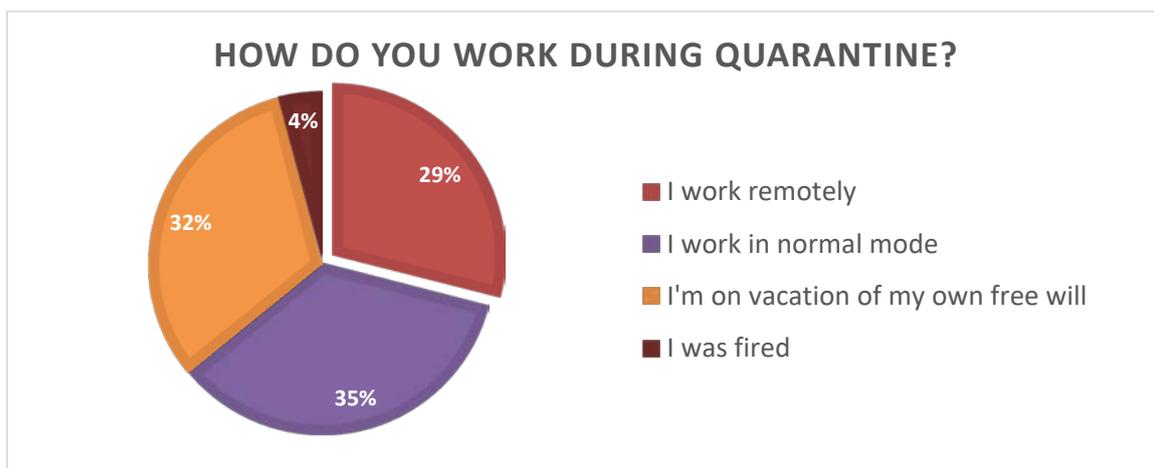


Fig.1. Working population in Ukraine during first wave of COVID-19 pandemic.  
(Adapted from sociological study of Sociological Group “Rating”)

However, remote work may confuse everyone, if leaders will use their traditional set of strategies and norms of conduct. Managers are facing difficulties organizing the work from home because previously they managed the teams only within the office.

Due to the spread of remote working among much larger number of people the pandemic has made advantages and disadvantages of such distancing more obvious. However, a significant part of the problems can be solved. Moreover, they need to be solved, because it is not known yet when people will be able to come back to their jobs without risk for their health. In addition, some workers are unlikely to return to pre-quarantine working conditions, because, as surveys show, many workers feel some benefits of distance work and would not want to give them up [1, 4, 6].

The first problem of distancing is office work schedule that employees had before the quarantine. The more flexible it was before pandemic, the easier it is for workers to get used to the new work mode from home. Therefore, for those who usually have a fixed working day, it is now difficult to adjust to new schedule. Such people risk being unproductive when working from home.

Anyway, quarantine is a temporary phenomenon, so there is no need to change regime abruptly. Many people, coming into quarantine measures, are confused, they postpone work and get into house routine. In such a situation, it is difficult to establish a work process at home. Employees do not see results, or are dissatisfied with them, and feel guilty. Any changes take time. Although readjusting normal work schedule is needed, it should be done little by little.

Managers always need to be aware of their subordinates' affairs. In the office, it is not hard, but during remote working, communication with subordinates is lost. Moreover, in such a situation, people are more prone to anxiety, they want to share their experiences and hopes, listen to others, understand that they are not detached from the team and hear from the leader that everything is under control. Therefore, employees should be offered such an opportunity to communicate, listen, and cheer [4]. Comfortable environment where everyone can share their thoughts need to be created. When communication with colleagues is remote through a device, it is important to take time to build and maintain friendships, even if remote ones. This can be done by creating semi-formal chat rooms for sharing information about colleagues' personal affairs, for example, about new films or musical hobbies, conducting remote training and other online activities for teams to minimize the negative consequences of self-isolation of each employee.

It is worth remembering that quarantine is a stressful event not only for business, but also for each individual. At this time, employees need support from their team and a sense of stability more than ever. The productivity of employees and their ambition to contribute to the development of the company depend on how the manager organizes the remote work format [4]. Therefore, team leaders need to cultivate empathy and the understanding that remote work is inevitably accompanied by disruption.

The Deloitte 2020 Global Human Capital Trends report found wellbeing was the top-rated trend for importance [8]. 80% of respondents shared the opinion that a good emotional state helps people feel better and work effectively, which is a very important factor for the success of the organization in which they work [4]. Leaders must show empathy, consideration, concern and try to take measures to support their

subordinates. No one is immune from unexpected power or internet outages, sick children or repairs in a neighboring apartment. Managers should understand this.

The work needs to be visible. Nowadays, office is an online platform with tools for remote interaction. When people demonstrate their work, they interact. For example, a public calendar allows employees to see the employment of all team members. In addition, managers should take time to create an online space where each team member can talk about what they have worked on today, plan tasks and check the progress of their implementation. Such visibility helps employees to be responsible.

Feeling unproductive can also be an important psychological problem. Employees who usually bring their work to the ideal may feel that they are not productive enough. Although the reasons for such feelings may not correspond to reality, and just be a consequence of the perception of the quarantine situation. Therefore, due to the lack of skills in independent planning of remote work people do less. Furthermore, home associates with rest, not work. This affects the perception of one's own productivity.

The life of many businesses after Covid-19 will no longer be the same as before. The pandemic has shown that offices as a way of organizing work are not necessary. On the one hand, some of the workers have learned to live in such reality and returning to the regular workplace is not bad for them, but already unusual. However, many people have not been able to adapt to new reality and still have anxiety, fears and obsessive thoughts. As a result, work efficiency is reduced. The task for managers is not to let the team disintegrate, but support, keep in touch and communicate with every employee, create the most friendly, comfortable and convenient working environment. Services for communication and fast information exchange effectively help with that.

#### **References:**

1. Brenan M. (2020) U.S. Workers Discovering Affinity for Remote Work. [Online]. Available at: <https://news.gallup.com/poll/306695/workers-discovering-affinity-remote-work.aspx> Accessed on: March 05, 2021.
2. Brik T., Obrizan M. (2020) COVID-19, quarantine and the job market expectations in urban Ukraine. [Online]. Available at: <https://voxukraine.org/en/covid-19-quarantine-and-the-job-market-expectations-in-urban-ukraine/> Accessed on: March 05, 2021.
3. German labor minister calls for right to work from home. [Online]. Available at: <https://www.dw.com/en/german-labor-minister-calls-for-right-to-work-from-home/a-53253366> Accessed on: March 05, 2021.
4. Pitstick H. (2020). 4 key leadership skills for a post-COVID-19 workplace. [Online]. Available at: <https://www.fm-magazine.com/news/2020/sep/leadership-skills-for-post-coronavirus-workplace.html> Accessed on: December 22, 2020.
5. Sociological Group “Rating”. (2020) Ukraine under quarantine: monitoring of public moods. [Online]. Available at: [http://ratinggroup.ua/en/research/ukraine/ukraina\\_na\\_karantine\\_monitoring\\_ob](http://ratinggroup.ua/en/research/ukraine/ukraina_na_karantine_monitoring_ob)

[schestvennyh\\_nastroeniy.html?fbclid=IwAR3Ige1LaAFAA7gtP5wMJ7\\_vvdtPNoEVWpHthPhg2p19HXpQ1DIZHjllA\\_Q](https://schestvennyh_nastroeniy.html?fbclid=IwAR3Ige1LaAFAA7gtP5wMJ7_vvdtPNoEVWpHthPhg2p19HXpQ1DIZHjllA_Q) Accessed on: March 05, 2021.

6. The 2020 State of Remote Work. (2020) [Online]. Available at: <https://lp.buffer.com/state-of-remote-work-2020> Accessed on: March 05, 2021.
7. Trykozko M. Digitalisation as a Cure. [Online]. Available at: <https://visegradinsight.eu/digitalisation-as-a-cure-covid19/> Accessed on: March 05, 2021.
8. 2020 Global Human Capital Trends Report. [Online]. Available at: <https://www2.deloitte.com/cn/en/pages/human-capital/articles/global-human-capital-trends-2020.html> Accessed on: December 22, 2020.

### Development of financial technology in the banking sector

Innovations in the financial sector are aimed at reducing costs, improving the security of operations, providing relevant services to a constantly evolving society. Financial technologies establish new kinds of procedures and agreements in the areas of banking (lending, payments, capital management, and transfers).

Financial technologies are understood as financial services, in the creation of which modern digital technologies are used. Fintech is widespread in almost all the world markets. However, the leading positions are occupied by emerging markets [6].

On the basis of the statistical data on the global index of Fintech acceptance, a tendency to increase this indicator was revealed. The use of Fintech services increased from 17% in 2014 to 33% in 2017, and in 2019 reached 64%, the percentage of customers using two or more financial and technological services or platforms. Only 4% of the world's consumers did not use any method of money transfer or payment for services [2].

In recent years, the Fintech ecosystem has progressed rapidly. Global investment in financial startups was 10.631 billion in 2020, which is the second best result since mid-2018. From 2010 to 2018, more than 2.6 thousand Fintech startups were released. In 2019, most new companies belonged to the banking industry and the capital market, the second most popular sector was insurance (Fig. 1).

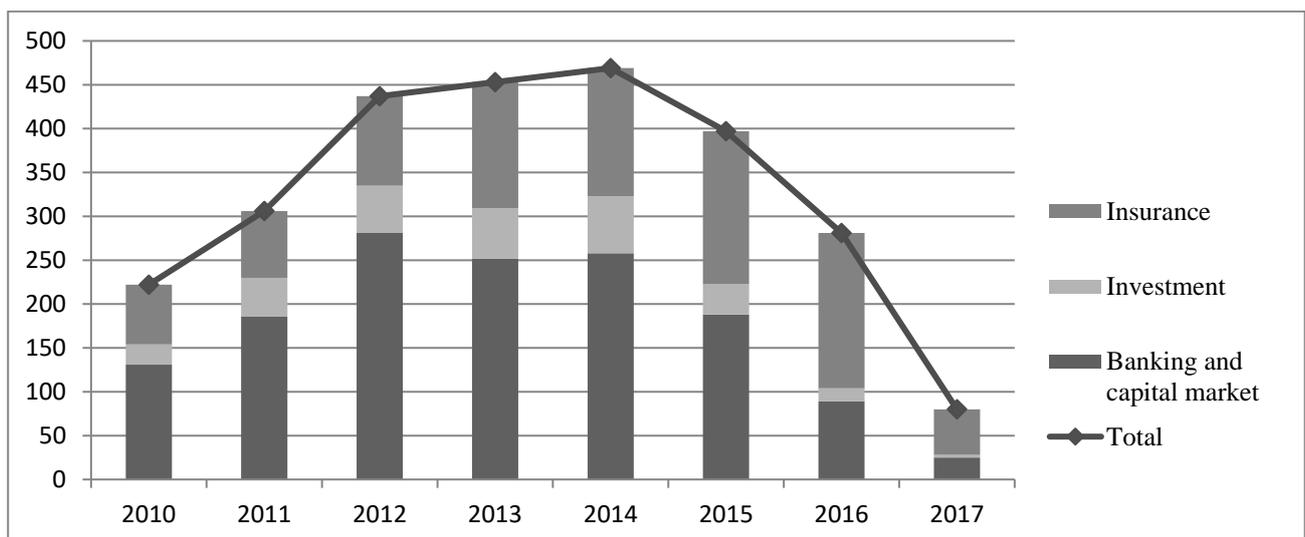


Fig.1. Fintech companies founded globally by industry (adapted from S. Friedman et al., 2018)

The number of Fintech companies in 2014 was the 724 (Fig.1). Most of them were in the banking and capital markets (258 companies). Since 2014, changes have taken place, the development of technology has contributed to the rapid development

of insurance.

According to the World Bank, in 2017, 69 % of the world population (over 15 years old) had their own bank accounts, while in the developed countries their share reached 94%. 53% of adult cardholders have made at least one digital payment; in the developed countries their share reached 91% [8]. Therefore, we can conclude that the banking industry is one of the most authoritative and important financial institutions in the world.

Among the many developments and implementations of Fintech in the banking sector, the most successful implementations of financial technologies are mobile banking, open banking, artificial intelligence and blockchain.

Despite the large market for banking services in Ukraine, new banks are created. Neobank, called a monobank, is an example of the project when in two years the number of customers has reached 1 million.

The most popular products among Ukrainian Fintech companies are payments and money transfers. More than 30% of all startups work in this field. However, since 2018, there has been no significant interest in this direction. The situation is the same with regard to blockchain technology, as during 2018-2019 only two companies in this area were established in Ukraine.

Recently, such technological areas as consulting and analytical systems are quite popular. This trend is likely to continue, as with the development of the popularity of artificial intelligence and big data, analytical services will become more diverse [7].

Cashless payment is the main trend. Mobile-related technologies (online banking and neo-banking) are important in Fintech development in banking.

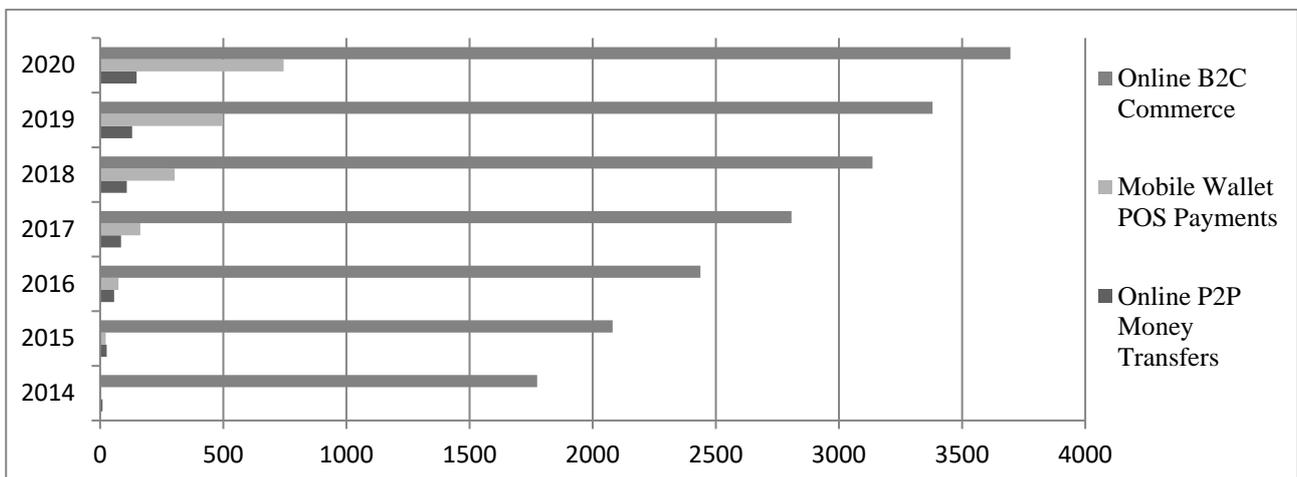


Fig. 2. Transaction value in digital payments worldwide, in million USD  
(adapted from Schulz et al. 2020)

Fig. 2 shows the dynamics of the value of transactions in digital payments during 2014-2020. The largest share is occupied by "B2C Internet Trade". It includes all consumer transactions that are made on the Internet and are directly related to online purchases of goods and services. The second largest transactions value is POS

payments via a mobile wallet, including transactions in outlets that are processed using smartphone applications. The last in terms of transaction value is P2P online money transfers, i.e. money transfers made over the Internet between individuals [5].

The development of financial technologies should directly or indirectly address the improvement of the information exchange process, the reduction of transaction costs and the provision of financing alternatives [4].

The rapid growth of Fintech has contradictory implications for the financial services market. On the one hand, Fintech modernizes financial processes and provides new opportunities for customers and employers in the market. On the other hand, there is a violation of the traditional financial system and models of customer service, which forces to constantly adapt to new market conditions.

## References

1. Friedman S., Canaan M. (2018) Closing the gap in Fintech collaboration: Overcoming obstacles to a symbiotic relationship. Deloitte. Available at: <https://www2.deloitte.com/content/dam/Deloitte/us/Documents/financial-services/us-fsi-dcfs-fintech-collaboration.pdf> Accessed on: March 4, 2021.
2. Ernst & Young (2019) Global Fintech adoption index. Available at: [https://www.ey.com/en\\_gl/ey-global-fintech-adoption-index](https://www.ey.com/en_gl/ey-global-fintech-adoption-index) Accessed on: March 05, 2021.
3. Fintech in Ukraine. Trends, market overview and catalog. Available at: [http://www.fst-ua.info/wp-content/uploads/2019/02/FinTech\\_Catalogue\\_feb2018\\_en\\_ua.pdf](http://www.fst-ua.info/wp-content/uploads/2019/02/FinTech_Catalogue_feb2018_en_ua.pdf) Accessed on: March 4, 2021.
4. Leong K., Sung A. (2018) Fintech (Financial technology): What is it and how to use technologies to create business value in fintech way? Available at: <http://www.ijimt.org/vol9/791-M775.pdf> Accessed on: March 5, 2021.
5. Schulz A., Ezenwaekwo C. (2020) Solution for Companies and Banks. Available at: <https://schulz-beratung.de/wp-content/uploads/2016/03/SP-Seminare-SP-Inhouse-Trainings-FinTech-digital-revolution-SP-study-2016-SP-Unternehmerforum.pdf> Accessed on: March 15, 2021.
6. Suryono R., Budi I., Purwandari B. (2020) Challenges and Trends of Financial Technology (FinTech): A Systematic Literature Review. Available at: [https://www.researchgate.net/publication/347650380\\_Challenges\\_and\\_Trends\\_of\\_Financial\\_Technology\\_Fintech\\_A\\_Systematic\\_Literature\\_Review](https://www.researchgate.net/publication/347650380_Challenges_and_Trends_of_Financial_Technology_Fintech_A_Systematic_Literature_Review) Accessed on: March 12, 2021.
7. Ukrainian Fintech Catalog (2019) Available at: <http://drive.fintechua.org/FintechCatalog19Ukr.pdf> Accessed on: March 5, 2021.
8. World Bank Group (2017) Account ownership at a financial institution or with a mobile-money-service provider, richest 60%. Available at: <https://data.worldbank.org/indicator/FX.OWN.TOTL.ZS> Accessed on: March 6, 2021.

## Neuromarketing and branding

Neuromarketing helps in brand positioning by studying the brain.

Two departments are located in the limbic system: an amygdala that processes incoming information and hippocampus that is associated with short-term memory.

When a person sees a profitable proposal, information about it immediately enters the amygdala. This causes changes in the physical condition of a person, for example, accelerating heart beating, rapid breathing, improving the electrical conductivity of the skin. After the emotion is obtained, the signal is moving towards the hippocampus. There it “binds” to memories, which leads to decision making.

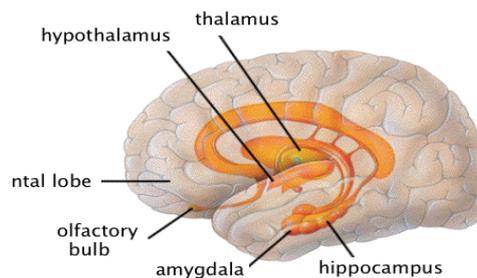


Fig. 1 Brain map

Brand managers should invest in the image of the company something that will cause a strong emotional connection with the consumer. The greater is the number of people reacting to the name, logo or slogan of the brand, the easier it will be to persuade a customer to make a positive decision to buy. This effect is called bandwagon [2].

Any changes in the visual, written/oral information affect brain processes.

To process images, brain needs 20% less energy than to process words. When we see the picture we disassemble it in colours. Human vision forms 4 colours: red, green, blue, and yellow. In this order the sensitivity of the brain towards them is graded. A striking example of a more acute reaction to a red serves as a study of sports psychologists from the University of Munich. They showed the video of the sparring to 42 referees, where one of the opponents was dressed in red, and the other - in blue. Then, using the video editor, they changed the colour of clothing and showed the video again. The fighter in red, both times received on average 13% points more than the one dressed in blue [1].

All other colours are a mixture of 4 main ones, so if you place them too close to each other, it will be difficult for the brain to distinguish them.

Music is important as it induces involuntary memory about the product in a very short period of time thanks to involuntary musical imagination (INMI). INMI describes the experience whereby a short section of music comes into the mind, spontaneously, without effort, and then repeats without conscious control [3].

Designing emotions by the strength of the word is what many brands are guided in the wording of slogans. For example, McDonalds uses the phrase "I'm lovin' it" instead of "You're lovin' it". The pronoun is chosen not to instruct the consumer but to give the subconscious signal to love the brand.

One more strategy is to use small narratives. They activate the work of the brain and automatically tip the concept of the brand with certain pleasant situations from the life of the consumer.

The most important emotion that brand managers try to evoke is pride. Some people are surrounding themselves with expensive things rather to gain recognition than for real use. If a buyer is given a high-quality fake branded thing, electrical signals in the brain, breathing and heart rhythm increase. If a person finds out that this thing is fake, all the indicators return to the previous values.

On the basis of the above, we can conclude that neuromarketing helps in branding:

1. It creates strong emotional brand-consumer ties using the memory influence.
2. Neuromarketing helps to qualitatively select the colour for logos and visual components of advertisements.
3. It chooses musical accompaniment in advertising, movies, etc.
4. It helps to choose proper wording (both in writing and orally) to communicate with consumers.

**References:**

1. Hagemann N., et al. (2009) When the referee sees red..., Psychological Science
2. Lewis, D. (2015) The brain sell. When science meets shopping, London
3. Williamson, V. J., Jilka, S. R., Fry, J., Finkel, S., Mullensiefen, D., & Stewart, L. (2012). How do "earworms" start? Classifying the everyday circumstances of involuntary musical imagery. *Psychology of Music*, 40, 259–284

### Value- added tax and its peculiarities in Ukraine

Taxes play a very important role for every state. Taxes are not only the basis of the state to mobilize funding resources for regular measures but also an important tool for the state to achieve macroeconomic goals. An efficient and reasonable tax system will have a positive impact on the process of economic growth, encouraging investment in all sectors of the economy and moving the economy in a growing direction. Taxes are also used by the government as an instrument of income redistribution and economic regulation. [3] This research aims to analyze the theoretical and practical prerequisites for the effectiveness of value- added tax (hereinafter - VAT) for the budget of Ukraine.

The taxation system in Ukraine is reflected in a large number of taxes, fees, and mandatory tax payments. Each tax occupies an important place in the tax system and the economy of Ukraine, performing its functions.

Like many other countries, Ukraine introduced VAT in 1992. According to the Tax Code of Ukraine, VAT is a consumption tax placed on a product whenever value is added at each stage of the supply chain, from production to the point of sale. The amount of VAT that the user pays is reflected in the cost of the product. [4].

Table 1. Composition, structure and share of tax revenues in the State Budget of Ukraine

Type of tax	2016		2017		2018		2019		2020	
	bln. UAH	%								
VAT	246,9	42,85	329,9	44,27	434,0	45,77	506,2	45,53	436,7	38,87
PIT	100,0	17,36	138,8	18,62	185,7	19,58	226,8	20,40	266,0	23,68
ET	70,8	12,29	101,8	13,65	121,4	12,81	137,7	12,39	147,8	13,16
IT	39,1	6,78	60,2	8,08	73,4	7,74	91,1	8,20	105,0	9,35
Total	576,0	100,0	745,2	100,0	948,2	100,0	1111,6	100,0	1123,4	100,0

Sources: developed by the authors[1]

Table1 shows the share of tax revenues from VAT for the period of 2016-2020. It can be seen that annual share of VAT in revenues from the total amount of taxes varies from 43% in 2016 to almost 46% in 2019. In 2019, the amount of revenues has increased by UAH 72.1 billion compared to 2018. In 2020, the absolute deviation of tax revenues from VAT increased by UAH 2.6 billion compared to 2018. Thus, it is expected that by the end of 2021 VAT will reach the planned value in the Consolidated Budget.

Fiscal policy is an important economic tool, used by the government of any country to influence economic development. It can be regarded as a tool of state influence on the relative size of the public and private sectors, which affects the aggregate demand and level of economic activity [1].

Furthermore, the main instrument of state fiscal policy is the state budget, which accumulates state revenues and converts them into public expenditures. The state budget is the most important part of government finances, the main one whose mission is to finance public goods. At the same time, it is also an important instrument in the hands of the state that interferes with the functioning of the economy (Table 2).

Table 2. Dynamics of VAT fiscal efficiency indicators during 2016-2020

Indicator	2017	2018	2019	2020
Actual VAT revenues, UAH billion	329,9	434,0	506,2	436,7
State budget revenues, UAH billion	598,3	747,2	881,8	866,7
GDP, UAH billion	2383,2	2982,9	3558,7	807,8
Final consumption expenditures of households, billion UAH	1569,7	1977,6	2431,0	655,4
Effective rate,%	21,02	21,95	20,82	66,63
Productivity of VAT,%	105,08	109,73	104,11	333,17
Fiscal significance of VAT, in% to State budget revenues	55,14	58,08	57,41	50,39
Fiscal significance of VAT in GDP,%	13,84	14,55	14,22	54,06

*Sources: developed by the authors[2]*

Analysis of the data in Table 2 indicates that the effective VAT rate tends to increase reaching a value of 20.82% at the end of 2019. Such rapid growth can be estimated from two sides. On the one hand, it is a positive trend, and on the other, it is a burden for domestic consumers of goods and services that directly affect national producers and can cause an outflow of investment if there is an increase in tax burden compared to neighboring states. Regarding VAT productivity, this figure remains at high levels and is proportionally increasing following the increase in the effective VAT rate. It can be seen that in 2018 it reached 109.7% and such trends occur against the background of GDP growth in the country. In general, the calculated level is high and is due to the development of controller authorities to minimize VAT evasion schemes and illegal reimbursement for certain transactions.

It can be assumed, that forecasting tax revenues is an important element in the development of fiscal policy because they give an idea of what sustainable fiscal action is in the long run. The role, that fiscal forecasts play in the development of fiscal policy indicates the risks in public finances, which will lead to further fiscal outcomes, completely different than originally planned [3].

The forecasting of tax revenues from VAT remains an important issue in many developing countries, and therefore in Ukraine. On this basis, we carried out the forecasting process of VAT revenues to the budget for the next three years using Microsoft Excel (Fig.1.1).We have chosen the highest value of the coefficient of

determination, which amounted to 0.992 for the most accurate calculation of VAT tax revenues for the period of 2019-2021. The calculations demonstrate that the amount of VAT which is subject to payments by businesses will continue to grow [4].

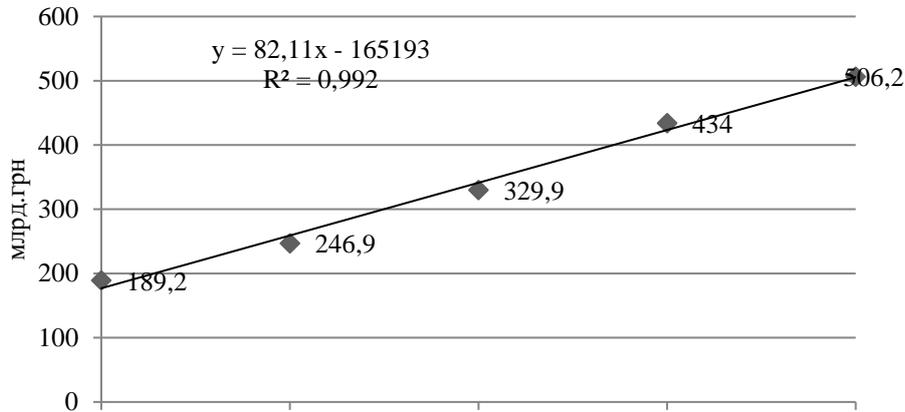


Figure 1.1 - Determination of trend lines and the coefficient of determination of VAT tax revenues

Sources: developed by the authors[2]

It can be concluded that the amount of VAT revenues to the budget directly or indirectly depends on the following factors: legal norms (object and base of taxation, rate tax, payers, etc.); macroeconomic norms (GDP, GDP per capita, consumption, household consumption, government consumption, imports, exports, and unemployment rate). The presented analysis demonstrates the complexity of the data on added value in all its manifestations. The research of the role of VAT confirms its crucial role and fiscal significance for the economy of Ukraine as value-added tax is a budget-forming tax.

## References

1. Lapshyn, Yu, (2016), «The tax value-added: positive tendencies», Visnyk podatkovoi sluzhby Ukrainy, vol. 11, pp. 6 — 7;
2. Podatkovyy kodeks Ukrainy vid 02.12.2010 r. #2755-VI [Elektronnyy resurs]. – Rezhym dostupu: <http://zakon3.rada.gov.ua.3>.
3. Sydorenko R.V. Vyznachennya sutnosti podatku na dodanu vartist' ta perspektyvy yoho rozvytku [Elektronnyy resurs] / R.V. Sydorenko // Ekonomichni nauky. Seriya «Oblik i finansy». – 2018. – Vyp. 11 (1). – Ch. 1. – S. 234-240. – Rezhym dostupu: <http://nbuv.gov.ua>
4. Chervins'ka, O.S. Demchuk, Kh.B. and Vojtkiv, O.V. (2019), «The tax value-added in the profits of the state budget and problem of his compensation», Naukovyj visnyk NLTU Ukrainy, vol. 21.5, pp. 298—305.

## **Features of advertising as the basic tool of marketing communications**

Advertising is one of the main marketing communication tools. Advertisement is a short message spread in different ways by any means, addressed to a certain circle of people, and aimed at attracting attention. What is more, it is a form of communication with the target audience that ensures the promotion of goods or services and ensures an increase in the volume of sales [1].

In marketing, an advertisement is described in different ways. The most common approach to the interpretation of advertising as a communication tool is a way of disclosing the developed marketing information to the target audience. Such communication is included in the promotion mix thanks to which the level of demand for products or the prestige of the brand increases, and the market presence and sales increase.

To increase the percentage of sales in clothing stores, these outlets are actively using audio marketing. If you often go to boutiques, you may notice background music. Advertisers impose a hidden meaning on the songs. The purpose of such messages encourages consumers to spend more money than they bargained for. Several messages can sound like this: "Everything can be yours", or "Forget about spending and money." This approach leads to the fact that the volume of sales increases by an average of 15%, and the level of theft decreases by 58%. The entrepreneurs thus use subconscious advertising. [1]

However, advertising affecting on the subconscious level, stimulates the purchasing of goods. In the experiment described by Lindstrom M. 40 people took part in the survey [1]. The respondents were shown an image with a drink held by people with joyful or gloomy faces for several seconds. Participants who saw the picture with a satisfied look, paid twice as much for the drink than those who watched the gloomy faces. Researchers call this phenomenon "unconscious emotion." The experiment proved that the smallest change in the emotional background can change the demand for a product in the market. Thanks to the smile in advertising, people are ready to pay more for a product [1]. Such advertising influence encourages consumers to purchase goods.

Advertising not only creates demand for goods and services, but also ensures the competitiveness of the product. The process of buying and selling a product is accelerated, increasing the circulation of not only goods, but also capital.

Planning advertising strategies is a necessary and integral part of marketing, and its concept can be developed only within the framework of marketing communications policy.

**References:**

1. Lindstrom M. (2008) «Buyology: Truth and Lies About Why We Buy and the New Science of Desire».
2. [Реклама и ее роль в маркетинге \(spravochnick.ru\)](http://spravochnick.ru)
3. [What is Advertising? Advertising Methods and Advantages Included \(marketing91.com\)](http://marketing91.com)

## The impact of the pandemic on the film industry and piracy in Ukraine

The pandemic has affected many areas of activity. One of these is the film industry. Many companies are still suffering losses, because income from ticket sales for movie screenings has fallen sharply, but employers still need to pay salaries [6]. For example, the Ukrainian network of cinemas Planeta Kino lost about UAH 20 million in the first four months of the quarantine.

But also, such a number of losses was significantly affected by the low attendance of cinemas. The main reason for this is a small number of high-profile Hollywood premieres, as the studios are postponing them. What is also logical, because the risk of failure of the film at the box office is quite high. In result, a state does not receive the proper contribution to its economy from the film industry in the current situation. And in some countries film sector forms a significant part of their GDP.

However, due to the emergence of the quarantine, many people began to watch movies and TV shows from their homes. And now streaming services have become even more popular than they were in previous years [1].

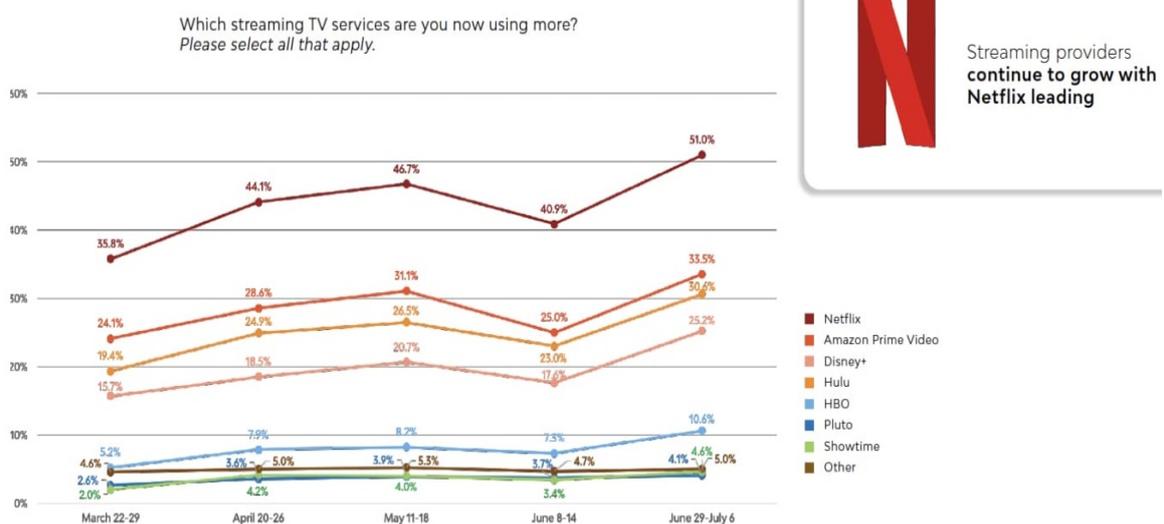


Fig.1 The growing popularity of streaming services during quarantine

Looking at the graph above, we can observe that since the beginning of quarantine, the number of people who use streaming services has increased and is now continuing to grow. Of course, Netflix is the most fortunate, as its popularity has grown by 15% [2]. And although not all services saw an increase in views, their popularity clearly has not decreased.

But most Ukrainians watch videos illegally, resorting to pirate sites. According to data for 2020, Ukraine ranks among the 10 countries that most often use pirate sites [4]. This is a rather big problem in our time, since many people believe that they can watch everything on the Internet for free, despite the fact that for some reason we still pay for television. So, who are these users who resort to piracy?

Who are the users of online movie sites?  
PC audience composition

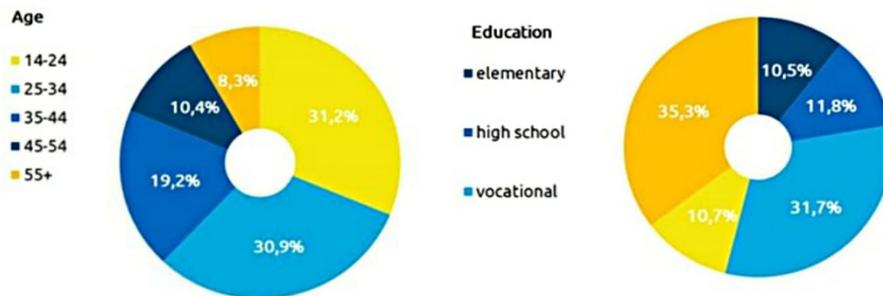


Fig.2 The “pirate” audience age and education

Based on the diagrams above, we can understand that mainly the population under 35 is engaged in piracy. Now let us look at the type of activity of the «pirates».

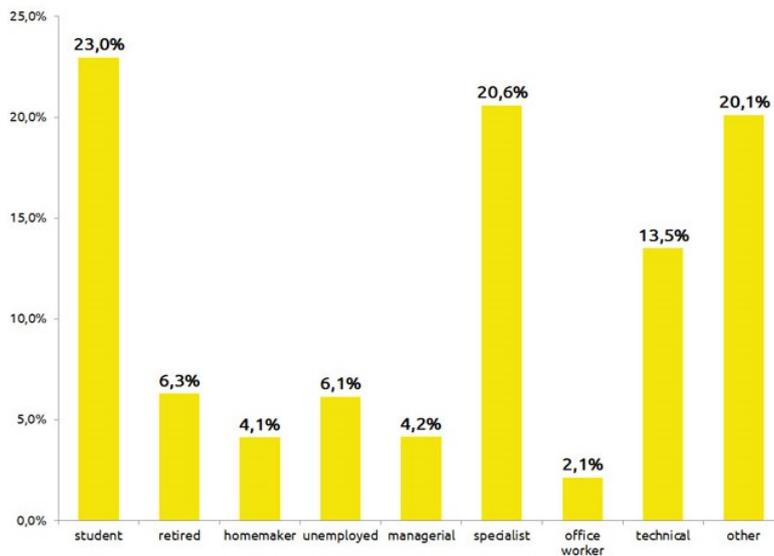


Fig.3

Types of “pirate” viewers

Students come first, and it is, in general, not so strange, but they are followed by specialists who seem to be the first to come to mind when it comes to legally watching videos [5].

So, it is rather a matter of devaluing someone else's labor and the general opinion that there is no need to pay for creativity. And such a mentality really does harm to the country. Because both the US and the EU do not accept such a level of piracy and such an attitude towards resources. Therefore, Ukraine is earning an extremely unprofitable reputation in this sphere. It means that the attitude of the population to this situation should be changed and taken under control.

What can be done to prevent piracy? For beginning, it is worth continuing to block sites with pirate content. A couple of years ago, it was practiced in Ukraine, but only the most famous sites were blocked, and since that time their number has only increased. So, not only site banning but also fines, administrative and criminal liability for the distribution of the stolen content should be introduced [3].

In addition, it is time to convey to the population that any work must be paid for and digital resource is not an exception. For some reason, it has happened that we are ready to pay for material things, but not for digital ones. For example, a person is ready to give his money for a paper copy of a book, but not always for its electronic version. But why is it so? After all, we pay not only for the paper in the first case, but also for the information that is presented on it. The same can be said about any content, because certain amounts of resources were spent on its creation and why it should be given for nothing. In addition, it would be nice to start promoting Ukrainian streaming services, as many Ukrainians are not even aware of some. Here is a list of several of such services: *Sweet TV*, *OLL.TV*, *Volia TV*, *Divan TV*, *Kyivstar TV*. And of course, it is necessary to show people that subscription is affordable. Moreover, if someone likes to watch movies and TV series, but he also needs cable TV, where channels are broadcast online, this can be combined within some services. So, this problem is quite solvable, the government and society just need to make some effort. And not immediately, but in some time the Ukrainian society will understand that piracy is not good and it is time to get rid of it, the main thing is just to start.

#### **References:**

1. Can there be a fairy-tale ending for Hollywood after COVID-19? [Online]. Available: <https://www.weforum.org/agenda/2020/07/impact-coronavirus-covid-19-hollywood-global-film-industry-movie-theatres/> Accessed on: March 11, 2021.
2. Netflix and Quarantine: How Have Streaming Services Fared During the Pandemic? [Online]. Available: <https://www.resonate.com/blog/netflix-and-quarantine-how-have-streaming-services-fared-during-the-pandemic/> Accessed on: March 11, 2021.
3. 6 Ways to Stop Digital Piracy, 2019. [Online]. Available: <https://www.viaccess-orca.com/blog/six-ways-to-stop-digital-piracy>. Accessed on: March 11, 2021.
4. Знову двійка. Україна в десятці «піратських» країн світу, 2020 [Електронний ресурс]. Режим доступу: <https://nv.ua/ukr/biz/experts/nelicenziyniy-soft-i-piratskiy-kontent-ukrajina-znovu-ocholyuye-reyting-krajn-z-porushennyam-avtorskih-prav-50087206.html> Дата звернення: Березень 11, 2021.
5. Хто і де дивиться відео онлайн – дослідження «Gemius Україна», 2017. [Електронний ресурс]. Режим доступу: <https://tehnot.com/ua/kto-i-gde-smotrit-video-onlajn-issledovanie-gemius-ukraina/> Дата звернення: Березень 11, 2021.
6. Deloitte TMT Talks: як звички кіноглядача формують економіку країни, 2020. [Електронний ресурс]. Режим доступу: <https://mind.ua/publications/20216841-deloitte-tmt-talks-yak-zvichki-kinoglyadacha-formuyut-ekonomiku-krayini>. Дата звернення: Березень 11, 2021.

### **Problems of employment of first-year students in Ukraine**

A large number of first-year students faced the problem of finding a job. During the quarantine, the urgency of this issue has intensified, as free time has become more available, primarily due to distance learning, and optimization of time spending, respectively. The opportunity to find an additional source of income is also a significant reason to start a career. But, unfortunately, the work seems accessible only at first glance, in fact there are a number of problems that a student faces.

When we talk about a job search, the easiest way is to start with well-known vacancies:

- *Waiter*. The main problem is that most institutions require more than 1 year of work experience. Most often, a freshman manages to get a job in a place where a salary is small and a probationary period is fairly long, as it allows employers to retain staff almost free of charge. After physical and mental exhaustion, most people give up. Usually, the fixed rate is UAH 100 per hour and hourly payment can be increased to a maximum of UAH 500.
- *Work in a call center* is the most common option that is offered to people in search of vacancies. The main problem is that employment in large well-known companies is possible only if you are 18 or older. But there are some ways to settle in places where age does not matter. Such institutions are usually engaged in illegal activities or banal calls to the uninterested consumers. The approximate salary is 5000 - 10000 UAH per month.
- *Courier of well-known delivery companies*. Of course, this is a physically hard job that requires a certain level of training. In addition, a student who does not have a driver's license of category A, A1, B can not apply for a job using types of transport other than bicycles. The courier's salary can reach UAH 25,000 per month.
- *Master of manicure, eyebrows, eyelashes*. This work requires significant initial investment and, in general, entering this business is not a simple process. You also need a certificate of education or courses to work. When choosing this profession, you will have to spend money on materials and equipment, as well as find customers on your own or pay for advertisement. So, to sum up, I can say that in general, finding a job for a fairly small salary is quite real, but still, in this case, you have to almost forget about education and devote all your time to work.

The table below summarises advantages and disadvantages of the most popular jobs among first-year students.

Section 01 Actual Problems of Sustainability of Economic Development  
and Innovative Management

Job	Advantages	Disadvantages	Salary
Waiter	<ul style="list-style-type: none"> <li>• new acquaintances</li> <li>• experience of working with people</li> <li>• flexible schedule</li> </ul>	<ul style="list-style-type: none"> <li>• physical exhaustion</li> <li>• unfriendly customers</li> <li>• unpleasant employers</li> </ul>	100 - 500 UAH per hour of work + possible tips
Call center	<ul style="list-style-type: none"> <li>• work remotely</li> <li>• usually easy to get to</li> <li>• no need to see people</li> </ul>	<ul style="list-style-type: none"> <li>• uninteresting monotonous work</li> <li>• sedentary work</li> <li>• unfriendly customers</li> </ul>	5000 - 10 000 UAH per month
Courier	<ul style="list-style-type: none"> <li>• mobile work</li> <li>• sport activities</li> <li>• the opportunity to travel around the city</li> </ul>	<ul style="list-style-type: none"> <li>• desirable driver's license</li> <li>• heavy physical load</li> <li>• risk due to driving on the road</li> </ul>	up to UAH 25,000 per month
Beauty master	<ul style="list-style-type: none"> <li>• be your own boss</li> <li>• flexible schedule</li> <li>• the possibility to choose customers</li> </ul>	<ul style="list-style-type: none"> <li>• large investments</li> <li>• risk of not paying off</li> <li>• possible lack of customers</li> <li>• PR costs</li> </ul>	depends on the work of the master

In addition to clear and common options, there are also professions that are not so legal and, as a rule, employers find people for their vacancies on job search sites. These jobs include:

- *Offices*. A popular way of earning money for young people in Dnipro is to illegally withdraw money from people who own Sberbank cards in Russia making calls with warnings and demanding a password from the card. Of course, participation in such activities threatens the freedom of a person and his family. However, the offered salary for this job is quite high, which becomes a lure. The promised earnings are of UAH 5,000 per week.
- *Marriage agency*. This kind of activity is often offered to girls, because it is enough to just know English and be able to communicate. In this case, the girl communicate with citizens of other countries under other people's names and extort money. The earning is between 10,000 - 55,000 UAH per month. But in fact this job is connected with fraud and immorality.
- *Web modeling*. Girls over the age of 18 are most often recruited for this job, as it is enough to simply have a computer with a camera and a nice body. For the so-called demonstration of her own body a girl can get 10,000 - 40,000 UAH. But she also faces the high risks of blackmail and persecution.

So, to summarize, modern realities require students to be very determined and able to choose between work for work or for money. The best options may not

always be affordable, but really well-paid deals tend to go against the laws and rules of morality. That is why, when looking for a place of work, students should take into account all the expected risks, realizing that it is almost impossible to make big money doing legal business. Therefore, they should be careful and vigilant when choosing the person or organization to work with.

**References:**

1. 23 of the Best Online Jobs for Students – and How to Get Them. [Online]. Available: <https://collegeinfo geek.com/online-jobs-for-college-students/>.
2. Online jobs for students. [Online]. Available: <https://www.uopeople.edu/blog/top-10-online-jobs-students-can-turn-career-business-home/>.
3. Вакансии Glovo [Электронный ресурс]. Режим доступа: <https://rabota.ua/company7194438>.
4. Где поработать детям на летних каникулах? [Электронный ресурс]. Режим доступа: <https://tlum.ru/news/gde-porabotat-detam-na-letnih-kanikulah/>.
5. Оператор call-центра. [Электронный ресурс]. Режим доступа: <https://www.work.ua/ru/jobs-dnipro-%D0%BE%D0%BF%D0%B5%D1%80%D0%B0%D1%82%D0%BE%D1%80+call-%D1%86%D0%B5%D0%BD%D1%82%D1%80%D0%B0/>.
6. Подработка на время карантина: какие вакансии и сколько платят [Электронный ресурс]. Режим доступа: <https://hrliga.com/index.php?module=news&op=view&id=21632>.
7. Работа для подростков: Где подработать школьнику? [Электронный ресурс]. Режим доступа: <https://blog.smart-course.ru/gde-podrabotat-shkolniku/>.

## **Information technologies in foreign economic activity of the enterprise**

Today we live in the time of technologies. Information technologies compass people in many areas of our daily routine: business communication, personal life, social events, etc.

Information technology is a concept identifying the components that come together to make successful communication in today's business world [1]. IT includes the management information systems used to automate and support business tasks and decision making [2]. Considering the definitions, we can note that IT is everything that is connected with processing, keeping and sharing information.

Modern technologies have had a significant impact on economy and business. IT technologies have opened up the opportunity to sale increase among individual buyers and wholesalers. Innovation development helps to find the new business partners, develop global brands, make forecasts taking into account competitors from other countries, etc. There are a few areas in foreign economic activities of enterprises that have been tangibly changed with the appearance of IT innovations.

IT evolution is one of the main factors that has contributed to the process of globalization. Innovation of new gadgets, internet, facilities and information searches have supported an opportunity to expand the extent of the firm's activity. The process of globalization can be understood as the global reach of communications technology and capital movements [3]. With innovation development, the globalization and integration levels have sharply risen. People, manufacturers and countries can exchange information and goods more quickly [4]. Companies are able to find partners all over the world and cooperate with them on the long-term basis.

Due to the development of IT technologies, the speed of communications between partners has become faster and more reliable. There are lots of ways of contacting partners: mailing, online conferences, faxing, video calls, chats and so on. The most popular are online conferences. Making a conference for a group of business members from different countries requires reliable gadgets supply and appropriate internet connection.

Sending official documents have become possible online. The systems of payments have been integrated that allows quick selling between countries using different currency. Lots of payment platforms, for example, PayPal in the USA have been created. Payment platforms warrant the safe transfer of big sums between countries using the currency exchange.

IT helps to adopt the experience of neighbouring countries. Public availability of information allows to observe the activity of the competitive enterprises and analyze their performance. Observing the similar business helps to see the pros and cons of the national firm's activities comparing to foreign company's activities. Comparing

the performance with competitors helps to find the best solutions. Moreover, facing the problems in the same field managers can predict some threats for the company and prevent negative effects. IT technologies give the great opportunity for monitoring competitors. Social networks, such as Instagram help to see the rating of the company, the feedback of clients, level of prices, services levels and speed of services. The business informational platforms are harder to find.

Social networks and applications have become the foundation for finding and contacting clients and partners. Such applications as Viber, WhatsApp, Telegram, Skype, Teams, Zoom are widely used for contacting in business. Installation of applications allows to get fast free communication without any additional expenses. Managers must be sure that their messages are seen and will be replied as soon as possible. Moreover, the notification system must help to know about all of the replies immediately and provide fast reply.

Social networks such as Facebook, Instagram, Telegram help to find direct clients for retail sales. Very often clients and producers face the problem of too high prices on the production due to the mediatory activity. The existence of one, two, sometimes three and even more intermediaries leads to the price increase. As a result, the producers prefer to rise up the prices. Consumers do not want to buy the expensive goods from intermediaries. Thanks to online activities clients are found without intermediaries, more products are sold, and the time of the feedback from clients is reduced. IT technologies create automatic reply systems. The time for a client is reduced, the customer base of retail wholesale clients is expanded.

More and more people start using social networks as the platform for communication. It is hard to calculate the number of social platform users because some of the platforms as YouTube do not require registration. Such platforms as WhatsApp are linked with the phone number and allow for one user to have more than one account.

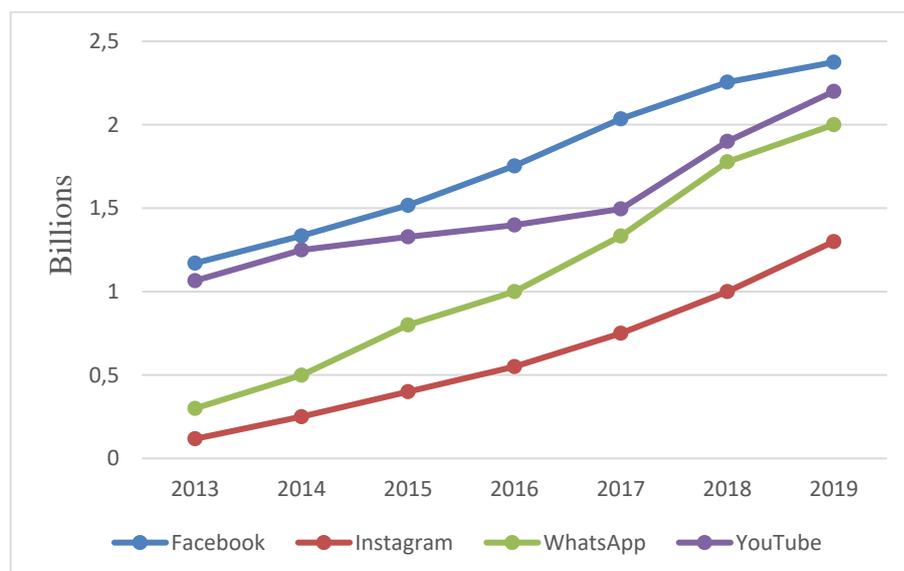


Fig. 1 Social media users (adapted from Zacharaki V., 2019)

Considering the statistics (Fig. 1), the number of social media users in 2019 was more than 2.5 billion people. Facebook was the leader (2.3 billion users), YouTube was the second (2.2 billion users), and WhatsApp took the third place (2 billion users).

Variety of information creates a huge competition of prices, quality, and uniqueness of the product.

Information technologies have influenced the foreign economic activities of the enterprises. They help to expand communication, share business experience, and increase sales.

**References:**

1. Sam O'Brien (2020). What is information technology and how it has improved business communications. [online] Available at: <https://www.ringcentral.co.uk/gb/en/blog/information-technology-business-communications/> Accessed on 10 March 2021.
2. Krume Nikoloski (2012). The Role of Information Technology in the Business Sector. [online] Available at: <https://ijsr.net/archive/v3i12/U1VCMTQzMjA=.pdf> Accessed on 12 March 2021.
- 3.A. Borcuch, M. Piłat-Borcuch, U. Świerczyńska-Kaczor (2014). The Influence of the Internet on globalization process. [online] Available at: <https://www.uav.ro/jour/index.php/jebr/article/view/348> Accessed on 13 March 2021.
4. Andreas Ebert (2013). Globalization - easily explained. [online] Available at: <https://www.explainity.de/englisch/globalization-easily-explained-1/> Accessed on 13 March 2021.
5. Virginia Zacharaki (2019). The Basics of Social Media for Businesses. [online] Available at: <https://www.pointloma.edu/resources/business-leadership/basics-social-media-businesses> Accessed on 14 March 2021.

### **Authentic leaders in business environment**

Due to the rapidly changing trends in the global business environment, the leadership of organizations is facing some challenges.

An impressive part of these issues touches the human resources sector and has a great influence on management decisions. Examples of such problems are:

- increasing motivation and involvement of employees;
- increasing the efficiency of employees;
- reducing staff turnover;
- satisfying and well-being of employees;
- increasing the creativity of employees.

These challenges cause shifts in working patterns and require organizations to work to resolve the problems encountered. Organizations need to update and improve existing knowledge, conduct new research, identify new solutions, and test them in practice. This urgent need to address the issues of the human resources sector has provided a number of scientific studies and articles on the topic.

Upon closer examination of scientific materials, one can notice a large number of studies devoted to the study of authentic leadership, its importance in working in an organization and the possibilities of effective use. Over the past two decades researches have agreed that authentic leadership can serve as a reliable tool for resolving a substantial part of the problems of the human resources sector [1, 2].

In order to consider in detail their approaches to resolving these problems, we need to understand the special advantages of this tool.

The emphasis is made on the ethical dimensions of the relationship between followers and leaders. It is described as a trusting relationship behaviour. Having a positive outlook on life authentic leaders are open in their interactions with others. They build trust with their subordinates and generate enthusiasm for projects [3].

The research on authentic leadership suggests that there are four major components including self-awareness, relational transparency, balanced processing, and internalized moral perspective [4]. Self-awareness helps to understand a multifaceted nature of a person. Relational transparency is about presenting our authentic self. Balanced processing helps leaders to objectively analyze the relevant data and come to a decision. Internalized moral perspective belongs to self-regulation.

Researchers and practitioners have advocated the authentic leadership approach making an emphasis on ethical standards rather than on profit [5, 10, 11].

The use of leadership in the internal processes of the organization has a number of advantages, which include:

- orientation to ethical values;

- creating a trusting relationship with employees;
- providing a healthy atmosphere in a team;
- providing employees a palpable sense of the cause.

According to M. Kim's research, "Authentic leaders who are honest with themselves and express consistent behaviors through self-regulation have positive effects on employees' well-being" [6]. The finding provides us with evidence of the suitability of leadership to address employee emotional satisfaction.

The needs for the well-being and moral satisfaction of employees being satisfied, the issue of increasing their productivity arises. The latest research of Pakistani scientists confirms the benefits of authentic leadership and its positive effect on employees' welfare [2]. The findings of the study show that employee emotional satisfaction and well-being is a key factor in increasing employees' engagement and productivity. In addition, staff turnover has a noticeable downward trend.

Having achieved the productivity of employees it will be advisable to move on to the stage of their retention and increase of work creativity. According to the Mubarak and Noor research, "Authentic leadership has a positive significant effect on employee creativity through work engagement and psychological empowerment" [7].

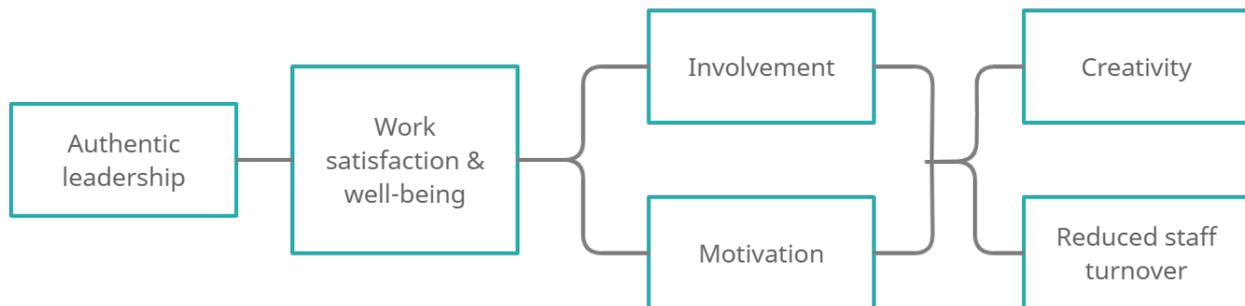


Fig. 2. Conceptual framework

The research described confirms the positive impact of authentic leadership on employees within an organization. Authentic leadership can be successfully used as a tool for resolving problems associated with human resources.

#### References:

1. Gardner, W. L. & Claudia C. Coglisier, C. C. (2011) Authentic Leadership: A review of the literature and research agenda. [Online]. Available at: [https://www.researchgate.net/publication/235431599\\_Authentic\\_Leadership\\_A\\_review\\_of\\_the\\_literature\\_and\\_research\\_agenda](https://www.researchgate.net/publication/235431599_Authentic_Leadership_A_review_of_the_literature_and_research_agenda) Accessed on: February 15, 2021.
2. Muhammad F. M., Muhammad A. K., Mahmood S. (2021) Increasing the efficiency of business process through authentic leaders and follower's attitude. [Online]. Available at: <https://www.deepdyve.com/lp/emerald-publishing/increasing-the-efficiency-of-business-process-through-authentic-4UIvKMgiEs> Accessed on: February 13, 2021.

3. Dr. A. Towler (2019) The power of authentic leadership: How legitimacy, ethics and positive psychology drive organizational performance. [Online]. Available at: <https://www.ckju.net/en/dossier/power-authentic-leadership-how-legitimacy-ethics-and-positive-psychology-drive-organizational-performance> Accessed on: February 23, 2021.
5. Datta B. (2017) Authentic leaders tend to be effective as managers. [Online]. Available at: <https://blogs.lse.ac.uk/businessreview/2017/09/06/authentic-leaders-tend-to-be-effective-as-managers/> Accessed on: February 28, 2021
6. Moonjoo K. The Effects of Authentic Leadership on Employees' Well-Being and the Role of Relational Cohesion (2018). [Online]. Available at: <https://www.intechopen.com/books/leadership/the-effects-of-authentic-leadership-on-employees-well-being-and-the-role-of-relational-cohesion> Accessed on: February 14, 2021
7. Mubarak F. & Noor A. (2017) Effect of authentic leadership on employee creativity in project-based organizations with the mediating roles of work engagement and psychological empowerment. [Online]. Available at: <https://www.tandfonline.com/doi/full/10.1080/23311975.2018.1429348> Accessed on: February 22, 2021

## **Development of the policy of management of fixed assets of an enterprise**

Fixed assets are tangible assets that the company must use for use in the production or supply of goods, services, lease to others or to perform administrative and socio-cultural functions, the expected useful life (activity) of which exceeds one year [2, p. 25-32].

The strategy of fixed assets management in enterprises is to ensure the most efficient use with minimal costs for their maintenance and service.

To obtain the best performance of the mechanism of enterprise management should take into account the principles on which it is based:

*Compliance (subordination) to the strategic goals of the economic development of the enterprise.* The mechanism for ensuring the efficient use of fixed assets should create the necessary material and financial conditions for the implementation of goals and objectives of economic development of the enterprise as a whole.

*Prospect.* The mechanism for ensuring the efficient use of fixed assets should provide conditions for expanding the activities of the enterprise and increase the efficiency of its activities in future periods by optimizing the ratio between the solution of current and current perspective tasks of development.

The validity of management decisions regarding the nature of the reproduction of fixed assets of the enterprise. Substantiation of the need for fixed assets should be based on a qualified analysis of the state and use of fixed assets, the study of reserves to increase the efficiency of their usage.

*Efficiency.* The formation of reproductive processes in the enterprise should be based on achieving economic or social effect; it has a final economic dimension.

The principle of continuity and reliability is manifested in the creation of such organizational, economic and technical conditions under which the stability and continuity of a given method of production are achieved. The solution to this problem is provided by reliability and coherence of the functioning of both the management system and its bodies and the managed object.

The principle of order, proportionality and dynamism mean that the management system should be aimed at solving not only current but also long-term development of the enterprise, to bear material, legal, administrative responsibility for the quality of the decision and the completeness of its implementation.

The management mechanism consists of elements that affect management relationships or information as a subject of management activities. The information is used to have a leading influence on the processes occurring in the system to achieve the desired states (goals) and information about the state of the control object and the system as a whole is obtained.

The control mechanism consists of the following parts:

- the target part - is a set of all goals, the implementation of which is aimed at management (improving the efficiency of the main functions of the system);
- functional part - types of management activities necessary to perform the basic functions of the organization;
- methodical part - those methods that are used in the implementation of all types of management activities, i.e. ensure the implementation of the functional part;
- management decisions, powers, means of information and the impact of material energy on the object of management;
- technological part - the technology of preparation of acceptance and execution of administrative decisions;
- the target part is a set of all goals, the implementation of which is aimed at management.

The mechanism of management of fixed assets is a dynamic component of the production management system, ensures the release of planned production volumes promptly with the rational use of material and labour resources, production potential.

The mechanism for managing the efficiency of the use of fixed assets of enterprises is aimed at solving the following main tasks:

- study the foreign experience of the functioning of the organizational and administrative mechanism;
- study of the composition and dynamics of fixed assets, technical condition and rate of renewal of their active part, technical re-equipment and modernization, reconstruction of the enterprise, the introduction of new equipment [1, p. 3-7].

Management of fixed assets of the enterprise is a rather complex system. The problem is that fixed assets are formed during the creation of the enterprise and serve for a long time. The success of the management of fixed assets of the enterprise can be considered in terms of efficiency of their use in economic turnover. As fixed assets are operated for a long time, they gradually lose their value due to physical depreciation, and the transfer of the value of fixed assets to manufactured products, work performed, services rendered occurs through depreciation. [3].

Thus, the successful management of fixed assets is influenced by many factors, both internal and external, but the main ones are the peculiarities of production conditions, the specifics of economic activity and the result, which directly affect the efficiency of fixed assets management in general.

#### **References:**

1. Андрющенко Н.С. Суть і значення витрат: історичний аспект / Н.С. Андрющенко // Економічна теорія та історія економічної думки. – 2007. – № 5. – С. 3–7.
2. Грецька Г.А. Розвиток підприємства в аграрному секторі України / Г.А. Грецька // Агросвіт. – 2011. – № 15. – С. 25–32.
3. Виханский О.С. Менеджмент: [учебник] / О.С. Виханский, А.И. Наумов ; 3-е изд. – М. : Гардарики, 2010.

### Japanese HRM model

The topic of this study is relevant, because every day companies around the world are looking for new management approaches, ways to improve the work of an organization.

Employers from all over the world have become interested in Japanese ways, methods and forms of enterprise management. This interest can be justified because over the past decades, Japan has significantly improved its economic performance, and entered the top list of countries with the strongest economies in the world. According to the UN data for 2020-2021 of the world ranking, taking into account GDP per capita, Japan ranks third, right after the United States and China [5].

The basis of Japanese management is the management of people [3]. Japanese companies have an ability to effectively use human resources. It helps to increase productivity and enables companies to achieve higher goals [4].

The Japanese management model aims to transform a company into a family, and in most cases this approach is successful. The human factor is very important for companies, while the leader protects the interests of the group, employees form friendly relations with each other (as between family members). Managers make a supportive work environment that leads to good relationships in the organization. It is common for Japanese workers to sacrifice themselves for the sake of the company; they often work late and skip vacations. Therefore, companies find important the ability of employees to work together, to trust, to help and support each other. The workers are sure that they and their work are important and necessary for the company. In these conditions the employees feel comfortable and are able to use their knowledge and skills to the maximum for the good of the company [4, 5].

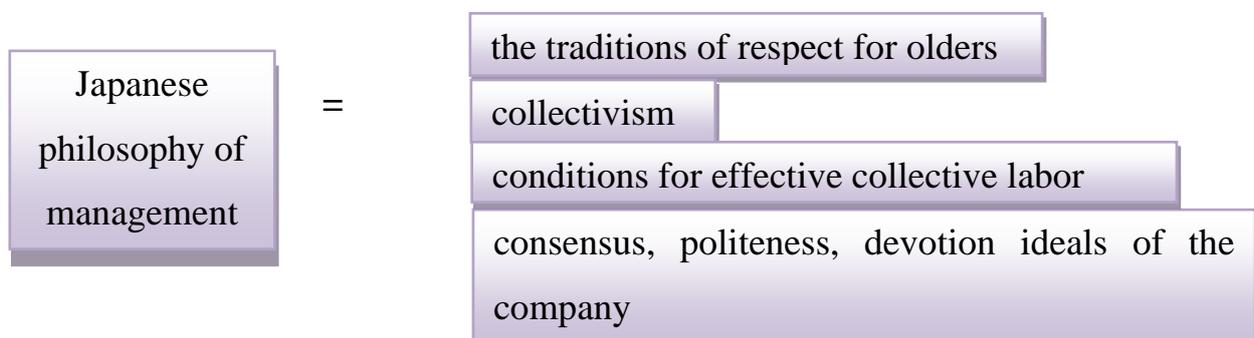


Fig. 1 Japanese philosophy of management

The indicators in table 1 could have a positive effect on the work of Ukrainian companies.

Table 1. Features of Japanese management

1.Trust system and employment guarantee.	This brings together the interests of the company and employees who need stability
2. Management based on collection of information	Collecting and using data to improve organizational performance
3. Quality-oriented management	Continuous quality control
4. The constant presence of management personnel in production	Provides the ability to quickly and efficiently solve problems, and also contributes to the improvement of
5. Corporate values	Employees feel themselves the part of the company and become more responsible

The traditional Japanese HRM model is very different from the US model. The Japanese model includes promise of human capital investment and job security for all employees. Therefore, Japanese employees are highly motivated to work for the good of the company and achieve its goals.

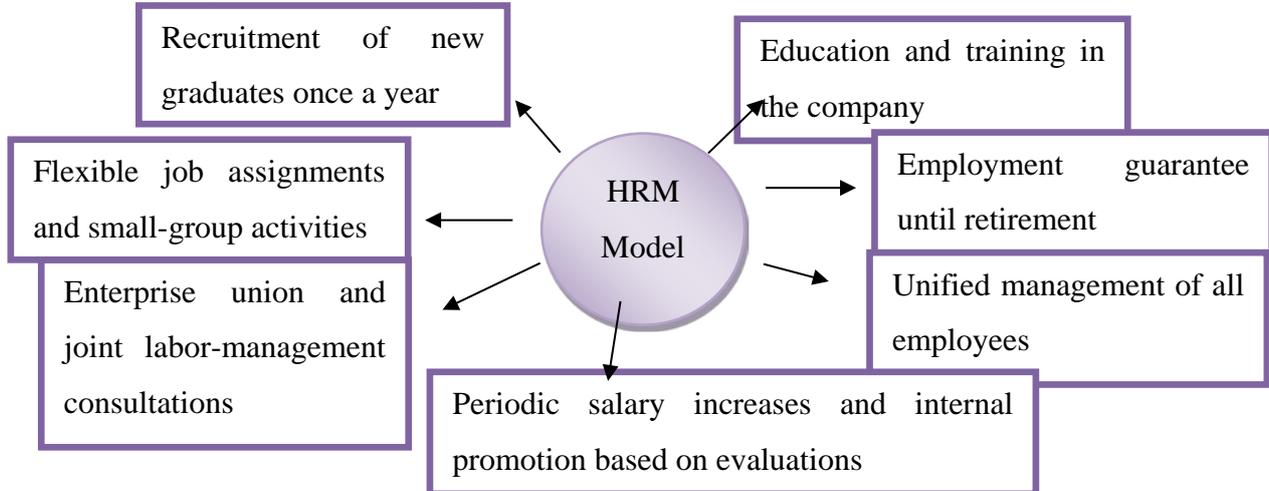


Fig.2 The Japanese-Style HRM Model (adapted from Chiaki Moriguchi, 2014)

If the Japanese management model were used at Ukrainian enterprises, it might have had good results.

Table 2. The well-known principles of Japanese management [4, 7]:

Heijunka	The goal of this system is to balance the load on all work centers in a fixed period of time.
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Kanban	The purpose of this system is to track parts during the production process in order to ensure that the right parts are delivered on time to the right place on the production line.
Jidōka	A system that blocks defective goods from entering the production life; this principle of operation of the equipment independently determines the problem that has arisen.
Elimination of Waste	The goal of this principle is to eliminate all types of waste
Kaizen	The goal of this system is an endless process of improvement; therefore, the company pays attention to global and minor changes

Unfortunately, Japanese model has its drawbacks: a lot of stress, not enough freedom to express yourself, collectivization, features of the mentality, etc.

The use of the Japanese HRM model in most cases has a positive effect on the work of the company. Managers in Japanese firms are focused on motivating employees to work hard. Staff is the main component of success, so managers do everything possible to ensure that people at work are surrounded only by kindness, sincerity and responsiveness.

The introduction of this model at Ukrainian enterprises would have a good effect on employee satisfaction with working conditions and on the success of the company.

### References

1. А.О. Іванова, Т.В. Пуліна, и Л.С. Кутідзе “Упровадження досвіду японської системи управління персоналом на українських підприємствах”, *БІЗНЕСІНФОРМ (Економіка; Менеджмент і Маркетинг)*, №10, с. 398 – 403, 2018. [Електронний ресурс]. Режим доступу: <http://oaji.net/articles/2019/727-1548751826.pdf> . Дата звернення: Бер. 12, 2021.
2. Л.В. Шостак, и Є.О. Болобан “ЗАРУБІЖНИЙ ДОСВІД УПРАВЛІННЯ ПЕРСОНАЛОМ”, *Приазовський економічний вісник (Класичний приватний університет)*, №3 (08), с. 94 – 99, 2018. [Електронний ресурс]. Режим доступу: [http://pev.kpu.zp.ua/journals/2018/3\\_08\\_uk/20.pdf](http://pev.kpu.zp.ua/journals/2018/3_08_uk/20.pdf) . Дата звернення: Бер. 14, 2021.
3. М.Є. Шкурат “ВИКОРИСТАННЯ «ЯПОНСЬКОЇ МОДЕЛІ» УПРАВЛІННЯ ПЕРСОНАЛОМ В ТНК”, *Економіка і організація управління*, №2 (22), с. 282 – 290, 2016. [Електронний ресурс]. Режим доступу: <file:///C:/Users/Asus/Downloads/4821-Текст%20статті-9680-1-10-20180111.pdf> . Дата звернення: Бер. 03, 2021.
4. Г.С. Григорян “Анализ системы управления в японских автомобильных компаниях”, *Економіка и менеджмент інноваційних технологій*, № 2, 2014. [Електронний ресурс]. Режим доступа: <http://ekonomika.snauka.ru/2014/02/3836> . Дата обращения: Бер. 15, 2021.

5. Л.С. Зеленцова, и Л.В. Докашенко, “Управление персоналом. Японский опыт”:

учебное пособие/ Оренбург: ГОУ ВПО ОГУ. 108 с, 2007. [Электронный ресурс]

. Режим доступа: [http://elib.osu.ru/bitstream/123456789/7394/1/2514\\_20110922.pdf](http://elib.osu.ru/bitstream/123456789/7394/1/2514_20110922.pdf)

. Дата обращения: Бер. 12, 2021.

6. Moriguchi, C. (2014). Japanese-Style Human Resource Management and Its Historical Origins. *Japan Labor Review*, vol. 11, no. 3. p. 58 – 77. [Online]. Available

at: [https://www.jil.go.jp/english/JLR/documents/2014/JLR43\\_moriguchi.pdf](https://www.jil.go.jp/english/JLR/documents/2014/JLR43_moriguchi.pdf) Accessed on : March 12, 2021.

7. Hagherian, P. (2010). *Understanding Japanese Management Practices* : book. New York

: Business Expert Press. p. 174. [Online]. Available at: <http://www.businessexpertpress.com/files/pdfs/10409930.pdf> Accessed on : March 11, 2021.

## PrivatBank vs Monobank banking strategies

The synthesis of different methods of customer offline and online service is essential for the development of the banking system.

In February 2019, there were 77 banks in Ukraine. PrivatBank was founded in 1992. It is the one with the largest assets (as of January 1, 2020). Monobank is rapidly gaining momentum nowadays. It was founded in 2017. The number of customers of this company exceeded 500 thousand people in 2018 [3]. In 2020, Monobank had 2.7 million customers and 2000 employees. 66% of Monobank cards are active. It is the highest rate among all Ukrainian banks [1].

The strategies of these financial institutions differ greatly. PrivatBank offers a mobile application, although one can get many services offline, in the bank offices. On the contrary, Monobank positions itself as a mobile bank without offices. In order to identify a bank that is more competitive, we have compared the main characteristics of both banks.

In the era of technology and innovations, the bank's work is impossible without its own mobile application that both banks have. Readers' vote held by MC Today shows that the most popular online banking service is Monobank application. It takes the first place among all mobile applications that participated in the vote [2]. Both applications can be downloaded from the Google Play Market or AppStore. However, Privat24 works on all versions of Android and iOS, while to install the Monobank program you need a smartphone with Android 4.4 and higher, or an iPhone with an iOS version not lower than 10.0. After downloading the application, Monobank invites you to scan your passport and TIN. Then, it pauses to study them. After these manipulations, you can already get a card at the pick-up point or order free home delivery. Privat24 opens without additional efforts, but to become a bank's client, you need to get to its office and get a card there. Thus, Monobank is convenient because the card can be opened without leaving home, and Privat24 advantage is in adapting to older versions of operating systems.

An important aspect is the design. Monobank's application is minimalistic and modern at the same time. Animation, such as a "card flip" and a CVV display timer, attracts the user's attention. The second advantage of this application is easy navigation: all the basic actions can be done not by clicks, but by swipes. The user does not need to try to get to a certain area of the screen. An indisputable pro of the program is that it asks for information that the

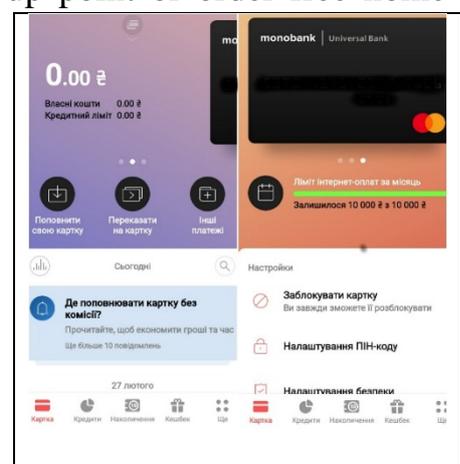


Fig. 1. The main screens of the Monobank application.

user thinks about. For example, to select the receivers' cards, one can enter their names or find them in the contact list, not entering 12 digits of the card number, where a mistake can easily be made. A convenient solution is to move all the minor functions of the program to another folder. Many people are skeptical about the bank, because it does not have physical offices. They do not take into account the fact that all communication with the bank's customers is carried out by people, not by robots via messengers (for example, Telegram, Viber, Messenger), and a free call to the hotline. This variety of communication methods indicates a customer-centric approach of the bank.

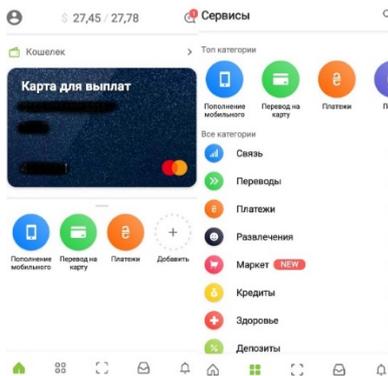


Fig. 2. The main screens of the Privat24 application.

On the contrary, in the Privat24 mobile application there is an opportunity to move from card to card with swipes, but most actions require clicks. Interaction with the bank requires not only online, but also offline mode. The application has not such a modern and laconic design, as Monobank does. Communication via chat is first carried by bot. People help, when the necessary options are not available. This is convenient for bank employees – they do not need to waste time to tell each user the same thing. However, customers need to review several lists of options from the bot, and only then ask bank employee a question, although one could start with the last point of that plan. The main screen of the Privat24 application loses to that of Monobank. The latter one has the main and secondary functions clearly separated. In Privat24 all of them are mixed.

Monobank has a more modern, nice-looking mobile application. It is designed to be user-friendly and has a more diverse system of communication.

To enter the mobile version of Privat24 you need to enter your phone number and password. To enter the Monobank application, it is enough to enter a 4-digit PIN code of your card. That simplifies the process. Both programs can be opened using a fingerprint scanner and Face-id. The convenience of the Privat24 application is determined by the fact that it creates templates for previous transfers so that you can repeat the same payment without spending time re-entering data. In addition to banking, the Privat24 mobile application has a large list of other services. You can get an insurance policy, find out your credit rating and order a credit history, buy tickets, use the BlaBlaCar, order delivery etc. The Monobank application does not have any of them. Both basic cards are free to open and use. You can order a name card for an additional fee (150 hryvnia in both banks). Using both applications, you can top up your mobile phone by entering the number or selecting it from the list of contacts. Both banks allow you to make utility payments with both your own and credit funds. Once you create a payment template for one or more addresses, the sums will be updated automatically monthly. Both in the Privat24 and Monobank there is a possibility to top up the account in online games, but in Monobank the list of such games is several times bigger.

Thus, Privat24 attracts with a variety of services provided. Monobank is likely to be used by customers of generation Z. The main types of transfers can be made by customers of both banks through the application.

The Monobank card wins by the duration of the grace period, because in PrivatBank it is up to 55 days, in Monobank – up to 62 days. The advantage of Monobank is in topping up the mobile phone for free using both customer's and credit money unlike PrivatBank which charges a fee for transferring. It is easier to make a transfer from card to card in Monobank application. If the ones, whom you want to make a transfer, are in your contact list, it is enough to find them there by name and specify the amount. The program will do the rest itself. In Privat24, you will have to enter by yourself the number of one's card whom the money will be sent. Transfer to the card of another bank in Privat24 will be with a commission (at least 5 hryvnias). In Monobank such a transfer will be free. It makes the bank more attractive. Although it is more convenient for PrivatBank customers to top up the card in cash. If you transfer not your own, but credit money, both banks will take 4% of the payment amount [4]. Monobank makes payments for utilities free of charge. PrivatBank will charge at least 1 hryvnia fee for each. Some payments are free depending on the contract with the utility company.

It is more profitable to transfer large amounts of your own funds to the accounts of legal entities through Privat24. It is better to transfer amounts up to UAH 10000 of your own or credit money by Monobank. The most profitable service for storing funds is Monobank, because here you get 10% of real funds. The "Universal" card from PrivatBank provides 7% per annum bonuses that can be paid in shops and services, that participate in the loyalty program "Bonus Plus". Using credit money longer, than the grace period is more profitable in Monobank. "Universal" card

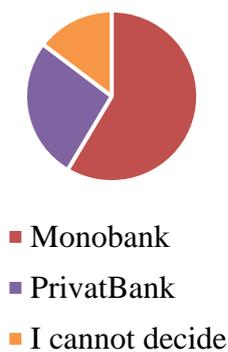


Fig. 3. Evaluation of the convenience of applications by respondents.

charges a fee of 3.6% per month for the amount owed (43.2% per annum); Monobank card –3.2% per month or 38.4% per annum [4]. Monobank cards have an indisputable advantage thanks to cashback. Each month, you can choose two categories and receive cashback of 1 to 20% of the purchase. The largest amount you can get is UAH 500 per month before tax. Then, 18% of income tax and 1.5% of military duty are deducted from the accumulated amount [4]. PrivatBank offers not cashback, but "Bonus Plus" loyalty

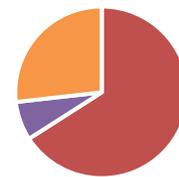
program. Paying with the "Universal" card in certain stores and pharmacies, customers receive bonuses: from 1 to 5% of the purchase amount. They can then be spent in the participating stores. Contactless payments can be made by both cards. The module, which allows to do it, is built into the standard Monobank card. The "Universal" card from PrivatBank does not have it; a card that supports PayPass/PayWave must be ordered for a separate fee of 149 hryvnias.

Therefore, for transactions such as card transfers, mobile top-ups or utility payments, it is more profitable to use the Monobank application. Monobank also

offers more favorable conditions for storage and withdrawal of funds, receiving cashback, and a longer grace period. An ordinary Monobank card has the function of contactless payment. To receive it in PrivatBank you have to pay extra. The PrivatBank advantages are Bonus Plus loyalty program, recharging the card with cash and transferring large sums to the accounts of legal entities on better terms.

In order to get a complete image of the banks, we conducted a survey among 41 students of Dnipro University of Technology. Most of the respondents have both Monobank and PrivatBank cards. The answer to the question "Which bank do you consider more reliable?" is presented as Monobank – 30%, PrivatBank – 30%, "I cannot decide" – 40%. Evaluation of the applications' ease of use is presented in Fig. 3. Fig. 4 shows the respondents' preferences for cashback from Monobank and "Bonus Plus" from PrivatBank. The average score of design of Privat24 mobile application on a scale from 1 to 10 is 6.6 points, Monobank application – 8.3 points. It was also found out that most respondents see swipe navigation as more convenient. When asked about the advantages and disadvantages of the Monobank application, respondents consider it to be created "for people", intuitive, and stylish. Convenience is in templates, the ability not to enter 12 digits of the card number, but find the receiver in the contact list. The advantage is in cashback, although some respondents note that the tab is sometimes inconvenient to go to. The participants of the survey listed such benefits of Privat24 as "very easy to use", "transfer of funds with a small commission", "a large number of functions and high reliability", "I like the opportunity to use payment templates and the Scarbnychka service". Among the disadvantages "it's difficult to find statements of transactions and receipts", "too many options in the menu", "it's difficult to find the necessary option", "inconvenient navigation", "there are unnecessary messages" are mentioned. Thus, respondents admit that Monobank application is user-friendly, it has a simple and stylish interface. They note the undoubted advantages of Privat24 are templates, loyalty program, a large number of features that are not available in Monobank.

The results of the survey show that PrivatBank confidently holds the leading position due to the variety of functions, ease of operations etc. Monobank offers even more favorable conditions, an application with great usability and numerous bonuses. It explains the rapid development of this startup and predicts its customer loyalty and a confident position of the bank in the market.



■ Cashback Monobank  
■ Bonus+ PrivatBank  
■ I cannot decide

Fig. 4. Respondents' choice of loyalty/cashback programs

## References:

1. Gritsyk, T. (2020) "By 2022 we will become a unicorn": how monobank grows and develops [online] Available at: <http://surl.li/obef> Accessed Date 13.03.2020.
2. Shkil, V. (2018) Voting: choose the best and worst online services in Ukraine [online] Available at: <https://mc.today/golosovanie-vybirajte-luchshij-i-hudshij-onlajn-servisy-v-ukraine/> Accessed Date 13.03.2020.

3. Zaspenko, A. (2019) Analysis of the Monobank application [online] Available at: <http://surl.li/obed> Accessed Date 15.03.2020.
4. Zhumatiy, A. (2020) Credit card battle: monobank vs PrivatBank [online] Available at: <https://finance.ua/cards/bitva-kreditok-monobank-vs-privatbank> Accessed Date 14.03.2020.

## **The impact of information technologies on business transformation in the context of globalization**

The emergence of new technologies has significantly influenced the development of business. Computer-based information technology was initially introduced only in the large enterprises or only at the state level [5].

The world is changing and every year the use of information technology in different sectors of the economy will grow, which will help improve and increase the efficiency of their activities.

Nowadays, these technologies are the foundation of any business, regardless of size, they are now openly available to everyone [7].

In business, the advent of information technology has led to a significant positive transformation [1]. Computers and different software are able to perform a variety of operations - calculations, analysis, planning, forecasting and more, which significantly speeds up the business development process, reduces operating costs and allows people in business to perform work more efficiently. Modern programs allow business owners to replace certain positions in production and significantly reduce data processing time

Constant search for new ideas, the implementation of innovations to increase the organisation's competitive advantages causes a lot of competition in the information technology market, as businesses need to have and attract only the best and most effective innovations to stay competitive, and they are willing to pay huge sums for it [3].

The rapid development of technology leads to the fact that companies seek to have their own IT specialists or even separate departments to create information products that will be most effective for their field of activity [2]. However, it is quite complex and requires high competence, additional resources, flexibility in the face of constant change and development. There are some corporations that create universal software that is gaining popularity around the world. The problem in this case is the criteria for selecting these programmes, and the selection of those that are right for the particular business.

In order to make the right choice and get the most out of the use of information technology, the following principles should be considered.

1. It is necessary to clearly understand the limits of the costs involved as well as plan the results to be achieved, and deadlines set for their implementation. Information technology often leads to an increase in the success of the organization, but it is necessary to assess the situation soberly, and not just chase after the world's trends. For example, if you are sure that planning future sales based on the analysis of

previous periods will allow the company to make more profit, then even a basic data analysis programme will help, and its implementation will justify all costs.

2. It is necessary to avoid partial automation when there is a chaotic set of applications, software, data analysis systems, etc. This most often occurs in conditions of limited time and budget, and the necessary functions will not be performed in the long run. This issue must be approached qualitatively, thoughtfully and systematically, as introducing all the new technologies that appear in the information market will not make unequivocal benefit. Marketing in this area reaches a high level, so very often it can offer something that is not urgently needed.

3. Quality information technology is required in every organisation, because this investment will allow the company to make high returns and avoid many problematic issues. Accordingly, an important aspect of the successful operation of a business owner is the establishment of communication and exchange of information between different departments of the organization. In this case, the implementation and use of certain software will give the results needed.

These principles should be considered by business owners while buying the software for the companies. A detailed study of the software market in accordance with the goals of the company is a long process. Apart from this, it is important to pay attention not only to the price of the license, but also to the cost of its implementation, training of the users, as well as its maintenance and modernization.

It is very important to analyze and calculate all of the above in detail. In this case, standard economic indicators can help assess the economic effect of the introduction of information technologies [6]:

- total cost of ownership (TCO) which includes all costs of technology including implicit costs;

- visible cost of ownership (VCO) which differs from TCO in that it includes only direct costs;

- return of investment (ROI) that means the time for which the profit covers the cost of technology.

After effectively calculating the efficiency of the implementation of information technology, business owners will get the opportunity to choose the system that is most suitable for a particular type of business and can significantly increase the productivity of the organization [4]. The other way is to create software for the company. This will require more funds, but it will take into account all the features of the organization structure and adapt the existing trends specifically for the company.

#### **References:**

1. Bailey, J. (2018) The role of technology in business. Oklahoma SBDC. [Online]. Available at: <https://www.oksbdc.org/the-role-of-technology-in-business/> Accessed on: February 15, 2021.
2. Collis, D. (2019) The Value Potential of New Business Models [Electronic Version]. Harvard Business School.
3. Dossi, A. & Schäffer U. (2014) Top management impact on management control [Electronic Version]. Journal of Management Control 24(3):219-221

4. Groysberg, B., & Abbott, S.(2020) It's Time to Reset Decision-Making in Your Organization. Harvard business school. [Online]. Available at: <https://hbswk.hbs.edu/item/it-s-time-to-reset-decision-making-in-your-organization> Accessed on: February 18, 2021.
5. Juneja, P. (2015) The Changing Face of Business Environment. Management Study Guide. [Online]. Available at: <https://www.managementstudyguide.com/information-system-and-information-technology.htm/> Accessed on: February 21, 2021.
6. Wright, N., Nagle, F. & Greenstein, S. (2020) Open Source Software and Global Entrepreneurship. Harvard business school. [Online]. Available at: <https://hbswk.hbs.edu/item/open-source-software-and-global-entrepreneurship> Accessed on: February 25, 2021.
7. Yang, M., Christensen, M., Bloom, N. & Sadun, R. (2020) How Do CEOs Make Strategy [Electronic Version]. Harvard Business School.

## TechFin vs FinTech

TechFin companies are technology companies that additionally offer financial services alongside their core technology-based products. They should not be confused with FinTech, which, in turn, provides exclusively financial services using digital technologies. TechFin companies cannot be called financial companies, since they operate without the support of traditional banks; their main activity is not related to finance [6].

The following are examples of TechFin companies:

- Google and Samsung that provide Gpay service and Samsung Pay service, respectively;
- Facebook, which has developed its own digital currency, called Libra;
- Apple, which has released the Apple Card;
- eBay, which owns PayPal;
- Alibaba, which has launched Alipay, etc.

One of the most common examples of FinTech is mobile banking, or ‘bank in the app’. It should be noted that even mobile banks operate as part of traditional banks, since not all functions can be implemented through the application. In Ukraine, as an example of such a bank, we have the Monobank application, which is part of the traditional ‘Universal Bank’ [5].

The bar chart illustrates the number of contactless payment users for Apple Pay, Samsung Pay, and Google Pay in 2018 with a forecast for 2020 (Figure 1).

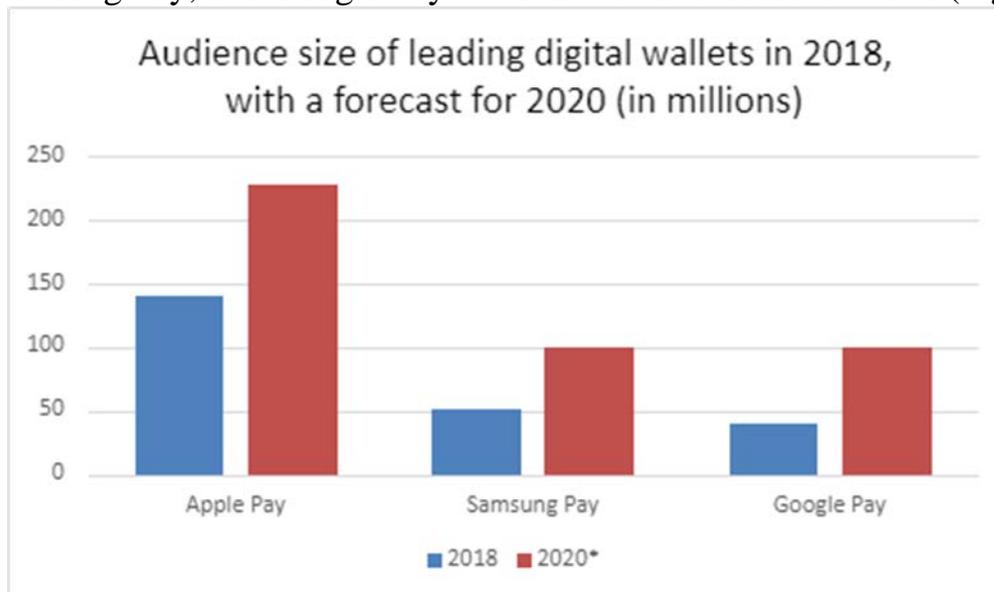


Figure 1. Audience size of leading digital wallets in 2018, with a forecast for 2020 (in millions)

It can be seen from the bar chart that Apple Pay was predicted to be leading with 227 million users worldwide, up from 140 million users in 2018. Samsung Pay and Google Pay were expected to reach 100 million users each in 2020 [3].

This forecast was justified: according to the data from the application platforms, all three types of digital wallets reached and increased the projected figures. So, for two years, Apple Pay has increased the audience by more than 1.5 times, Samsung Pay – almost twice, and Gpay – more than 2.5 times. This is a significant increase in such a short period of time.

Another example of TechFin's rapidly expanding businesses is PayPal, which became a separate public company from eBay in July 2015. The company has become the most commonly used digital payment tool among North American retailers. [4]

The graph shows that the total number of active PayPal user accounts from the first quarter of 2010 to the fourth quarter of 2020 is steadily growing (Figure 2). Over the past 10 years, it has grown from 84.3 million to 377 million, which is more than 4.4 times [4].

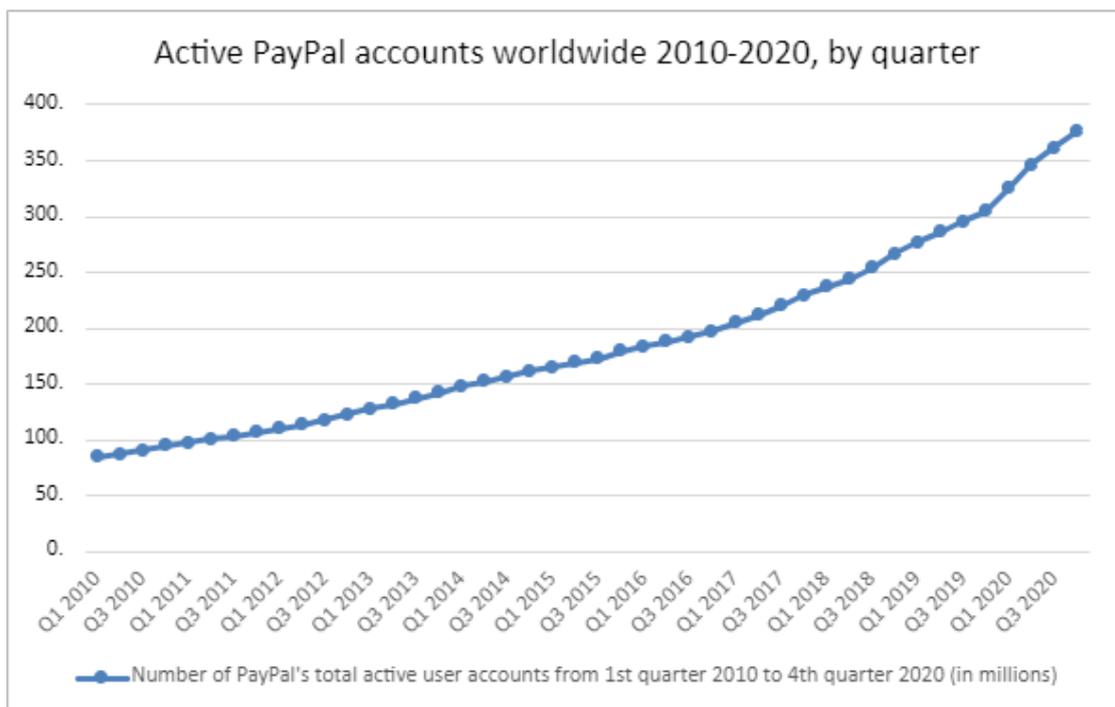


Figure 2. Total number of active PayPal user accounts from Q1 2010 to Q4 2020 (in millions)

To compare the prospects of TechFin and FinTech, it is also worth looking at the statistics of FinTech representatives. Monobank has already been mentioned as an example of a FinTech company in Ukraine. The bar chart shows the amount of growth in the customer base over the past year (Figure 3).

In 2020, the number of customers grew steadily. It increased 1.7 times from 1846.2 thousand to 3141.7 thousand customers [1].

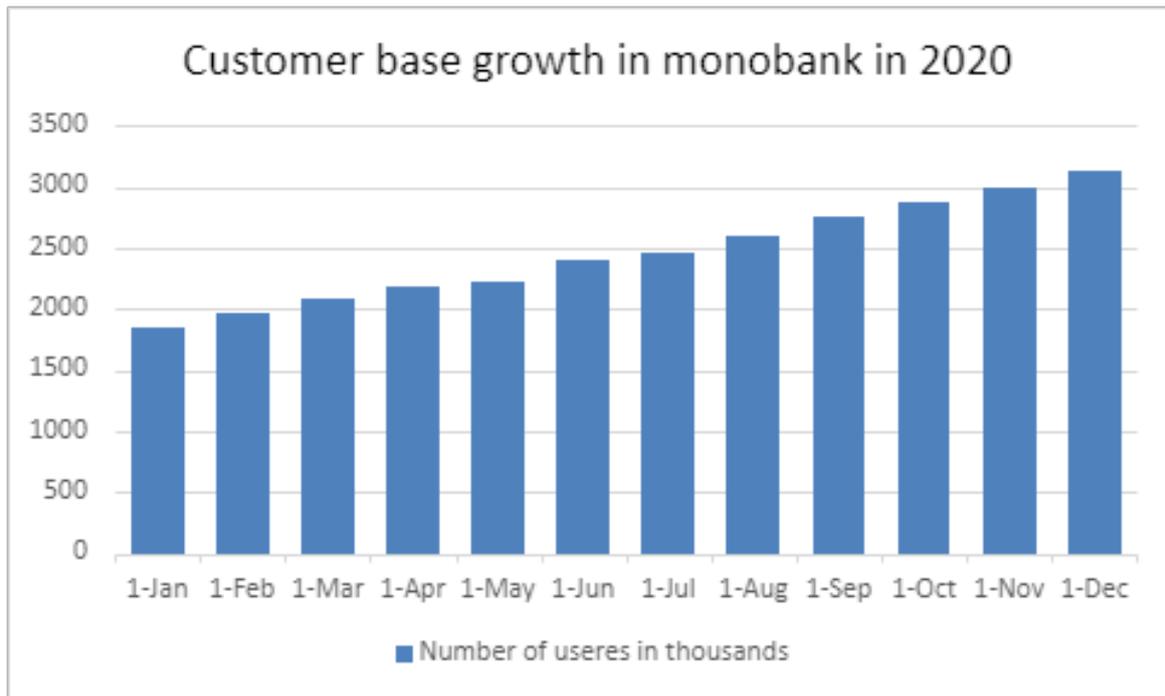


Figure 3. Growth of Monobank customer base in 2020 (in thousands)

It is not quite correct to compare the number of global companies with a multi-million audience with a bank that operates in Ukraine and has several million consumers. However, this gives us an idea of the growth rates and prospects of both directions.

The solutions that TechFin provides are more innovative, creative, and relevant than FinTech implementations. The reason is that TechFin companies start with technology, figuring out how it can be related to finance. On the contrary, FinTech companies start with existing financial structures, trying to make them cheaper and faster with the help of technology.

As a result, TechFin companies provide simpler, cheaper solutions for customers' needs and make money from it. Moreover, any of the TechFin companies mentioned above had to get a license to conduct financial transactions.

On the other hand, financial institutions, such as banks or investment funds, are strictly regulated. That makes them safe, sustainable, and legally protected. Moreover, both TechFin and FinTech solutions allow you to conduct financial transactions around the world. Thus, these transactions must be secured in accordance with the legal framework of all parties.

At the intersection of these two directions, the concept of the so-called neo-bank emerged.

Neo-bank is a category of FinTech players that offer a technological level through an interactive mobile or web application, relying on the banking license of a commercial bank. Obtaining a neo-bank license would simplify and legalize the work of new digital institutions [2].

Ideally, FinTech and TechFin companies could create an environment in which they would interact, improve each other's financial mechanisms, and such cooperation would bring profit to both parties. This can be cooperation through common development and technology, based on the sale of patents or mutually beneficial terms.

However, now, TechFin and FinTech are competing rather than collaborating. We believe that such a race could lead TechFin to develop financial instruments as long as they do not encounter the barrier of the legal framework. The financial sector, in turn, risks reducing the range of its operations to a minimum that TechFin cannot take on.

Thus, we consider it necessary to develop a mechanism for effective interaction of all players of the financial digital market with the involvement of state or international institutions in order to establish a regulated, safe and effective interaction between both consumers of services and their suppliers.

### References

1. Підсумки 2020. *monobank*. [Online]. Available: <https://www.monobank.ua/2020?lang=uk> Accessed on: March 15, 2021.
2. Entrepreneurs queue up to set up neo-banks, hoping for digital banking license whenever it comes. *Moneycontrol*. [Online]. Available: <https://www.moneycontrol.com/news/business/entrepreneurs-queue-up-to-set-up-neo-banks-hoping-for-digital-banking-licence-when-ever-it-comes-6161841.html> Accessed on: March 15, 2021.
3. Number of Apple Pay, Samsung Pay and Google Pay contactless payment users in 2018, with a forecast for 2020. *Statista*. [Online]. Available: <https://www.statista.com/statistics/722213/user-base-of-leading-digital-wallets-nfc/#:~:text=Audience%20size%20of%20leading%20digital,with%20a%20forecast%20for%202020&text=According%20to%20industry%20forecasts%2C%20Apple.million%20users%20each%20in%202020>. Accessed on: March 14, 2021.
4. PayPal - Statistics & Facts. *Statista*. [Online]. Available: [https://www.statista.com/topics/2411/paypal/#dossierSummary\\_chapter1](https://www.statista.com/topics/2411/paypal/#dossierSummary_chapter1) Accessed on: March 15, 2021.
5. Главная страница. *Universal bank*. [Электронный ресурс]. Режим доступа: <https://www.universalbank.com.ua/ru> Дата обращения: Март 14, 2021.
6. Forbes: Будущее банковского сервиса — ФинТех или «ТехФин»? *Coinspot*. [Электронный ресурс]. Режим доступа: <https://coinspot.io/fintech/forbes-budushhee-bankovskogo-servisa-finteh-ili-tehfin/> Дата обращения: Март 14, 2021.

### **Ways to increase the level of financial security of the banking system of Ukraine**

Nowadays, the development of the banking system is accompanied by the integration processes of the banking business in almost all areas of socio-economic life of the country through the introduction of new banking services and innovations. Given the depth of integration of the banking business into the economic processes of the country, the issue of developing mechanisms, measures and methods to increase the financial security of the banking system is relevant, because in the case of even minor economic or political imbalances undermines the banking sector.

The issue of ensuring an adequate level of financial security of the banking system becomes even more important in the context of economic or currency wars, as well as in the context of military conflicts, during which banking institutions, on the one hand, are involved in money laundering, terrorist financing and - suffer enormous material and financial losses due to the termination of a significant number of their customers.

Thus, according to the recommendations of the Ministry of Economic Development and Trade of Ukraine on calculating the level of economic security of Ukraine "the financial security is the state of the country's financial system, which creates the necessary financial conditions for stable socio-economic development, ensures its resilience to financial shocks and imbalances conditions are created for preserving the integrity and unity of the country's financial system" [1].

The financial security of the state is considered as a subsystem of the highest level system - economic security, which, in turn, is a subsystem of the highest level - national security, which is achieved by a level of development and a state of security that fully meets the needs of the state and its citizens of this state. This confirms the complexity and versatility of the concept of "financial security".

It is the lack of economic policy strategy, monetary policy and development strategy of the banking system of Ukraine has led to imbalances in monetary policy in the direction of financing the state budget by buying IGLBs, to imbalances in lending to consumer foreign currency and insider lending, as a result - to the violation of the functions of the banking system, in particular the effective redistribution of money and capital in the economy.

Thus, one of the priority measures to ensure the appropriate level of financial security of the banking system of Ukraine should be the development of monetary policy and development strategy of the banking system, which would define the main objectives of the National Bank of Ukraine and development of the banking system, as well as measures, mechanisms and tools banking management.

The main objectives of the monetary policy strategy should be as follows: to achieve exchange rate and price stability through the use of monetary policy instruments; refusal to finance the state budget by buying IGLBs; unified approach to the policy of refinancing of commercial banks; restriction of the use of foreign currency in credit operations of banks and cash operations of business entities and individuals [2].

Regarding the goals of the banking system development strategy, the following should be highlighted: creation and development of specialized development banks; establishing a quota for the presence of foreign capital in the banking system, in particular the bank capital of the aggressor country, support for systemically important banks, the development of lending to the real sector of the economy.

Achieving exchange rate and price stability will make economic processes in the country more predictable and will increase the confidence of individuals and businesses in monetary authority and banking institutions in particular, which will positively affect the financial security of the banking system of Ukraine as a whole.

As for the problems of legislative support of banking, the lack of effective legislation to regulate the two largest areas of banking, namely: foreign exchange transactions and lending, comes to the fore. It is in these areas of banking that the greatest threats to the financial security of the entire banking system arise, as banks often use the foreign exchange market for currency speculation, which ultimately leads to the devaluation of the national currency, which has a cumulative effect on banks' profitability.

The devaluation of hryvnia requires banks to revalue foreign currency assets, which, in turn, increases the amount of contributions to reserves for active operations, thus increasing the costs of banks and, consequently, reducing profitability. On the other hand, the devaluation of hryvnia leads to the development of inflationary processes, which leads to a decrease in confidence in banks and the outflow of deposits, as well as to a decrease in the purchasing power of individuals and businesses and, consequently, an increase in bad debts.

Another equally important legislative or regulatory act should be an act that would provide the basis for the effective functioning of the collateral market in Ukraine, especially in the assessment of property and its liquidity, as well as the protection of property rights. Effective property valuation, together with proper protection of property rights, will allow banks to provide longer-term and larger loans for business development, and on the other hand, in the event of bankruptcy of the borrower - to sell collateral quickly and at an affordable price.

One of the main problems of the legal field in terms of ensuring the financial security of the banking system of Ukraine is the inefficiency and corruption of the judiciary, which does not contribute to establishing the institution of liability for abuse of financial instruments, speculation in the foreign exchange market and bankruptcy.

Concerning the problems of anti-crisis management of the state economy, as experience shows, the greatest revision of anti-crisis management is in the banking

system, because the crises of 2008-2009 and 2014-2015 arose in the banking environment.

There are three groups of measures in the field of improving the crisis management of the banking system, namely: improving the preventive analysis of banking activities; improving banking supervision; improvement of problem asset management methods.

As for the preventive analysis of banking activity, in this context it is necessary for the NBU to systematically conduct scenario stress testing of the banking sector using a wide range of unified indicators and identify potential losses from the implementation of risks inherent in banking.

Improvements in banking regulation and supervision should take place in the area of control and the introduction of adequate penalties for banks' speculative operations in the foreign exchange market through the use of funds provided through refinancing. Penalties, including the revocation of licenses, should also be applied to banks that provide excessive lending or financing (through promissory notes) to insiders.

It is also important to bring the banking risk management systems of domestic commercial banks closer to international standards with detailed coverage of the real situation and measures taken to hedge against various risks in the annual financial statements.

As for improving the management of distressed assets in a crisis, as world practice shows, the most effective mechanism at the level of the entire banking system is to create a company to manage distressed assets of commercial banks, which should buy market assets from commercial banks for further management them. Repurchase of distressed assets will reduce the loss of the banking system of Ukraine, as it will reduce the amount of contributions to reserves for active operations, which will allow banks to use these funds for anti-crisis and current activities.

Another important institution of the banking market should be the rehabilitation bank ("bridge bank"), whose task is to manage the exclusively operating assets of troubled banks withdrawn from the market. The effective operation of the "bridge bank" should ensure the return of customers of troubled banks deposits guaranteed by the state [3, p. 18].

Thus, today the banking sector of Ukraine lags significantly behind developed countries in some quantitative and qualitative banking characteristics. These primarily include the lack of credit potential for large-scale modernization and reconstruction of the economy, low public confidence in domestic banks and potential risks in the operational field. Ensuring the appropriate level of financial security of the banking system of Ukraine requires a set of measures to improve legislation, banking supervision, strategic planning and crisis management.

#### **References:**

1. Методика розрахунку рівня економічної безпеки України. Затверджена Наказом Міністерства економічного розвитку і торгівлі України від

29.10.2013 р. № 277 [Електронний ресурс]. – Режим доступу:  
<https://zakon.rada.gov.ua/rada/show/v1277731-13#Text>

2. Стратегія розвитку банківської системи України 2016-2020 [Електронний ресурс]. – Режим доступу:  
[https://kneu.edu.ua/userfiles/Credit\\_Economics\\_Department/afedra+bankspravi/proekt\\_strategi.pdf](https://kneu.edu.ua/userfiles/Credit_Economics_Department/afedra+bankspravi/proekt_strategi.pdf).

3. Міщенко В. І. Санаційний банк – «бідж-банк» як механізм роботи з нежиттєздатними банками [Текст]: Монографія / В. І. Міщенко [та ін.] ; Центр наукових досліджень Національного банку України. – К.: УБС НБУ, 2016. – 119 с.

## **Comparative characteristics of the Japanese and Ukrainian model of HR management**

Human resources management is a major area in the strategy of a modern enterprise as the human role in the production, provision of relevant services, and economic life of society is growing. The value of company's human resources frequently becomes evident when the company is sold. Often the purchase price is greater than the total value of the physical and financial assets, partly because of the value of company's HR.

HR management is a purposeful, organized impact on the company's employees, the purpose of which is to ensure the most effective functioning of the organization, as well as to meet the interests of the working team and the needs of an individual employee.

We can assume that the choice of HR management model is significantly influenced by the following main components: the level of humanistic development of society, principles underlying organizational culture, and the level of development of the technological base of the enterprise. That is why staff management should consider the developments in management theory and practice.

There are different HR management models. The Japanese, the so called 'gentle' model, was formed in the middle of the 20th century. It is built on the nation's mentality, which is characterized by cultural values and beliefs such as collectivism, practicality, diligence. This model was worked out to develop initiative in employees and encourage a creative approach to work. The management of the organization gives the employees the tasks to perform that are described in general terms, and indicate the results that must be achieved. However, the way the workers will solve the task is just their choice. The employees of the organization have got all the necessary data about the tasks that have been set. This allows them to make a decision independently in their work activities and participate actively in optimizing the work of the company.

The Japanese model of HR management takes into account the following:

1. The employees hired by the company remain in their positions until retirement (lifelong employment).
2. Workplace is not provided to workers without education.
3. The value of the employee will grow, if he/she has excellent personal qualities, a high level of education and experience.
4. Salaries depend on the employees' experience.

For example, an employee with a lower level of education, but with more work experience, will receive a higher salary than a school graduate. However, young employees will have more privileges in discussing the company's problems.

Thus, remuneration for work in Japanese companies is seen as focusing on the characteristics of the employee not only to perform their duties, but also to address issues related to the activities of the company. The Japanese management model is based on teamwork and cooperation.

Obviously, the Japanese model has many advantages. At the same time, it has some shortcomings. It is not always possible to objectively assess professional abilities of the employees. Employees need to adapt constantly to the changes taking place in the company.

In general, HR management in Ukraine can be represented by such a sequence as: the formation and definition of goals, information gathering, planning, decision making, realization and control. This management system provides for the motivation of employees, their material interest and social safety.

However, HR management in Ukrainian companies proves to be ineffective and imperfect according to the statistical data given by a leading recruitment company Antal [4]. Such management model leads to low productivity (8.7 points compared to 46.8 points in Japan), and high staff turnover (43%).

Modern Ukrainian structure of management can be characterized as:

- focusing on corporate profits;
- poor staff training;
- reduced motivation for career growth;
- lack of successful leaders among managers.

To redesign the Ukrainian structure of HR management which will lead to the best result of economic development, we need to change it a bit. Firstly, the structure of HR management must be fully explored. All attention should be focused on the cultural and social-historical factors that influence the formation of management. Secondly, managers need to learn about other structures of management worldwide and develop the model of management that takes into account the Ukrainian realities. As the direct transfer of methods that have proven successful in one national system may be ineffective for another one, traditions, mentality, cultural, spiritual and social-economic factors are very important here.

Modern realities increasingly incline the management of organizations to apply the Japanese model of human resources management. It is used in many countries of Southeast Asia and the European Union because the organizations that use it are characterized by stable and high financial and economic performance. It is proven to be effective in newly established organizations and small businesses. Such organizations often have a blurred management structure, based on existing family relationships. It is the most productive in knowledge-intensive industries, in which the creation of innovative products requires analytical, non-trivial, informal approaches.

#### **References:**

1. А. Оксентюк, Р. Оксентюк, Б. Оксентюк “Зарубіжний та вітчизняний досвід управління персоналом”, Галицький економічний вісник, №1(34), с.66-72, 2012. Режим доступа:

Дата звернення: March, 15. 2021.

2. А.А. Білопуп, Л.М. Малік “Сучасні моделі управління персоналом підприємства”, Міжнародний електронний науково-практичний журнал «WayScience», №2 (4), с.4-19, 2019, Дніпро. Режим доступу:

Дата звернення: March, 15. 2021.

3. В. С. Гуменюк, М. Д. Прищак, “Японська модель менеджменту”, Вінницький національний технічний університет, 2017, Вінниця. Режим доступу: <http://ir.lib.vntu.edu.ua/handle/123456789/17618>.

Дата звернення: March, 16. 2021.

4. Antal (2021). Available at: <https://www.antal.com/office/kostiantynivska-street> . Accessed on: March, 22. 2021.

## **The impact of the pandemic on operations management in metallurgical industry**

In the contemporary circumstances, the enterprise is the main link in the market economy, since it fulfills the following economic functions: production, marketing of goods and provision of services [3]. Therefore, it is very important that its working process runs clearly and without interruptions, and any defects are eliminated as soon as possible. The COVID-19 pandemic has made fundamental changes in the work of enterprises.

Metallurgical industry is one of the most important spheres of the economy of many countries of the world, Ukraine in particular, as metal is an irreplaceable material in the life of mankind. Metallurgy is considered to be a specific and critical industry, because its work cannot be stopped due to a complex technological process. These processes, or “operations”, are managed by operations management.

Operations management is all activities related to the deliberate transformation of materials, information or buyers [4].

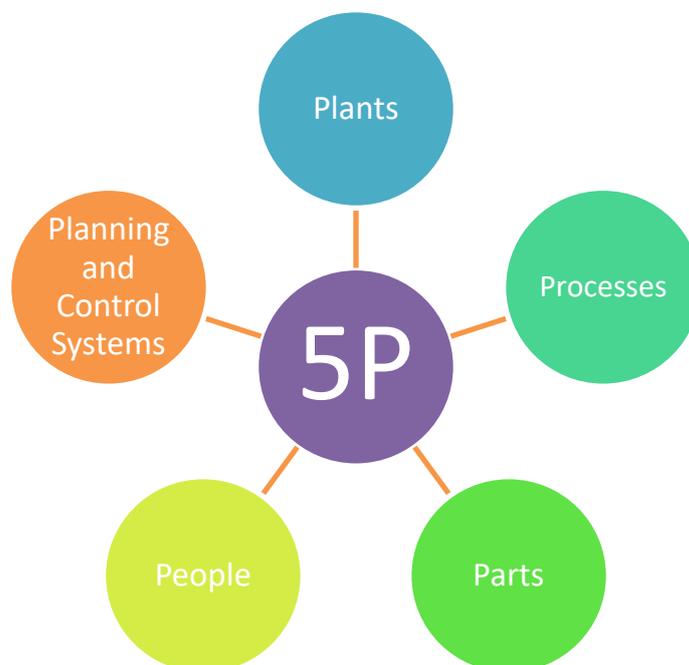
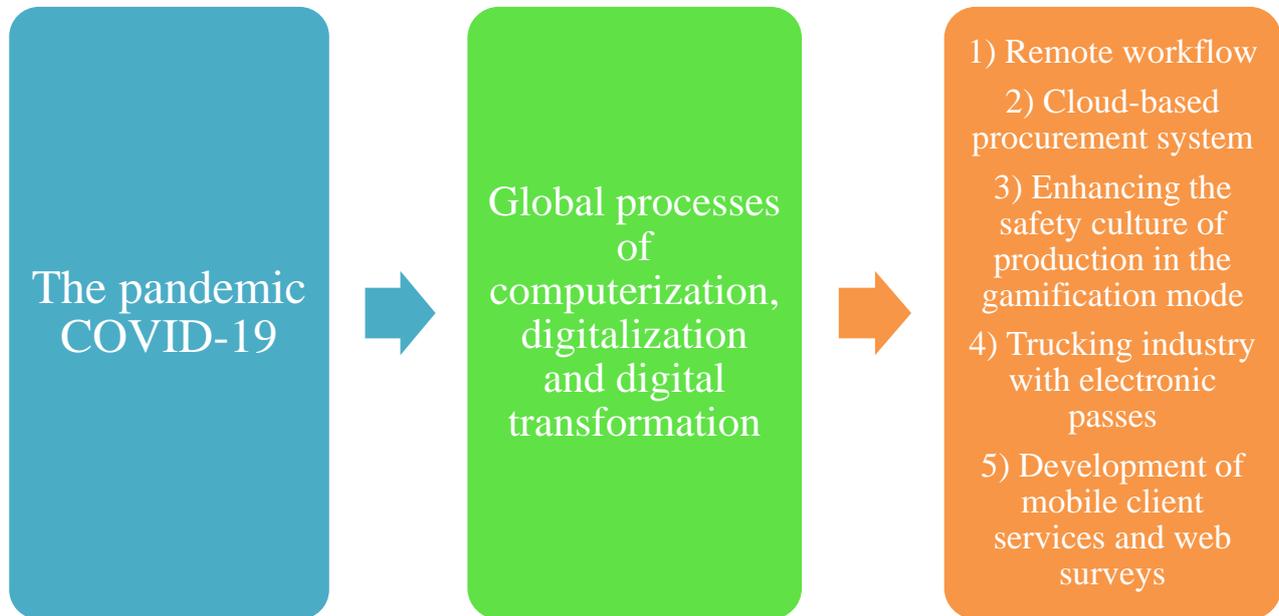


Fig.1 – The 5P model of operations management [2]

The 5P model of operations management includes various organizations that produce products or provide services (plants), business process design (processes), products and services (parts), recruiting personnel to perform individual operations and business processes (people), and implementation of management functions, i.e. planning, organization, analysis, control and regulation (planning and control



systems).

Fig.2. A brief scheme of the impact of the pandemic on operations management at metallurgical enterprises

COVID-19 has pushed metallurgical enterprises towards mass computerization. In conditions of aggravated epidemiological situation, all meetings are held exclusively remotely with the help of video communication technologies. Most of the office workers are transferred to remote work. Enterprises purchase computer equipment, and install additional equipment and software. It allows the employees of the enterprises to carry out their work safely and efficiently [1].

According to the company Metal Expert [5], the innovations that are being introduced in connection with the pandemic include mass digitalization and digital transformation of operations at different stages of the technological process. For example, large metallurgical enterprises have begun to improve procurement practices by introducing a cloud-based procurement system into industrial exploitation, which simplifies, speeds up and reduces the cost of procurement. A feature of the cloud service is the ability of authorized users to order all the necessary products in self-service mode. The main advantage of this mode is an improvement of procurement efficiency at the expense of increasing user engagement, expansion of collaboration capabilities, as well as a clear simplification, standardization and automation of routine transactions.

Modern technologies are being actively introduced in the field of production safety. For the convenience and efficiency of registration of hazards at the plants, metallurgical enterprises develop and use special mobile applications. The purpose of

such projects is the ability to reduce the level of industrial injuries in the gamification mode and ensure the safety of the enterprise personnel. The main functions of the applications include:

- fixing dangerous behaviour or violation of labour protection requirements (making a photo);
- identifying the true cases of unsafe actions;
- collecting proposals from employees to ensure safe work in production.

Electronic passes are used to speed up the delivery of goods to enterprises and eliminate queues and traffic jams at the entrance to the plant. Suppliers have their own personal electronic accounts. They remotely leave requests for delivery. Electronic passes are issued, and drivers receive an SMS with the location of the checkpoint. Thus, they can go directly to the checkpoint for entry.

The enterprises of the metallurgical industry increase their competitiveness, gain a foothold in the metal products market and develop customer focus at the expense of various customer services. This refers to special applications informing customers online about the execution of the contract for the supply of products. Clients can at any time find out about the status of their orders, data on the balance of payments, send their claims, get access to receipts and invoices, as well as to the catalog of metal products. One of the latest innovations is the development of a web-based consumer survey. This approach not only improves feedback, but also helps to determine the level of customer satisfaction, provides appropriate support and speeds up the process of responding to complaints and suggestions.

**References:**

1. ЕВРАЗ против COVID-19 (2020). [Online] Available at: <https://www.evraz.com/ru/covid-19/>. Accessed on: March 12, 2021.
2. Мойсеева Н.К. (2017) 5Р операционного менеджмента. [Online] Available at: [https://studref.com/367414/menedzhment/operatsionnogo\\_menedzhmenta](https://studref.com/367414/menedzhment/operatsionnogo_menedzhmenta). Accessed on: March 11, 2021.
3. Предприятие. In Wikipedia. Available at: <https://ru.wikipedia.org/wiki/Предприятие>. Accessed on: March 11, 2021.
4. Управление операциями. In Wikipedia. Available at: [https://ru.wikipedia.org/wiki/Управление\\_операциями](https://ru.wikipedia.org/wiki/Управление_операциями). Accessed on: March 11, 2021.
5. Metal Expert. [Online] Available at: <https://metalexpert.com/ru/index.html>. Accessed on: March 12, 2021.

**Assessment of the competitive situation in the banking market.  
Does it contribute to the improvement and implementation of banking  
services?**

Competitiveness (according to Cambridge dictionary) is the fact of being able to compete successfully with other companies, countries, organizations, etc. [1] It is a competition between entities in the market, which leads to their ability to have a higher level of real or potential satisfaction of consumer demand compared to similar entities in a particular market.

Usually, banks are analyzed by their areas of operation or by the product (services) that they provide. So, it would be fair to give a definition to characteristics of competitive advantages for the banking sector. First of all, competition gives you an idea of how many goods or services you need to produce. It's a force to produce more, expand your assortment, raise the quality, increase productivity and save resources in order to obtain more profit.

Analyzing competitiveness of a bank, you need to pay attention to basics, such as: ability to react on changes in economic situation in the region (country, world) in time, bank's reputation, stable clientele, communication between bank and clients, development of affiliates, high quality of services, work experience and introduction of innovative services and products. [2]

In our research we looked at PrivatBank, Oshchadbank, Monobank and Raiffeisen Aval as the top four banks in terms of the number of payment cards in circulation by 2020.

Bank	PrivatBank	Oshchadbank	Monobank	Raiffeisen Aval
Payment cards, MM	29,2	11,6	3,1	2,5
Affiliates	2 021	2 630	0	503

Let's take a look at a customer rating of banks with positive evaluations:

Bank	Minfin	Reviews, thousands	Google Play	Reviews, thousands
Monobank	50%	1,4	4,9/5	451
PrivatBank	32%	8,4	4,6/5	325
Oshchadbank	29%	3,9	2,0/5	33
Raiffeisen Aval	28%	1,0	4,2/5	15

According to the rating we can see that people mostly trust Monobank – young, perspective, and high-tech bank. PrivatBank – the largest bank in Ukraine – takes the

second place followed by Raiffeisen Aval. The least satisfied customers are with Oshchadbank – the second largest customer base in Ukraine.

Talking about customer base, let's look at the data on the number of customers of banks (some banks have not published information for the past few years yet):

Bank / year	2017	2018	2019	2020
PrivatBank	22,8 (7,3)	21,8 (8,9)	- (10)	27,4 (10,2)
Oshchadbank	16,8 (1,1)	13,2 (2)	(3,3)	(4,5)
Monobank	0,03	0,5	1,5	3,1
Raiffeisen Aval	2,3	3,0	2,7 (0,5)	-

() – number of customers using internet banking, mln

Based on a fact that Monobank is the only neobank in Ukraine, we can make a forecast for the next two years. Monobank now has the biggest potential for development in the market. Easiness in using the application, high level of customer focus, low tariffs (in comparison with regular banks) and high percentage of people's trust are the main characteristics of the bank.

We need to mention that the bank hasn't received a large number of its potential customers yet. In a future, Monobank plans to compete with PrivatBank in terms of services for the purchase of air- and bus tickets, receipt of pension on the card and the number of international transfers that can be transferred.

Analyzing real reviews [2], we highlighted positive and negative moments in working with PrivatBank. On the positive side, we can see a big number of affiliates and ATMs, a wide range of services, fast money transfers and working online 24/7 customers' support. On the negative side, we need to mention bad quality of service in affiliates (constant long lines and very slow service), incompetent staff, poor information support for the client, a system that is constantly slowing down. Based on this information, we can make conclusion that to get full trust and respect from customers the largest bank in our country needs client-oriented staff, that will solve customer issues and problems as their own, and stable work of online systems. Last error in a system was on June 4<sup>th</sup>, 2020 and lasted about 9 hours. Occasions like this change the way customers think about bank security.

Most companies and agencies in Ukraine use payment cards of PrivatBank for receiving the salaries and other payments, and that creates a big part of customer base of this particular bank, but those people chose this bank not because they wanted, but because they were forced to. They had no option. This type of customer is less loyal to the bank and at the right opportunity may change to a bank that is more convenient for them. So, at a time when the market is filled with real competitors, PrivatBank's main task should be to attract customers to join them voluntarily. Such customers are characterized by loyalty and are more likely to turn a blind eye to small shortcomings of the banking institution.

Talking about the second largest bank in Ukraine – Oshchadbank, from the table 2 we can make a conclusion that bank needs to pay attention to negative reviews from its customers. A large commission both at the cash desk and in Oshchad24 for any transaction (compared to other banks), the lack of communication channels,

endless queues, the work of one or two cashiers per large affiliate, the constant lack of cash in ATMs, the complete destruction in the branches [3] – this is a small list of customer feedback on the shortcomings of the bank, which greatly affect the development of the company. From table 3, due to lack of information, we can't make conclusion about further development of the bank, but in 2019 international rating agency Fitch Ratings upgraded the rating of Oshchadbank (Long-Term Foreign and Local Currency Issuer Default Ratings – Long-term issuer default rating in foreign and national currency) from “B-” to “B”. The forecast for the bank is "positive". [4]

Looking at the customer base of Raiffeisen Bank, there was a need to know the data about previous years. They are given in table 4.

2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
3,9	3,1	3,0	-	3,1	2,6	2,3	3,0	2,7	-

We can see that throughout the decade, the bank keeps a certain, almost identical, number of clients and has difficulty encouraging new ones. Here are some of the problems customers face: poor online banking, lack of working ATMs, high transaction fees, complicated online banking registration procedure, lack of good quality service.

Nevertheless, in 2020 Raiffeisen Bank Aval takes the first places in reliability. The bank will be able to resist unfavorable factors and face the strong influence of negative and unpredictable factors, which can lead to his bankruptcy.

As a conclusion, we can make a statement that competition in the banking market, despite the strong player, PrivatBank, which seemed to dot the "I's" and cross the "T's." in the banking sphere in Ukraine and is a “giant” with which it is impossible to compete, still exists.

This research shows how many problems our banking sphere has from the customers’ perspective and pays attention to the great potential of the future of banking development.

Nowadays, the market of banking services is so crowded that people begin to actively seek "alternative", "minimalism" and "convenience", and easily change the main bank to the one where the client is, trivially, more politely spoken to. In order not to lose the customer base during this trend, you need to pay attention to the quality of the service, the correct operation of their services, starting from ATMs and ending with large-scale system failures and implementation of minimalism and accessibility in services. Today, in order to attract people to use banking services and not to lose already acquired customers, you need to improve and make changes that customers will be able first of all to see and feel.

### **References:**

1. Cambridge dictionary. What is “Competitiveness”? // [Electronic source]:  
Access mode:  
<https://dictionary.cambridge.org/ru/%D1%81%D0%BB%D0%BE%D0%B2%>

D0%B0%D1%80%D1%8C/%D0%B0%D0%BD%D0%B3%D0%BB%D0%B8%D0%B9%D1%81%D0%BA%D0%B8%D0%B9/competitiveness

2. Конкурентоспроможність як об'єкт аналізу при формуванні стратегії банку / Юлія Олександрівна Самборська-Музичко// Економічний аналіз : зб. наук. праць / Тернопільський національний економічний університет; редкол. : В. А. Дерій (голов. ред.) та ін. – Тернопіль : Видавничо-поліграфічний центр Тернопільського національного економічного університету / “Економічна думка”, 2014. – Том 17. – № 1. – С. 181-188. – ISSN 1993-0259.

3. Відгуки реальних людей щодо користування послугами банків [Electronic source]: Access mode: <https://www.otzyvua.net/>

4. Ощадбанк демонструє постійне зростання бізнесу за результатами 9 місяців 2019 року [Electronic source]: Прес-служба Ощадбанку - Access mode: <https://www.oschadbank.ua/ua/press-service/news/oschadbank-demonstrue-postiynne-zrostannya-biznesu-za-rezultatami-9-misyaciv-2019>

## **Inventory accounting: integration of information technology for inventory optimization**

The intensive development of economic relations and the significant impact of global economic trends on the economic activities of Ukrainian enterprises force to improve the existing model of the accounting system, control and improvement of their work at all levels. The supply of a company inventory affects its production volume and subsequent potential profit. In the modern conditions of the formation of new industries and areas of activity, the question of determining what the production stock is and their further accounting becomes especially relevant for enterprises. The need to ensure clear control over their availability, receipt and disposal, without allowing the possibility of mixing the quantity and value of different items, requires clear knowledge and a detailed accounting system.

Inventories occupy the main position in the structure of costs, they are part of the enterprise material resources used for manufacturing products, selling goods or providing services, depending on the type of economic activity carried out by the enterprise. However, today, when new industries are emerging, especially those that use only the latest electronic means of communication of information technologies, which cannot be safely attributed to the classical areas of economic activity, the issue of inventory accounting is one of the most complex and controversial.

The use of production resources, namely the efficiency and reasonableness of their use, primarily affects the competitiveness of the enterprise in the chosen field of activity and functioning in conditions of excessive choice for consumers of goods or services, as well as the rapid variability of economic trends and financial instability.

In order to provide the latest research base, the information that became the basis for studying the issue had to meet the following parameters:

- 1) Topic: accounting and audit of inventory in Ukraine
- 2) The number of citations of the study
- 3) Availability of full articles
- 4) References to foreign experience
- 5) Compliance with the current legislation of Ukraine
- 6) Date of publication – relevance and timeliness.

The first and second criteria were applied using the Google Scholar website. Google Scholar evaluates specialized articles according to their citations in more than 83,600 textbooks, scientific papers, and articles published by more than 9,000 publishers worldwide. It provides a list of the most cited articles and authors according to the research issue.

Each of the authors' works, taken as a basis, meets at least 5 of the above criteria. “Ways to improve inventory accounting” by O. Levchenko [3], “Organization and methods of audit: a textbook” by L. Kulakovskaya [1], “Ways to improve inventory accounting” by O. Levchenko [5], “Audit. Fundamentals of state, independent professional and internal audit” by V. Nemchenko [4], “Accounting for the movement of goods: regulatory and legal aspects” by Y. Kvach [2] and “Accounting: teaching methods” by T. Voronchenko [6] – all these scientific papers and textbooks were published in the period from 2004 to 2016 and therefore they provide an opportunity to consider the basics and issues of the fuzzy formation of resource management.

There is no common single definition of inventories in the economic environment. However, based on the definition of both domestic and foreign scientists, we can conclude that inventories are assets owned by the company at the time of its activities, which represent all the resources involved in the production process, and without which this process is impossible .

Table 1 provides an overview of the main problems identified during the study and the best ways to solve them.

Table 1. Main problems of average enterprise inventory accounting

№	Problem	Solution
1	Stock inventory suspends the enterprise operation for a long time. Errors in calculating the exact amount of each inventory item.	Install affordable software that can turn smartphones and tablets into scanning devices for physical inventory accounting, or use handheld or national RFID readers. SQL-developer services to compile a single electronic inventory database.
2	Insufficiently adjusted work of the warehouse; lack of remote access to the data of inventories.	Introduction of a warehouse management system (WMS) and electronic data interchange (EDI).
3	Downtime because of disordered purchases and/or interruptions in delivery.	Arranging procurement and delivery operations according to principles that occur on time (JIT costing method).
4	Changes in the productivity because of illness, etc. Impossibility of well-organized work.	Using a remote control on a work computer by installing software on a private computer and on a work computer, such as TeamViewer and AnyDesk.
5	Additional costs for keeping stocks in warehouses of other enterprises due to lack of space in their own warehouse.	Using historical and forecasting methods to estimate future inventory needs.

The results obtained allow to identify the problem areas that prevent the full coverage of the entire inventory accounting mechanism, taking into account all the

features of the enterprise economic activity, and help to compile a list of procedures that can contribute to solving a specific problem and eliminating disadvantage.

All these areas of work should be carried out in order to assess the efficiency and productivity of operations with inventory and improve the efficiency of the enterprise.

Control over the enterprise activities is the key to sustainable functioning in the market. The ability to accurately and timely assess the state of the enterprise and make a functional management decision contributes to improving competitiveness.

An important aspect of organizing inventory accounting is the state of the organization of analytical and synthetic accounting. The companies still does not have a well-established process for accurately estimating inventory and problems with determining the optimal demand for them at a certain date. When buying a certain stock, there may be an excess of them in case of insufficient storage space and further non-use of production stocks due to their excess.

The development of a system of economic analysis and control of the efficiency of the use of production stocks would make it possible not to purchase production stocks with an excess that is most often not used in further production.

To get the maximum profit, the company must carefully monitor the cost of production. Control is carried out at all stages. To evaluate the efficiency of the use of inventory, you can use the following performance indicators: material efficiency, material consumption, material utilization rate, the share of material costs in the cost of production and the rate of return on costs in the Ukrainian currency.

In modern Ukraine, a single direction of accounting regulation for all economic entities has already been defined, as well as unified rules have been approved by law. The regulatory legal acts of Ukraine establish norms and standards that define the procedure for describing the financial condition and results of the company activities.

It should be noted that the legal regulation of accounting in Ukraine is regulated by a large number of documents that cover a wider area, regulate accounting in general, and have a greater impact.

Analyzing the current legislation and documents that can be used as the basis for maintaining and regulating the inventory accounting at the enterprise, we can say that they do not fully meet the requirements of modern management and cannot cover all areas of economic activity that appear almost daily in a rapidly developing economy.

Since a significant part of the regulatory documents was drawn up in the period from 1993 to 2000, it can be said that the inventory accounting system is outdated. Of course, current versions of the documents are introduced to bring them in line with the current economic situation, but most of them are based on old principles, some of which have been adopted since Soviet times.

The current internal audit procedure for operations does not provide timely data on the status, recognition, receipt, movement and disposal of inventory. Many enterprises use an outdated accounting system, which complicates the inventory

process, and hinders the development of new enterprises selling services and goods that are difficult to fit into the classical understanding of economic activity.

Therefore, the regulatory framework improvement has to be organized in accordance with international standards, as well as taking into account modern economic trends and the experience of European countries.

The condition for improving the management of enterprise resources is to increase the acceleration of inventory turnover and reduce material consumption. At the same time, it is necessary to reduce the norms of material costs and set limits on the consumption of the same costs.

As a conclusion, we can say that inventory accounting is one of the most difficult in the enterprise. Due to the development of new branches of economic activity, a number of issues concerning the definition and further accounting of stocks involved in production are increasing. The existing legislative system of regulation still has certain shortcomings and gaps, and does not have time to legislate and regulate new business trends that appear in Ukraine. To make the audit at the enterprise more accurate, it is necessary to study in detail the typical errors in accounting and pay more attention to the reporting in these aspects.

#### **References:**

1. Kulakovskaya L.P. (2004) Organization and methods of audit: Textbook. manual / L. P. Kulakovskaya, Y.V. Picha. Retrieved from: [https://pidruchniki.com/1584072011764/buhgalterskiy\\_oblik\\_ta\\_audit/organizatsiya\\_i\\_metodika\\_auditu](https://pidruchniki.com/1584072011764/buhgalterskiy_oblik_ta_audit/organizatsiya_i_metodika_auditu) (assessed 19.03.2021)
2. Kvach Y.P. (2015). Accounting for the movement of goods: regulatory and legal aspects / Bulletin of socio-economic research: collection. Retrieved from: <http://vsed.oneu.edu.ua/collections/2015/57/pdf/135-143.pdf> (assessed 15.03.2021)
3. Levchenko O.P. (2014). Ways to improve inventory accounting. Retrieved from: <http://elar.tsatu.edu.ua/bitstream/123456789/1342/1/1138.pdf> (assessed 19.03.2021)
4. Nemchenko V.V. (2012). Audit: Fundamentals of state, independent professional and internal audit. Retrieved from :[https://pidruchniki.com/15931106/buhgalterskiy\\_oblik\\_ta\\_audit/audit](https://pidruchniki.com/15931106/buhgalterskiy_oblik_ta_audit/audit) (assessed 18.03.2021)
5. Utenkova K.O. (2011) Audit: Textbook. Retrieved from: [https://pidruchniki.com/1409062142163/buhgalterskiy\\_oblik\\_ta\\_audit/audit](https://pidruchniki.com/1409062142163/buhgalterskiy_oblik_ta_audit/audit) (assessed 17.03.2021)
6. Voronchenko T.V. (2016). Fundamentals of accounting. Retrieved from:[https://stud.com.ua/41439/audit\\_ta\\_buhoblik/osnovi\\_buhgalterskogo\\_obliku](https://stud.com.ua/41439/audit_ta_buhoblik/osnovi_buhgalterskogo_obliku) (assessed 10.03.2021)

## Social networks as a communication tool in the B2B market

Many marketers have studied the specifics of B2B marketing when analyzing large enterprises. Then each famous specialist had his own designation of this term. Business-to-business (B2B or, in some countries, BtoB) is a situation where one business makes a commercial transaction with another [1]. B2B is a type of interaction when the parties are legal entities, it is a relationship between two businesses (in the translation from English b2b - business to business, business to business) [2].

An important feature of the b2b market is the approach of the marketing itself. In this market, it will not be possible to influence the client with bright banners or guest stars, first, clients of such a market rely on profit, if not specifically now than in the future. Second, the reputation of the company with which they plan to work is one of the key factors for long-term cooperation.

A company reputation in the market is the most important indicator when choosing a business partner. In this case, the loyalty of the company to certain suppliers, readiness for honest and long-term cooperation are taken into account. Life without social networks is already difficult for an ordinary person to imagine, so the integration of business into social networks is a rather organic process. The figure below shows the trend of change in the use of social networks over the past five years [3].

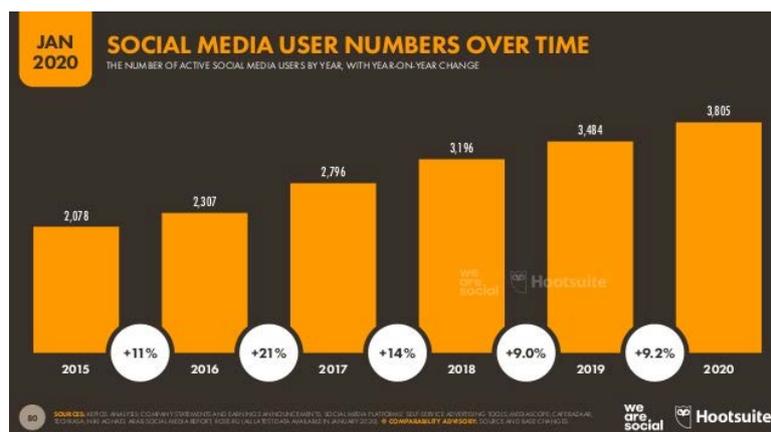


Figure 1. The percentage of social media users over five-year time

What can Social Media Marketing (SMM) do in social networks for B2B?

Social media marketing (SMM) is a full-fledged marketing, not just promotion through various social platforms [4]. Social Management is part of the marketing and communication strategy.

1) Marketing reputation.

Competent maintenance of social networks has a positive effect on the final opinion of customers about the company. Social networks are unlikely to be a decisive point in the decision to cooperate, but they will help shape attitudes towards the business and towards the contractor.

2) Increase in the number of visits to the site.

With the help of promotion and content, you can achieve transitions to the site and the conversion of page visitors to customers.

3) Generation of leads

This means that with the correct management of social networks, you can get a lead. This does not have to be an application left on the site. It is quite possible that they will write to you in private messages and test the ground for further negotiations.

4) Hiring employees

It is possible to find company employees through social networks. This can be done either by the business itself or by the person who applied to the company about vacancies.

As stated earlier, using social media alone is nearly impossible to strike a deal with a partner you haven't previously contacted. There will be too high distrust in companies that do not even have a website. When looking for information about the reliability of a company, social networks will be viewed in a larger percentage of cases. Moreover, a lot of companies follow each other on social media. The constant activity of each other increases of brand awareness and when there is a need for the same managers, your company can appear in the memory.

Most brands that operate in the B2B market have social networks. However, markets are changing; dry office posts about constant praises of the company carry very low involvement (no one is interested in hearing this). Accept mistakes and do not be afraid to talk about them! Shares the experience of failures and do not worry about being judged. This will bring the brand "humanity" [5].

Here are some ideas how to make the social networks bring the brand 'humanity' and consequently success [6]:

1) Move away from the too pomp of social networks, add light humor, accept mistakes.

The modern world shows changes in companies in a social format, more and more companies are adopting socially responsible marketing (talking about environmental issues, inequality, health) and not only talking, but also trying to help, creating whole funds to fight cancer or helping the poor.

2) Socially responsible marketing. Do good and don't forget to mention it on social networks.

For the time being, many specialists approach the next trend with caution. The logic of the trend is to be on the same social networks as your customers. While this trend is not yet particularly popular among Ukrainian business, some companies abroad are already creating content plans for these social networks.

3) Don't be afraid to experiment in new social networks

It is important to be where the audience is, if it changes preferences and any social, then this should be used. Recommendation for companies: do not be afraid to change the approach to communication with the consumer.

4) Create masks

Masks for social networks are also becoming popular; many Instagram users are avid fans of unusual masks. Why not give them the opportunity to become brand ambassadors for free?

5) Open the backstage of your work.

The latest trend is the increasing popularity of conversational videos/live broadcasts. Everyone is interested in how the parts of a huge mining crane are created or how customs brokers work, which will increase the credibility of the company.

In this case, social networks are still the key factors for business development in the B2B market and are still developing dynamically. The only thing that is changing the approach to communication between consumers and the company: they become simpler, the constant praises of the company, excessive pomp are no longer working. Customers understand humor and have a positive attitude towards it on social media, and because of this, brand loyalty rises.

For any enterprise, it is necessary to constantly monitor the trends of social networks. As a rule, now it is not scientists who work as trend research, but marketers of top companies in their industries (Proctol & Gambel, Nike, General Motors). This is because the situation is constantly changing. Market analysis requires significant funding for representative results. What few companies can afford.

**References:**

1. Sandhusen, Richard. Marketing — Hauppauge, N.Y: Barron's Educational Series, 2008. — C. 520. — ISBN 0764139320 (accessed 19.03.2021)

2. What is B2B segment. *Towards data science: web-site.*

URL: <https://semantica.in/blog/chto-takoe-segment-b2b.html> (accessed 19.03.2021)

3. Digital 2020: 3.8 billion people use social media. *Towards data science: web-site.*

URL: <https://wearesocial.com/blog/2020/01/digital-2020-3-8-billion-people-use-social-media> (accessed 10.03.2021)

4. What is Social Media Marketing. *Towards data science: web-site.* Search Engine Land. (accessed 19.03.2021)

5. More than half of the people on earth now use social media. *Towards data science: web-site.*

URL: <https://datareportal.com/reports/more-than-half-the-world-now-uses-social-media> (accessed 12.03.2021)

6. Change or leave: what B2B marketing will be like in the next few years. *Towards data science: web-site.*

URL: <https://mmr.ua/show/kakim-budet-b2b-marketing-v-blizhajshie-neskolko-let> (accessed 15.03.2021)

## **Trends and prospects for the development of the «green» economy**

For a long period of time, people did not realize how much damage they were doing to the environment. There was no clear control over the amount of natural resources used and the release of pollutants, which led to the current state of the environment and the threat of the environmental crisis. As a result of the global financial, energy and environmental crises, a huge environmental problem of a global scale has been created, which will need to be solved not only by present, but also by future generations of humanity.

The emergence of such global problems has made people think and look for ways to prevent an environmental disaster. One of the effective solutions to this problem is a "green" economy, reflecting the new reality of expectations, rules, algorithms of behavior of companies, financiers, governments, etc. to protect the environment.

If we consider the green economy as an economic activity, then we can describe it as an activity that increases the wellbeing of people and ensures social justice, significantly reducing the risks to the environment and the destruction of nature.

On the other hand, this term is considered as the development, production and use of technologies to control and reduce emissions of greenhouse gases and other pollutants, to monitor climate change and technologies for saving energy, resources and renewable energy [1].

Therefore, the green economy takes on the mission of improving the quality of life and the human environment, while modernizing and improving the efficiency of the production process.

The world is changing and it is impossible to deny the existence of this sector of the economy, as it is only gaining momentum and increasing popularity. We can already say that the green economy has become a very important area of economic development of countries. The green economy is already gradually coming to Asian countries, America, Brazil and the countries of the European Union. Economists believe that 2020 was a turning point for the introduction of a green economy in a number of decisions, both within countries and in the foreign economic activities of countries and companies [2].

Below are the trends that indicate the prospects for the development of a green economy:

1. *The development of a carbon-neutral space.* After the pandemic of 2020, the green economy became the center of the national economic development plans of China and the countries of the European Union (EU). The so-called "green deal" is the largest economic correction in the history of the EU. The program includes

changes in all areas to achieve the global goal of developing a carbon-neutral space in the European Union in 30 years. [3]

The year 2021 in Europe is designated as the year of "railways". Recently, A. Merkel marked the positive impact of railways in the EU in her speech, saying that transport accounts for about 25% of emissions, and railways – less than 1%. China, on the other hand, mentions that it is on a course to achieve carbon neutrality by 2060 and to align itself with the EU, the UK and a number of other countries with a similar goal [4]. These countries include Brazil, Austria, Argentina, Canada, Chile, and others.

2. *Public expectations.* 87% of people (employees and consumers) believe that companies should create products that meet the interests of society, and not only bring profit [5]. It is important for people to influence the company's activities and their impact on the society. 60% of job candidates take into account the social and environmental responsibility of the employer when choosing the location and products of the enterprise.

3. *Change in demand.* 40% of consumers are ready to pay more for products that are created on the principles of sustainable development. More than 3/4 of consumers are prepared to reject products and services that do not comply with their ethical principles. A study by New York University, which analyzed consumer behavior in 2013-2018, proved that in addition to the high demand for green goods, their presence has a positive effect on the growth of the entire product category [6].

4. *Investors.* In the first quarter of 2020, Ukraine saw an increase in investments in green economy funds. More than 30% of investment funds have invested part of their capital in "green" sectors. This increase is justified by the high demand of both the consumers for "green products" and the producers and investors for "green" profits [7]. The reasons for financing the green economy also include the urgent need for companies to demonstrate their achievements and involvement in environmental cleaning [8].

So, we can conclude that in the current conditions of globalization, the "green" economy is an effective tool for overcoming the environmental crisis. This trend is supported by the governments of most countries in Western and Eastern Europe, Asia, America and other countries, what indicates the need to solve this problem not at the level of a particular country and its economy, but at the global level, which will ultimately contribute to improving the efficiency of production and its competitiveness, as well as improving the quality of life of the population and the living environment in general.

#### **References:**

1. Б. Порфирьев. «Зеленая» экономика: реалии, перспективы и пределы роста. [Электронный ресурс]. Режим доступа: <https://carnegie.ru/2013/04/04/pub-51414>. Дата обращения: 15.03.2021.

2. Climate home news. Which countries have a net zero carbon goal? [Online]. Available: <https://www.climatechangenews.com/2019/06/14/countries-net-zero-climate-goal/>. Accessed on: 15.03.2021.

3. «Зеленая сделка»: ЕС когда и для чего? [Электронный ресурс]. Режим доступа: [ru.euronews.com/2020/01/15/rb-03-european-green-deal](http://ru.euronews.com/2020/01/15/rb-03-european-green-deal). Дата обращения: 15.03.2021.

4. «Зеленый разворот. Какой будет экореволюция Китая? [Электронный ресурс]. Режим доступа: <https://tass.ru/mezhdunarodnaya-panorama/9580515>. Дата обращения: 15.03.2021.

5. Т. Ременева. Бизнес с экологическим лицом: ответственность или маркетинговый ход. [Электронный ресурс]. Режим доступа: <https://www.forbes.ru/forbeslife/386049-biznes-s-ekologicheskim-licom-otvetstvennost-ili-marketingovyy-hod>. Дата обращения: 15.03.2021.

6. Fortune. Consumers Say They Want More Sustainable Products. Now They Have the Receipts to Prove It. [Online]. Available: <https://fortune.com/2019/11/05/sustainability-marketing-consumer-spending/> Accessed on: 15.03.2021.

7. Концессии и инфраструктурные инвестиции. [Электронный ресурс]. Режим доступа: [https://investinfra.ru/novosti/mirovoj-obem-emissii-zelenyx-obligaczij-v-yanvare-2020-goda-sostavil-\\$143-mlrd.html](https://investinfra.ru/novosti/mirovoj-obem-emissii-zelenyx-obligaczij-v-yanvare-2020-goda-sostavil-$143-mlrd.html). Дата обращения: 15.03.2021.

8. Client Alert Commentary. [Online]. Available: <https://www.lw.com/thoughtLeadership/the-future-of-sustainable-finance-in-russia-and-cis>. Accessed on: 15.03.2021.

### Management of an enterprise based on information technologies

With the development of information technologies in modern enterprises there is a need for new methods and approaches to management. This happens due to the complication of the processes and functions performed. Therefore, the implementation and adaptation of IT in the organization is becoming increasingly important because it helps to optimize many processes and increase the competitive advantages.

There is an interdependence between the effective management of the enterprise simultaneously and the management of its information activities.

At the present stage of development, enterprises have to work in conditions of some uncertainty and high risk. That is why it is very important for the executive to make the right and weighted management decisions, keeping all the components of financial and economic activities under control. This decision should be effective and lead to the increasing of the competitiveness and success of the organization.

Information technologies are a set of software and technical means and methods of production, transmission, processing and consumption of information. Their implementation is to create a system in which information flows are settled in such a way that users with minimal cost gain access to the necessary information in real time [3].

Information technologies in the management of the enterprise help to effectively use resources, while ensuring a high level of customer focus.

Table 1 shows the positive and negative aspects of the application of IT in companies.

Table 1. Advantages and disadvantages of using information systems and technologies in the life of the enterprise (adapted from Pchelianska H., Vaskovska K., Pcheliansky D., 2018)

Advantages	Disadvantages
Unified information base registration and storage of accounting	Cybercrime growth
Quick access to information when making management decisions	High costs for updating machinery and personnel training
Continuous operational control	Internet dependency
Access to information via the Internet	Not guaranteed reliability of information
Reducing the influence of the human factor	

Optimization of accounting and control	increases business vulnerability
Reducing costs and time saving	
Reducing paper work	

The use of IT in organizations is manifested through information systems and complexes in various management segments. With the development of information systems (IS), it becomes possible to effectively conduct the control process at low costs, to provide an automated process of settlement, design and information work. IS provides support for basic and auxiliary management processes in such functional sites as industrial, engineering, financial, accounting, marketing, personnel, foreign economic information connections.

Figure 1 shows the structure of the management information system at the enterprise [1].

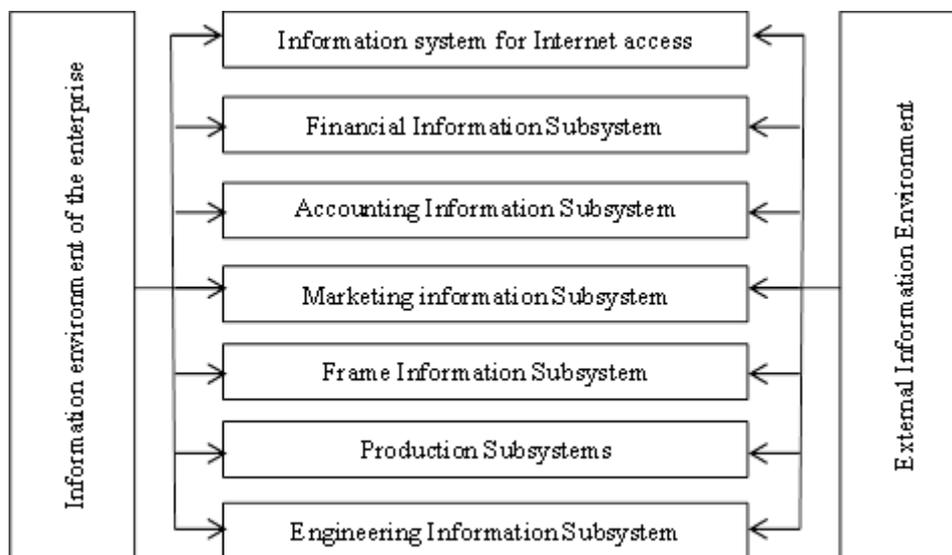


Figure 1. Functional structure of the management information system

There are five basic information systems that can be applied in enterprises. Consider them in more detail [2]:

MRP (Material Requirement Planning) and SCM (Supply Chain Management) technologies are used in managing and regulating relationships with partners and customers. They are oriented on growth of sales, cost reduction, increasing in customer loyalty and counterparties, improving service quality, which generally contributes to the expanding company's competitiveness and its goods / services.

SCM is focused on logistics management, namely: production, delivery, location, reserves, transportation and information. Thus, this system covers the whole cycle of procurement of raw materials, production and distribution of goods.

CRM (Customer Relationship Management) helps to improve customer service quality. The task of this system is manifested in the automated collection and

processing of data about buyers and maintaining a constant information connection with them.

With the help of CRM- system it is possible to: provide prompt access to information when conducting a conversation with a client; have a general data analysis about the activities of the client and the company; define sales plan; receive and transmit orders for processing; compile sales schedules; manage resource distribution.

BPR (Business Process Reengineering) and ERP (Enterprise Resource Planning) are useful for managing business processes and for improving the efficiency of economic activity of the enterprise.

The BPR system is an analytical system that allows managers to have a personalized (that is, takes into account personal contribution in the management process) look at the state of the business [2]. Business processes reengineering increases profitability and increases profits.

The ERP system performs functions of business planning and forecasting; planning sales and product volume; projects and programs planning; demand and costs management.

Business processes reengineering wears bilateral orientation. Therefore, for the best results it is necessary to use two systems simultaneously.

MIS (Management Information System) and BI (Business Intelligence) technologies are used for more efficient economic activities. With their help, it is possible to monitor the life cycle of goods, process a large amount of product information in a short time. This is held in order to identify exact segment of the market in which the company gets more profit, to focus its capacities on the appropriate product.

The application of the system results in synergistic effect, automated and coordinated actions of all enterprise departments, successful implementation of strategic programs and the enhancement of competitive advantages.

IBM Spectrum Protect (Tivoli Storage Manager) is used to protect the enterprise data. It protects the organization data from hardware failures and other errors, maintaining backup and archive copies of data in autonomous storages [2].

Thus, information technologies are becoming more accessible and indispensable in the functioning of management processes. They allow you to increase the efficiency of the functioning of the enterprise by creating new forms and management methods.

The introduction of the latest information systems at the enterprise significantly improves the quality of decisions making, increases the competitiveness of the company and products, and also helps in the automation of production and operation as a whole.

### **References:**

1. Гарасим М.П., Сайко Л.Я. «Необхідність інформаційних систем і технологій в управлінні підприємством», 2012. [Електронний ресурс]. Режим доступу: [http://ena.lp.edu.ua:8080/bitstream/ntb/12500/1/62\\_327-332\\_Vis\\_722\\_menegment.pdf](http://ena.lp.edu.ua:8080/bitstream/ntb/12500/1/62_327-332_Vis_722_menegment.pdf). Дата звернення: Березень 6, 2021.

2. Онопко А.С., Жигалкевич Ж.М. «Застосування інформаційних технологій в управлінні підприємством». [Електронний ресурс]. Режим доступу: <http://ape.fmm.kpi.ua/article/viewFile/102782/97865>. Дата звернення: Березень 6, 2021.

3. Пчелянська Г.Б., Васьковська К.О., Пчелянський Д.П. «Роль інформаційних технологій в управлінні підприємством», 2018. [Електронний ресурс]. Режим доступу: <https://journals.onaft.edu.ua/index.php/fie/article/view/868/860>. Дата звернення: Березень 6, 2021.

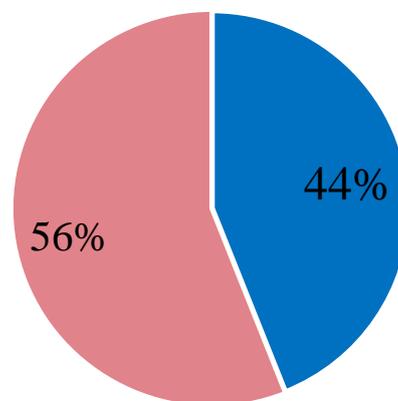
### The importance of self-management during distance learning

Due to the global spread of the coronavirus infection, the entire world was forced to switch to a distance learning and working. A year and a half ago humanity had no idea that it would have to go so rapidly online and forget about visiting educational institutions, offices, etc. Despite limitations, in the time of pandemic people have more opportunities for self-development.

Self-management is characterized by both integrity and multifaceted peculiarities [1], including better organization of work and getting better results, reducing the hurry and stress, getting satisfaction from the work done, motivation of work and less workload [2]. In this paper, the concept of self-management is seen as the ability to organize time and energy during distance learning.

To study the importance of self-management during distance learning, we created a google form in which we asked questions about respondents' satisfaction with distance learning, its advantages and disadvantages. An online survey was conducted among 100 students of the National Technical University "Dnipro University of Technology", National University of Kyiv-Mohyla Academy, Alfred Nobel University and Oles Gonchar Dnipro National University. The results of the survey show that 53% of respondents study from home and 47% of respondents study off-line. Students demonstrate favorable reaction towards distance learning (4 out of 5 on satisfaction scale). 41% of respondents note that their academic performance has not changed. However, 39% of respondents indicate that they have started to learn better. It is important to notice, that 44% of respondents plan their time.

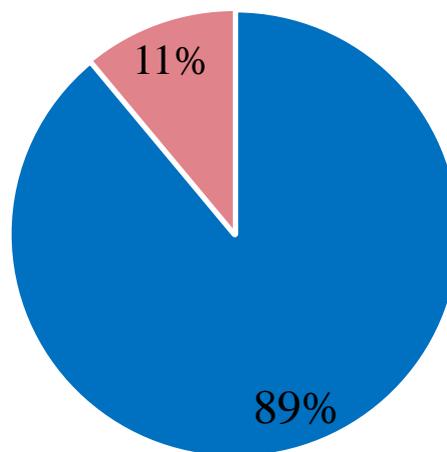
Time scheduling



- students, who plan their time
- students, who do not have a fixed daily schedule

Among the difficulties of distance learning the most popular are: poor information assimilation due to distractions at home, laziness, lack of discipline, difficulties with proper time management, constant procrastination of important study-related tasks, too much free time. The results of the survey show the following advantages of distance learning: saving time, ability to combine work with studies, reducing the costs and time for traffic, friendly atmosphere, large amount of free time. As for scheduling time exclusively for studying, 89% of respondents meet deadlines and only 11% do not always meet all assignments on time.

Meeting the deadlines



- successfully meet all deadlines
- rarely meet deadlines

We can suggest that a lot of free time is a disadvantage due to the lack of correct planning students become procrastinators. If learners goals and opportunities were accurately defined and structured, they would not have this problem. Self-management is directly related to discipline, which, unfortunately, students lack during distance learning.

In the Small Academy of Sciences research "The Art of Time Management" by Diana Shut presented the results of the experiment. She researched some of the principles of time management on herself to confirm their importance. The purpose of the experiment was to demonstrate the difference of living according to the plan and without the help of the organizer. During the first day she prioritized her tasks doing the difficult ones first. It was also important to give up "time eaters", such as social networks, movies etc.

The next day was without a schedule, without using an organizer and time management principles. Therefore, the day passed with nerves, some plans failed due to lack of time, and she was very tired by the end of the day. The experiment proves that time management is an important element of everyone's life, and planning is the key to productivity.

Time management is an important part of being productive in distance learning planning and motivation are the best helpers in achieving goals, self-development, and proper use of free time.

**References:**

1. Череповская М. SELF-МЕНЕДЖМЕНТ или 5 навыков успешного менеджера. [Online] Available at: <https://www.itctraining.ru/biblioteka/menedzhment/self-menedzhment/> Accessed on: March 10, 2021.
2. Значение самоменеджмента. [Online]. Available at: [https://studwood.ru/933608/menedzhment/znachenie\\_samomenedzhmenta](https://studwood.ru/933608/menedzhment/znachenie_samomenedzhmenta) Accessed on: March 12, 2021

## **Gender roles in management**

According to the State Statistics Service on January 1, 2021, women in Ukraine run 29, 2% of enterprises, institutions and organizations [3]. Women are much less likely to apply for senior management positions than men, and their salary expectations are more modest. Women always think that they are missing something, that they should study more and improve themselves to become even better [1]. This is due to the fact that the society has always elevated men over women. Many people live with gender stereotypes and prejudices such as: *men are smarter and more ambitious than women, the main role of a woman is to take place as a mother and wife, men cope with the role of a leader better than women.*

Is it really true that men are better leaders than women? To answer this question, we need to consider how men and women act in typical situations for a manager, and how their behaviour influences the working process and the result.

### 1. The relationships with subordinates

Men are oriented on the tasks and results. They want to build a work team. Males are too focused on the achieving the goals. They do not notice colleagues' problems that may influence the work process and lead to bad results. At the same time, women are oriented on people who will be doing tasks. They want to build a family. Females aim to have a good relationship with their subordinates. They always try to create a positive environment where workers will feel valued, trusted and comfortable. However, women can be too concerned about what is happening in the team, because they are very emotional and can take everything to heart.

### 2. Stressful situations

In a stressful situation actions of men and women differ greatly. Men "take a break", wait, spend some time with new information. They are going through the whole situation in itself and try to solve the problem by themselves. Females prefer to consult with people around them.

### 3. Conflict situations

Studies show that 40% of men are often the initiators of the conflict, while 44% of women try to avoid conflicts [2]. If the dispute cannot be avoided, men will argue with their opponents to the last and will adhere only to their point of view. They focus on defending their own interests, desires and needs. Women are more likely to cooperate or compromise, as they tend not to be aggressive and strive to maintain good relationships.

### 4. The way of considering the problem/task

Men are used to looking at the problem globally. It helps not to pay attention to obstacles, but complicates routine activities. Women carefully study all the details, analyze absolutely every component of the task. They do not miss anything

important, but this process can take too long, and it may be not worth the efforts at all.

5. The way of making decisions

Men prefer to make decisions quickly. They are not afraid of taking risks. They will take risks, even if they are no more than 50% sure of success [1]. Sometimes it helps to think creatively and move the business forward, but it can also be harmful, as often quickly made decisions are not fully thought out and can even cause financial damage. Women are more cautious and need more time to make decisions. They think more far-sighted and strategically. Sometimes managers have to make decisions quickly, and a woman can get confused and lose concentration.

All of the above proves the fact that men and women differ from each other in many ways: in cognitive development, in physiological formation, in habits, volitional and emotional spheres [2]. Therefore, in certain situations, they act differently. This does not mean that someone copes with the role of a leader better or worse. After analyzing the main features and differences, it becomes clear that both men and women have advantages and disadvantages. Therefore, everyone can be a good, skilled specialist regardless of gender.

**References:**

1. Дешковец Н. (2018) Почему среди руководителей так мало женщин [Online]. Available at: <https://probusiness.io/management/5265-pochemu-sredi-rukovoditeley-tak-malo-zhenshchin.html> Accessed on: February 27, 2021.
2. Макарова С. (2018) Гендерные особенности поведения мужчин- и женщин-менеджеров в организационных конфликтах [Online]. Available at: [https://www.muiv.ru/vestnik/pdf/eu/eu\\_2018\\_3\\_26\\_86\\_90.pdf](https://www.muiv.ru/vestnik/pdf/eu/eu_2018_3_26_86_90.pdf) Accessed on: February 27, 2021.
3. Показники Єдиного державного реєстру підприємств та організацій України [Online]. Available at: [http://www.ukrstat.gov.ua/operativ/operativ2020/edrpoy/Gender/Gender0121\\_u.htm](http://www.ukrstat.gov.ua/operativ/operativ2020/edrpoy/Gender/Gender0121_u.htm) Accessed on: February 27, 2021.

### **Feminism in the labor market: why we need a feminist economics**

It would be foolish to deny that feminism has achieved a lot in various social, political and economic spheres of activity in more than a hundred years of its existence. Women have the right to pursue higher education, although two hundred years ago a few universities could provide them with such an opportunity. Women also have gained the right to vote in politics, when not so long ago a woman was not considered as a full-fledged unit of society.

Now, it would seem, in the age of tolerance and equality, feminism should be deprived of common sense as a past stage of social evolution, nevertheless, according to the results of a survey by the social group "Rating" 83% of Ukrainians believe that the main task of the supposedly weaker sex is caring for home and children [1]. The world statistics on this matter is also quite sad, because every third girl is subjected to sexual and / or physical violence [2], and in 32 countries it is completely forbidden to obtain a passport without the participation of a man [3]. And on top of that, there is a significant gender pay gap, which generally devalues the role of a half of the world's population in the economic sphere. As a result, we are in the situation where women generate only 37% of the world GDP, although in case of gender equality, this percentage could potentially be much higher.

Probably, it was the insignificant position of women in the labor market that gave a birth to such a trend of economic thought as feminist economics, which advocates a revision of the modern methodology of economic calculations. According to an economist Marilyn Waring, they are aimed at keeping women «in their place», as they do not perceive housework as such. The essence of the resentment of women economists to the theory is that it was originally designed for men and stems from the patriarchal foundations of the time when the so-called patriarchal slavery was conceived. However, even Plato in his dialogues emphasized that human abilities for a particular type of activity are not based on gender and should be taken into account in the distribution of the roles in the state.

Feminist economists want to broaden the reach of the economic theory to make it work beyond the classical and neoclassical ideal of the white male capitalist, that is not to promote uniformity without considering factors such as gender, race, ethnicity and class. Theoretical economists deliberately ignore women in the labor market, as they believe that their opportunities are limited by everyday life. That is, outside the walls of the house, they do not represent economic value. However, even household chores are often devalued. For example, Catherine Marsal at the very beginning of her book " Who Cooked Adam Smith's Dinner?: A Story of Women and Economics" emphasized an interesting fact that Adam Smith neglected the role of his mother in cooking him dinner by claiming that his dinner was the result of the goodwill of a

butcher, brewer or baker [4]. And despite such a clear neglect, the life shows that women successfully combine household duties and work, which, according to world statistics, is on average 16-22% lower paid than men's [5]. Not to mention the fact that the theory of economics itself is largely indebted not only to men. There were also many talented women contributors, such as Harriet Martineau, who adapted the works of Adam Smith for the next generation of readers, or Joan Robinson, whose ideas in the labor economy were not of the last importance.

A logical question arises whether feminist economics is limited to the theory alone. And the answer to this question lies in the modern concepts of the use of female labor. Thomson Reuters conducted a global study, which found that companies with gender uniformity performed worse in the stock market, while many entrepreneurs say that diversity, on the contrary, can increase profits [6].

At the same time, the global research confirms the fact that reducing the gender gap in the world of work can increase productivity in the world economy. So MGI (McKinsey Global Institute) proposes to consider the scenario of "full potential", according to which, with the equal participation of men and women in the labor market, global GDP could increase by \$12 trillion by 2025 [7]. But experts from The Global Gender Gap Report argue that with the current pace of introducing equality into modern society, it will take about 217 years to bridge the gender gap.

Taking into account the development of the feminist economics, we may be able to shorten this period by several times. However, it is quite obvious that it is precisely the use of a more holistic approach offered to us by the feminist movement that can accelerate the dynamics of the development of society on the basis of social responsibility, and not on stereotypes and discrimination.

As for Ukraine, although the feminist economics is not discussed as actively as one would like, the gender issue at the social and political level is quite clear. Olga Stefanishina, the Deputy Prime Minister of Ukraine, argues that gender equality is seen as a strategic goal for the development of the Ukrainian society. Unfortunately, the State Statistics Service of Ukraine reports that in 2020, the average monthly salary of women in Ukraine was 21.3% lower than that of men. However, in 2019 this gap reached 24.3%, which may indicate at least some progress [8]. According to the same poll of the social group "Rating", since 2015 the number of people who believe that women should be mainly engaged in household chores has been gradually decreasing [1].

At the same time, the Center for Scientific Strategies claims that the state needs to solve the problem of women employment, what, in turn, can help to achieve the promised 40% of economic growth. According to them, if 4 million able to work women were attracted, Ukraine's income could increase from 7 to 23 billion dollars [9]. Perhaps in the coming years, the feminist economy will reach us as a way to realise it.

But the question of using the methodology of feminist economics remains open even in more developed countries. The International Association for Feminist Economics has existed since 1990, but anti-feminist movements are not backing down either. Therefore, it is difficult to say how quickly the world will be ready for

such changes and how difficult it will be for men to abandon their clearly privileged position in the labor market.

**References:**

1. Роль женщин в украинском обществе. *Рейтинг*: веб-сайт. URL: [http://ratinggroup.ua/ru/research/ukraine/rol\\_zhenschin\\_v\\_ukrainskom\\_obschestve.html](http://ratinggroup.ua/ru/research/ukraine/rol_zhenschin_v_ukrainskom_obschestve.html)
2. Насилие в отношении женщин. *Who.int*: веб-сайт. URL: <https://www.who.int/ru/news-room/fact-sheets/detail/violence-against-women>
3. В 18 странах женщина – собственность мужчины. *Независимая*: веб-сайт. URL: [https://www.ng.ru/world/2015-09-11/8\\_women.html](https://www.ng.ru/world/2015-09-11/8_women.html)
4. «Кто готовил Адаму Смиту?» Почему экономическая теория забыла женщин? *Секрет фирмы*: веб-сайт. URL: <https://secretmag.ru/trends/tendencies/kto-gotovil-adamu-smitu-pochemu-ekonomicheskaya-teoriya-zabyla-o-zhenshinakh.htm>
5. За 20 лет средняя зарплата в богатых странах выросла всего на 9 процентов. *Новости ООН*: веб-сайт. URL: <https://news.un.org/ru/story/2018/11/1343531>
6. Исследование Thomson Reuters. *Thomson Reuters*: веб-сайт. URL: <https://www.thomsonreuters.ru/ru/about-us/press-releases/issledovanie-thomson-reuters-kazhdaya-pyataya-delovaya-zhenshchina-v-rossii-ispytyvaet-k-sebe-predvzyatoe-otnoshenie-na-rabote.html>
7. [How advancing women's equality can add \\$12 trillion to global growth.](https://www.mckinsey.com/featured-insights/employment-and-growth/how-advancing-womens-equality-can-add-12-trillion-to-global-growth#) *McKinsey and Company*: web site. URL: <https://www.mckinsey.com/featured-insights/employment-and-growth/how-advancing-womens-equality-can-add-12-trillion-to-global-growth#>
8. Зарплата жінок в Україні на 21% менша, ніж зарплата чоловіків. *Хмарочос*: веб-сайт. URL: <https://hmarochos.kiev.ua/2020/06/04/zarplata-zhinok-v-ukrayini-na-21-mensha-nizh-zarplata-cholovikiv/>
9. Як збільшити зайнятість жінок і чому це важливо для економіки? *Центр економічної стратегії*: веб-сайт. URL: <https://ces.org.ua/gender-paper/>
10. 13 женщин, которые изменили мир экономики. *Womo*: веб-сайт. URL: <https://womo.ua/13-zhenshin-kotoryie-izmenili-mir-ekonomiki/>
11. Феминизм и экономика. *Steppe*: веб-сайт. URL: <https://the-steppe.com/gorod/feminizm-i-ekonomika>
12. Досягнення гендерної рівності в Україні. *Укрінформ*: веб-сайт. URL: <https://www.ukrinform.ua/rubric-politics/3064160-dosagnenna-gendernoi-rivnosti-v-ukraini-mae-buti-metou-vsih-derzprogram-stefanisina.html>

## Effectiveness of advertising in Ukraine

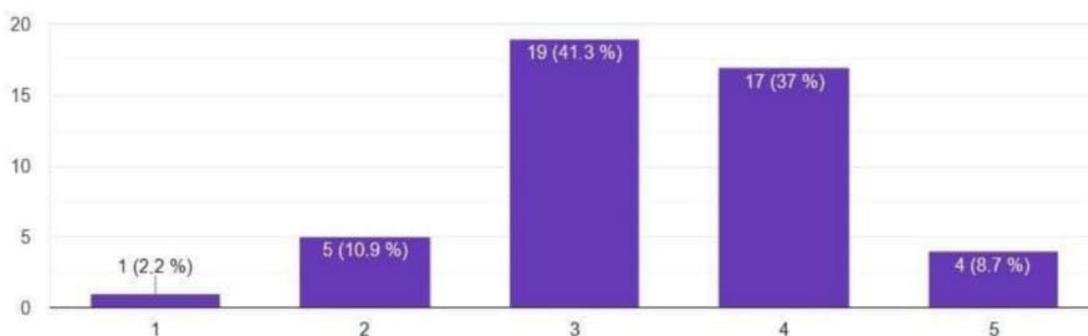
Advertising plays an important role in society nowadays. It is an effective way to promote goods and services and disseminate information about them. The main media channels are the Internet, radio, television, etc. Product placement is a hidden advertisement in movies, TV series or TV programmes. With the development of the film industry, product placement has become widely popular.

Advertising can work in different directions. It can sell goods, inform, assess the attitude of others, and analyze the market situation. Ukrainian marketers and PR specialists have made an important contribution to the world of advertising.

Nowadays, the most developed method of advertising is through the Internet. It analyzes the search data and offers those options for products that are relevant to us at one time or another. Advertising on television loses its relevance for the reason that fewer and fewer people watch it. You can never say exactly what audience is watching this or that advertisement. It is clear that advertising, for example, of diapers, will be very useful for adults with small children, but irrelevant for teenagers.

Similar situations occur with radio and street advertising. Usually, the focus is on something else that applies to street and radio advertising campaigns. Many people do not have time to stop and take part in advertising surveys; flyers are usually simply thrown away, so the efficiency, respectively, will be low.

### 1. Is advertising effective in Ukraine at the time of 2021?



- 1 – not effective at all
- 2 – slightly effective
- 3 – rather effective
- 4 – effective
- 5 – very effective

Fig. 1 The level of advertising effectiveness in Ukraine (the results of the survey)

The effectiveness of advertising should be determined not only in terms of questionnaires and opinions of others, but also with the help of economic calculations. A survey was conducted to determine the communication effectiveness of advertising.

At first, it was necessary to assess the overall effectiveness of advertising in Ukraine. From the statistics obtained, it can be determined that most respondents rate it as "rather effective" or "effective" (Fig. 1).

The respondents are more likely to encounter advertising on the Internet (95.7%), a smaller percentage find it on television (43.5%) and on the streets (54.3%), and almost no one is exposed to telephone (8.7%) and radio advertising (10.9%) (Fig. 2). All this allows us to get the first conclusion: the Internet plays the most effective role in the field of advertising.

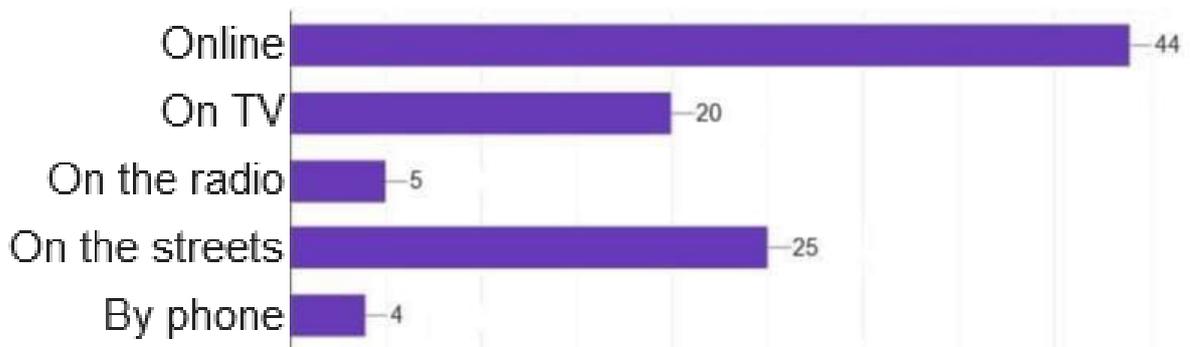


Fig. 2 Effectiveness of advertising campaigns

In addition, the majority of respondents consider that the method of collecting information on the Internet is the most effective and convenient (almost 78%) (Fig. 3)

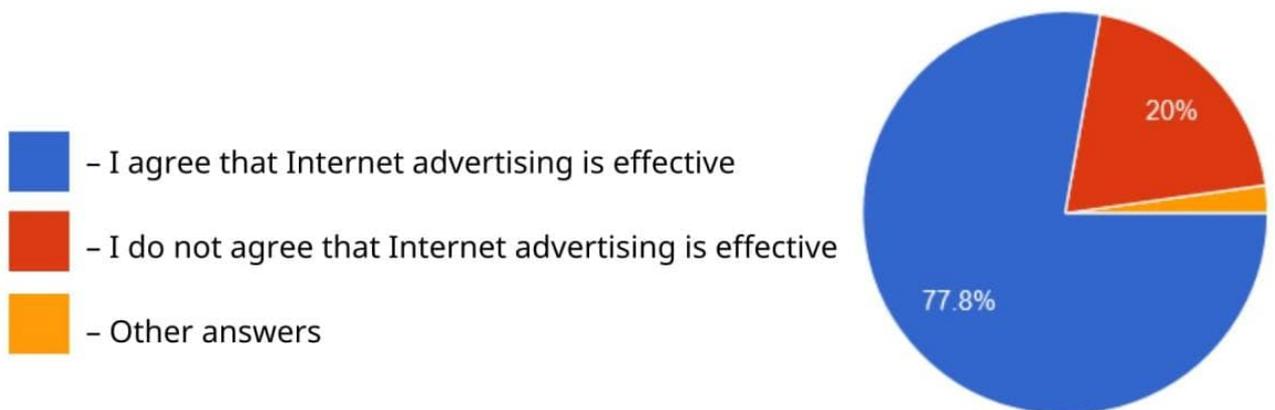


Fig. 3 Effectiveness of online advertising

The effectiveness of advertising was analyzed through the answers to the question "If you conducted an advertising campaign, which of the following methods would you use?" (Fig. 4) The vast majority would use the Internet, the least number of respondents would use radio or mobile phone.

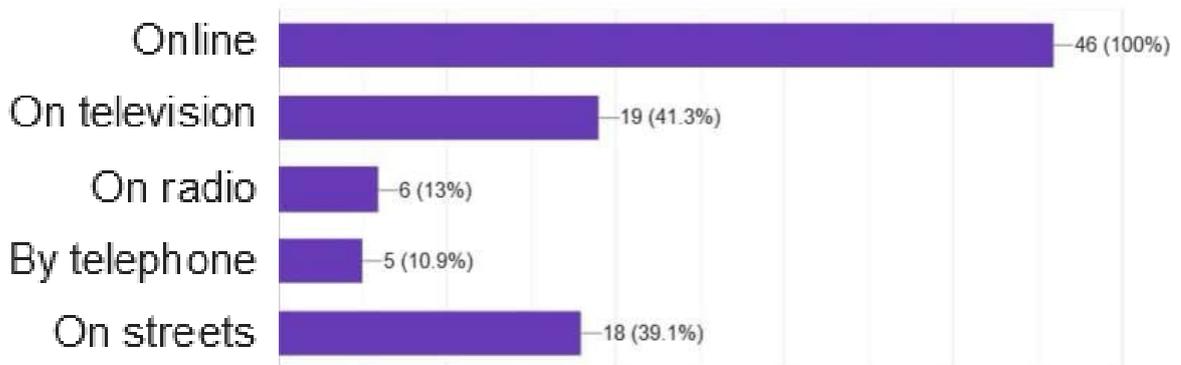


Fig. 4 Advertising campaign methods respondents want to use

The results of the survey conducted show that advertising in Ukraine operates according to the global trend. The dissemination of information and communication with consumers have become more convenient and accessible.

**References:**

1. Baran, R. & Romanchukevych, M. (2019) Evaluation of the efficiency of advertising on the Internet. [Online]. Available at: [http://www.economy.nayka.com.ua/pdf/7\\_2019/38.pdf](http://www.economy.nayka.com.ua/pdf/7_2019/38.pdf). Accessed on: July 26, 2019
2. Аналіз ефективності реклами в Україні (Опитування, проведене автором). [Online]. Available at: <https://forms.gle/mQkAmxWLd5hhwMfv5>

## **What Ukrainian businesses boosted during the COVID-19 pandemic**

On March 3, 2020, the first confirmed occasion of COVID-19 infection was registered in Ukraine . On March 12, the Cabinet of Ministers of Ukraine imposed a state of emergency throughout Ukraine, closing all secondary and higher education institutions, shopping and entertainment centers, catering establishments, gyms, kindergartens, and even restricting the use of public transport. Millions of people in Ukraine and around the world have lost their jobs and have been forced to stay at home. However, there were types of businesses that continued to operate and even increased their income due to restrictions.

First of all, due to the measures taken, purchases in online stores and delivery of these goods increased a lot. For example, Nova Poshta is one of the most comfortable and actual express deliveries throughout Ukraine. At the end of 2019, it had about 6,000 departments, and in 2020 number increased to 7,145. The company has expanded its network during the pandemic period, opening 1,300 new departments, most of which are located in the villages. It means that every 7th village has already a Nova Poshta department and their residents have the opportunity to sell their products and farm goods to consumers, as well as to buy food, goods, medicines and medical supplies online, receiving them at home. For 6 months of 2020, Nova Poshta delivered more than 128 million parcels and cargoes, which is 32% more than at the same period last year [1].

Ukrposhta is also in demand. In 2020, it increased its income by 16% compared to the previous year. So, the net profit for this period amounted to UAH 60.9 million [2].

Due to movement restrictions, home delivery services have become utterly actual. It has become convenient for people to buy food and other goods from supermarkets without violating quarantine. Different types of delivery services were also beneficial for cafes and restaurants, since it was the only way for them to operate in the period of pandemic restrictions. Rocket, Glovo and Bolt have become the most famous companies in this field in Ukraine. At the beginning of the quarantine, they expanded their range for food delivery from supermarkets, fast food and restaurants.

For example, Rocket began working with KFC in March 2020, and then with Auchan, Puzata Khata and McDonalds, and now it operates in 25 cities in Ukraine. Since the beginning of the quarantine, Rocket has entered the top 10 most popular applications in the App Store, and it has even overtaken Glovo since that time. In total, the Rocket application has already been downloaded by several million Ukrainians, and the number of people who want to become couriers is constantly growing. Nowadays about 2,000 couriers work on the platform. Because of the

quarantine, the amount of orders has increased 2-3 times for all delivery operators in Ukraine, not only for Rocket [4].

Although quarantine did have a negative impact on most areas of activity, online business has almost no problems with it. Today, most stores have their own websites and pages in social networks. According to the results of Shop-Express work for 2.5 months, 1271 online stores were created on the platform, and the company's employees received and processed more than 8000 requests by phone, e-mail and via chat support. For this reason, the demand for online managers, graphic designers, copywriters, SMM-specialists, site promotion specialist, iOS-developers has increased [3].

Almost 77% of Internet users around the world between the age of 16 and 64 shop online every month. There was a significant increase in revenue from online commerce in many categories of business in 2020. Table 1 shows the percentage of changes in online purchases.

Table 1

Online shopping in various areas of business in the world

Travel	– 50%
Furniture and appliances	+ 20%
Fashion and beauty	+ 27%
Games and hobbies	+ 25%
Electronics	+ 18%
Digital music	+ 26%
Food	+ 41%
Video games	+ 23%

Today, social networks are a rather profitable niche. Even before quarantine, networks such as Instagram, YouTube and Tik-Tok developed very rapidly, and the number of users increased by 13% over the last year, due to an increase in people's free time. There are 4.20 billion social network users in the world now. Over the past 12 months, this number has increased by 490 million.

In 2021, 53.6% of the world's population uses social networks. According to the latest GWI research, the average Internet user spends 3 hours 39 minutes every day online with his mobile. Because of this, blogging has become a fairly lucrative business. As a whole, if a blogger has a large audience, advertising on his page will be expensive and successful, that is why more and more online projects are being created, such as fitness, gymnastics, foreign language learning, psychology, various webinars and so on. Almost everyone orders advertising from well-known bloggers, because they can choose a page with an audience that will like their product and will be potential customers.

Of course, the pandemic and lockdown have greatly affected the world economy. But, as you can see, online jobs and the delivery of a variety of goods have been given extra opportunities to increase profits.

**References:**

9. Нова пошта. Архів новин: веб-сайт. [Електронний ресурс]. Режим доступу: <https://novaposhta.ua/ru/news/rubric/2/id/7848>. Дата звернення: 13.03.2021.
10. Укрпошта. Новини: веб-сайт. [Електронний ресурс]. Режим доступу: <https://www.ukrposhta.ua/ru/news>. Дата звернення: 13.03.2021.
11. Інформаційне агентство Інтерфакс-Україна. Прес-релізи: веб-сайт. [Електронний ресурс]. Режим доступу: <https://interfax.com.ua/news/press-release/673918.html>. Дата звернення: 13.03.2021.
12. Как Raketa обошла Uber Eats и закрепила на рынке - рассказываем историю компании. [Электронный ресурс]. Режим доступа: <https://ain.ua/2020/08/20/istorija-raketa-2020>. Дата обращения: 13.03.2021.

## **Structure of digital marketing**

Marketing is often referred to as a process of identifying market needs, creating, promoting a product or service(s), and then interacting with customers. That is why marketing plays a huge role in business. Nowadays, Marketing Department is one of the obligatory constituents of any business organization, which can sometimes be encompassed in Research and Development Department (R&D) of a Company or Corporation. In the era of digitalization marketing has been digitalized too. The structure and models of digital marketing are in the focus of this paper.

Usually Marketing Departments are responsible for:

- analytics. i.e. market research and potential market analysis;
- product creation, i.e. design of a product and its packing;
- promotion
- the process of interacting with buyers at the sale phase;
- after-sales interaction, i.e., product maintenance, evaluation etc.

Today, more and more companies are trying to develop their businesses in the Internet that was fostered by COVID-19 pandemic which started in March 2020, and has brought to digital marketing becoming in great demand worldwide.

Now the most popular digital marketing building model in business is RACE: Reach, Act, Convert, Engage. This model is described below from the perspective of a marketer or a businessman.

1) The first stage is Reach. It is the stage of acquaintance with your brand and product by potential customers. At this stage, you need to get to know and interest the customer in your product.

2) Next stage is connected with active actions aimed at studying the product of your business, it is a stage of decision-making with the overall aim to engage internet users with the brand on its website or other page of a product.

3) Third stage is Convert. It is a stage of making a purchase and interacting with your business by customers. The aim of this stage is to achieve conversion from fans, leads or sales on the web and offline.

4) The last is a stage of engaging and building strong relationships with your consumers. The main aim of this stage is to build customer and fan relationships through time to achieve retention goals.

The described model is cyclic, where most businesses build CUSTOMER JOURNEY MAP - the customer's journey from the stage of the first contact with the company to the moment of realizing their need and to repeated interaction.

For example, detailing - a service for visual or technical improvements to the car. Here, marketers build the sales process in such a way that, first, using different

methods, they attract customers to the landing page (one-page site), which arouses interest in the service.

Then, the client is sent to the company's Instagram page, where he sees the results of previous work and the company's experience and in directly asks everything that interests them.

Next, he signs up for a consultation and calculation of the cost of the service, after which in case everything suits them, they pay for the service and, if desired, for additional services.

The most important for marketers is the need to make sure that he becomes an eternal client. To do this, they will be reported on the same page in Instagram, which will remind them of the company and its existence periodically and urge them to use the services provided again and again. Also, email marketing and chat bots in Telegrams are often used for this purpose.

The main traffic sources is a target advertising in Instagram, Facebook and TikTok and contextual advertising in Google. There are also several types of customer acquisition: SEO, SMM and E-mail – marketing.

As a result, it must be said that more and more marketing is moving into digital environment, and these marketing operating schemes are in great demand since they are considered the most effective in working and interacting with clients. In future, the majority of if not all marketing operations will find their place in the Internet.

**References:**

1. Маршрут построен! Применение карт путешествия потребителя для повышения продаж и лояльности/ Илья Балахнин – «Альпина Паблицер». 2019 – 9 с
2. Маркетингова модель RACE. [online]. Available at: <https://bigid.com.ua/uk/race-planuvannya-v-marketingu/>. Accessed 15 March 2021.
3. *How to Create an Effective Customer Journey Map* [Examples + Template]/ Aaron Agius, 2021 [online]. Available at: <https://blog.hubspot.com/service/customer-journey-map>. Accessed 12 March 2021.

## **Implementation of investment projects at agricultural enterprises in Ukraine**

Ukraine is an agrarian industrial country. Agriculture is one of the leading industries of the economy. Investment activities not only play an important role for an individual enterprise, but also increase the country's economic potential by enhancing the volume of high-tech products.

The agricultural sector of the country's economy is complex, time-consuming and risky. Soil-climatic and economic conditions have a significant influence on agricultural production. To ensure the profitability of agro-industrial enterprises and the stability of production, technological, technical, organizational and economic measures, and economic mechanisms for regulating the growth of enterprises in this industry must be developed and implemented. In the process of reforming the agricultural sector of the economy market-type agricultural firms have been created:

- agricultural production cooperatives;
- business associations;
- private enterprises;
- farms;
- other forms of management that operate on the basis of private ownership of land and property.

Land is a factor of production. It does not participate in the formation of the cost. However, different levels of natural land yields and their location affect the rental income of these lands [5].

The natural process of production determines the peculiarities of the turnover of agricultural producers: the gradual growth of costs, a little slower turnover of funds, the release of monetary resources at the time of the sale of products.

During the year, there is a seasonal break between the terms of expenditure and income. Therefore, producers should have a sufficient amount of money in circulation in addition to the company's own funds. Attracting external funds in the form of loans is necessary to create some reserve funds for situations, such as crop failures, floods, droughts, various diseases and other adverse conditions.

The production cycles range from several months to a year, so, financial results are determined only on an annual basis. At the same time, there is a distribution of profit, formation of funds, and the planning of the future periods. Evaluation of the results of the enterprise is carried out taking into account economic and production indicators [2].

There are a large number of similar producers of agricultural products on the market, which leads to high competition. It is not considered possible to create a monopoly. The low rate of capital turnover makes agriculture less attractive to investors, which creates the need for the state aid [5].

The need for investment can be identified for various reasons. They can be divided into three main types:

- updating the existing material and technical base;
- increasing the volume of production activity;
- the development of new activities and innovative technologies.

Investment-innovative activity of the enterprise foresees the existence of a thoroughly developed project, which means a set of interrelated measures aimed at meeting a specific need by achieving specific results and efficiency indicators with established resource provision with clearly defined goals for a given period of time [4]. The project provides an intensive use of various resources of the enterprise and effective methods of realization of the purposes set [1]. Not all of the projects can be aimed at maximizing profits. Those that are economically unprofitable have the potential for indirect income (gaining stability in the supply of raw materials, access to new markets or certain achievements in the social or environmental spheres) [3].

Investing in agricultural enterprises is risky, and Ukraine's agriculture is rarely attractive to foreign investors. The development of innovations in the agro-industrial complex and competent support from the state will contribute to the further development of this industry, which will ensure the demand for agricultural products in both domestic and world markets.

**References:**

1. Kabachenko, D.V. (2015) Improving the assessment effectiveness method of innovative industrial Leading Ukrainian Companies activity. A Balkema Book. Theoretical and Practical Solutions of Mineral Resources Mining. Taylor & Francis Group, London. pp. 353–362.
2. Knyazevych, A.O. (2015) Innovation market as a part of the country's innovation infrastructure. *Marketing and innovation management*, № 3. pp. 129–139. [Online]. Available at: [https://mmi.fem.sumdu.edu.ua/sites/default/files/mmi2015\\_3\\_129\\_139.pdf](https://mmi.fem.sumdu.edu.ua/sites/default/files/mmi2015_3_129_139.pdf). Accessed on: February 21, 2021.
3. Krykunencko, D.O. (2011) Problems of introduction of innovations at the enterprise. *Marketing and innovation management*, № 4(1). pp. 45–49. [Online]. Available at: [https://mmi.fem.sumdu.edu.ua/sites/default/files/mmi2011\\_4\\_1\\_45\\_49.pdf](https://mmi.fem.sumdu.edu.ua/sites/default/files/mmi2011_4_1_45_49.pdf). Accessed on: March 5, 2021.
4. Kuzmin, O.Ye. (2003) Investment and innovation activity: monograph / O.Ye. Kuzmin. S.B. Knyaz, N.V. Tuvakova, A.Ya. Kuznietsova. according to the scientific edition of the professor, doctor of economic sciences O.Ye. Kuzmin. Lviv: Lviv Banking Institute of the National Bank of Ukraine. p. 233.
5. Ilchuk, M.M., Zribnyak, L.Ya. et al. (2008) Organization and planning of agricultural production. Textbook for students of economic specialties of higher agricultural educational institutions of III–IV levels of accreditation. / ed. M.M. Ilchuk, L.Ya. Zribnyak. Kyiv. p. 749.

## Motivation and Incentives as Management Functions

Through motivation, anyone can achieve huge goals. Motivation is success, new ideas, and the ability to show oneself. Motivation in management is used for the enterprise to be productive. Stimulation to work is also needed to improve performance.

Motivation affects employees. Needs induce a person to act, they can be primary and secondary. In Maslow's pyramid all the needs are clearly described in stages [1]. Primary needs are needed to support life, while secondary needs are formed throughout life.

Certain human values are all different, and if we trace human behaviour, we can observe a person's values. People strive for rewards and career growth. There are other rewards that play a role, such as: health insurance, paid vacation, monthly incentives, etc., but they do not allocate a large percentage out of 100%.

In the pie chart (Fig.1) various ways of staff motivation are presented.



Fig.1 Ways to motivate employees

Motivation and incentives have a huge impact on subordinates. The subordinates are interested in monetary reward and internal reward from the work itself, that is, the subordinate should enjoy the work done.[2]

There are also problems that can be faced. If the task is multispecialized, it is more difficult to complete and motivate staff. We can also notice that the higher level of a person in the organization, the less he interested in the amount of wages, but for them, not material incentives, but internal ones, become more significant[1].

Incentive is an act or promise for greater action. It means additional remuneration or benefit to an employee in recognition of achievement or better work. Incentives provide a spur or zeal in the employees for better performance[1]. It is a natural thing that nobody acts without a purpose behind [1].

Therefore, management has to offer the following two categories of incentives to motivate employees[1,8]:

1. Monetary incentives- Those incentives which satisfy the subordinates by providing them rewards in terms of rupees[1]. Money has been recognized as a chief source of satisfying the needs of people[8]. Money is also helpful to satisfy the social needs by possessing various material items[8].
2. Non-monetary incentives- Besides the monetary incentives, there are certain non-financial incentives which can satisfy the ego and self- actualization needs of employees[8]. The incentives which cannot be measured in terms of money are under the category of “Non- monetary incentives”[1]. Whenever a manager has to satisfy the psychological needs of the subordinates, he makes use of non-financial incentives . This will include job satisfaction, job security, job promotion, and pride for accomplishment

Management is a creative process and a person gets inner satisfaction from work. Problems in being properly motivated are also encountered. And here you need to look for the right approach. People also have different temperaments and everyone will perceive the spoken phrase in their own way.

Managers motivate people to action to achieve the goal [2, 3, 4]. “No matter what part of business you are in, you have to get things done through people,” Crant says [5].

Incentive is an act or promise for greater action. It means additional remuneration or benefit to an employee in recognition of achievement or better work. Incentives provide a spur or zeal in the employees for better performance. It is a natural thing that nobody acts without a purpose behind [1]. Besides monetary incentive, there are some other incentives which can drive a person to do work better. This will include job satisfaction, job security, job promotion, and pride for accomplishment. Therefore, incentives really can sometimes work to accomplish the goals of a concern.[1, 2] The need of incentives can be many:

1. To increase productivity,
2. To drive or arouse a stimulus work,
3. To enhance commitment in work performance,
4. To psychologically satisfy a person which leads to job satisfaction,
5. To shape the behavior or outlook of subordinate towards work,

6. To inculcate zeal and enthusiasm towards work,
7. To get the maximum of their capabilities so that they are exploited and utilized maximally.

Allocate positive and negative incentives and each works in its own way and in different situations.

Positive incentives are those incentives which provide a positive assurance for fulfilling the needs and wants. Positive incentives generally have an optimistic attitude behind and they are generally given to satisfy the psychological requirements of employees. For example-promotion, praise, recognition, perks and allowances, etc. It is positive by nature.[4]

Negative incentives are those whose purpose is to correct the mistakes or defaults of employees. The purpose is to rectify mistakes in order to get effective results. Negative incentive is generally resorted to when positive incentive does not work and a psychological set back has to be given to employees. It is negative by nature. For example- demotion, transfer, fines, penalties.[4]

A model of motivation that integrates many ideas about motivation, including those in this chapter, has been developed by Carole Ames (1990, 1992).[6] The acronym or abbreviated name for the program is TARGET, which stands for six elements of effective motivation:

- **T**ask
- **A**uthority
- **R**ecognition
- **G**rouping
- **E**valuating
- **T**ime

The bottom line about motivation: sustaining focus on learning

Every member of an organization—employee, manager or C-suite executive—wants to work for a company that is successful, productive, motivational and offers an enjoyable work environment[7]. By keeping employees happy, managers motivate them to stay longer and work harder to reach company goals[6,7]. Motivation plays a huge role in the organization, so you need to be able to do it right. Don't forget about the most important thing about the subordinates, because they are make the enterprise functional.

#### **References:**

1. А.В. Бардась, М.В. Бойченко, А.В. Дудник Менеджмент навчальний посібник, Дніпропетровськ Національний гірничий університет. 2014. С 194-252.
2. А. М. КОЛОТ МОТИВАЦІЯ, СТИМУЛЮВАННЯ Й ОЦІНКА ПЕРСОНАЛУ, Київ 1998
3. Knowledgehut . 2020. . Available:  
[/https://translate.google.com/translate?hl=ru&sl=en&u=https://www.knowledgehut.com/tutorials/project-management/motivation-theories&prev=search&pto=aue](https://translate.google.com/translate?hl=ru&sl=en&u=https://www.knowledgehut.com/tutorials/project-management/motivation-theories&prev=search&pto=aue)  
Accessed on: March 21, 2021

4. Wikipedia.2020. Available:  
<https://translate.google.com/translate?hl=ru&sl=en&u=https://en.wikipedia.org/wiki/Motivation&prev=search&pto=aue>  
Accessed on: March 21, 2021
5. Notredame online. Available:  
<https://www.notredameonline.com/resources/leadership-and-management/motivating-employees-key-to-effective-management/>  
Accessed on: March 27, 2021
6. Training industry. 2019. Available:  
<https://trainingindustry.com/articles/content-development/t-a-r-g-e-t-your-motivation-strategy-to-increase-learner-engagement/>  
Accessed on: March 27, 2021
7. Indeed.2020. Available:  
<https://translate.google.com/translate?hl=ru&sl=en&u=https://www.indeed.com/career-advice/career-development/motivation-in-31management&prev=search&pto=aue> Accessed on: March 31, 2021
8. Chron. 2019. Available:  
<https://translate.google.com/translate?hl=ru&sl=en&u=https://smallbusiness.chron.com/differences-between-monetary-nonmonetary-incentives-26139.html&prev=search&pto=aue>  
March 31, 2021

## **Visual merchandising**

To date, retail trade is one of the most significant strategic areas of the economy for the sales of goods. Visual merchandising is the main method of working with visitors of offline stores, through the use of tools and technologies for the effective display of goods. This science combines three components – marketing, psychology, and advertising. Specialists of this sphere work to ensure that the product does not just lie on the shelf, but is also perceived visually and pushes a customer to buy it. This method is the most effective in sales issues, because a person gets more than 80% of information with the help of vision [5].

What are the goals of visual merchandising? Sales, or rather an increase in their volume are the general task. The basis is making the most profit by pushing customers to spontaneous and additional purchases. One of the tools for improving sales efficiency is the correctly chosen method of display of goods, that is the design of windows with all the rules of viewing perception.

There are an endless number of these rules. Six well-known rules are the basis of visual merchandising.

The first law is "Figure on the background". Our view fixes the image according to the principle of the "background and object". Therefore, if you need to highlight a specific product, you should turn it into an object and make surrounding products the background. You can achieve the desired effect with quantity, bright colour, and unusual packaging. The time of the year should be taken into consideration because in summer people choose cold shades, and in winter the warm ones.

The second law is related to the way the goods are located on the shelves. Studies have confirmed that the product is perceived at eye level the best way [3]. Hence, the following rule follows – the avoidance of the dead (blind) zones when the goods are too high or low.

To switch the attention of the visitor and not to overload his/her visual perception, the shops use the fourth rule of merchandising - the creation of visual accents using POS-materials: separators, tires with the name of the brand and everything else that can "dilute" the boring geometry.

The grouping is the fifth rule that helps a buyer to orient with a variety of products. The grouping criteria can be different: type of product, price, weight, packaging size, or trademark. Perfect solution is grouping in several signs.

In a modern store, there are a lot of factors that scatter our attention. That is why merchandisers often use the rule 2/3 in their practice because the "sobering" of attention occurs in 2/3 of the shop window, and that is the centre of the window.

We have conducted a marketing research with a limited sample. The purpose of the study was to identify the buyers` perception to a different display of goods. Seventy people took part in the survey. The results of the research are given below.

The first law is "Figure on the background". In the course of the study, it was discovered that the showcase made by this rule attracted most of the people - 64.3% (Fig.1).

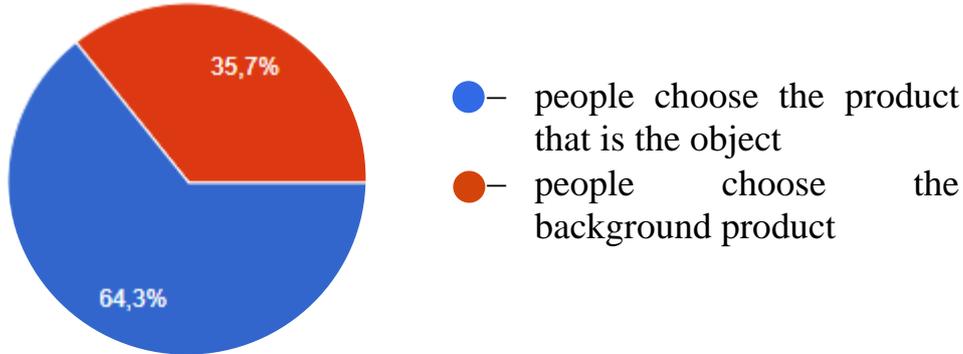


Fig.1 "Figure on the background" rule (customers` perception)

The second law is "Eye level". To check this rule via the gadget screen was difficult. The results have shown that 57.1% paid attention to the central shelf, and 30% to the upper one (it is also allowed by the rule) (Fig.2).

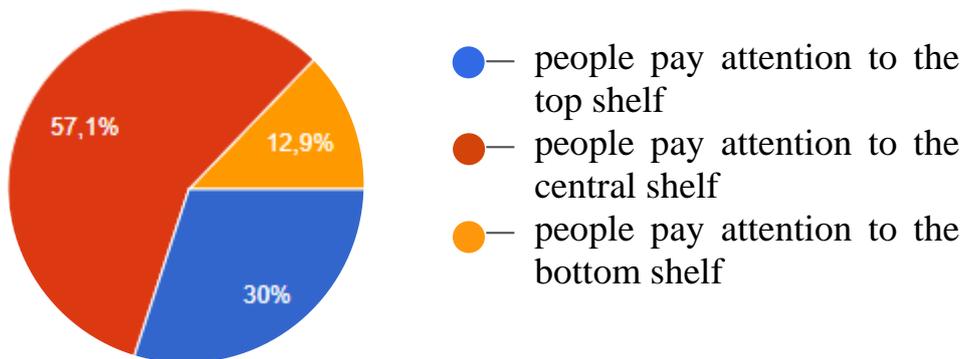


Fig.2 "Eye level" rule (customers` perception)

The third law is "Blind Zones". 90% of people did not pay attention to the products in the blind zone (Fig.3).

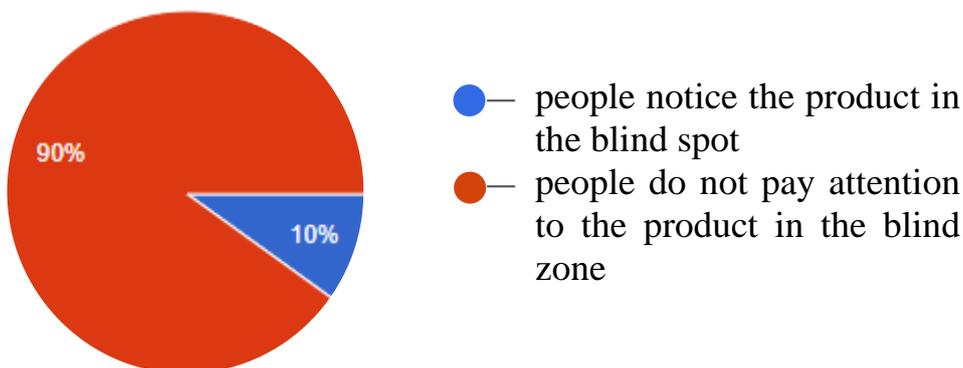


Fig.3 "Blind Zones" rule (customers` perception)

The fourth law is "Visual accents". 85,7% of people found more attractive and visually pleasant showcases with separators (Fig.4).

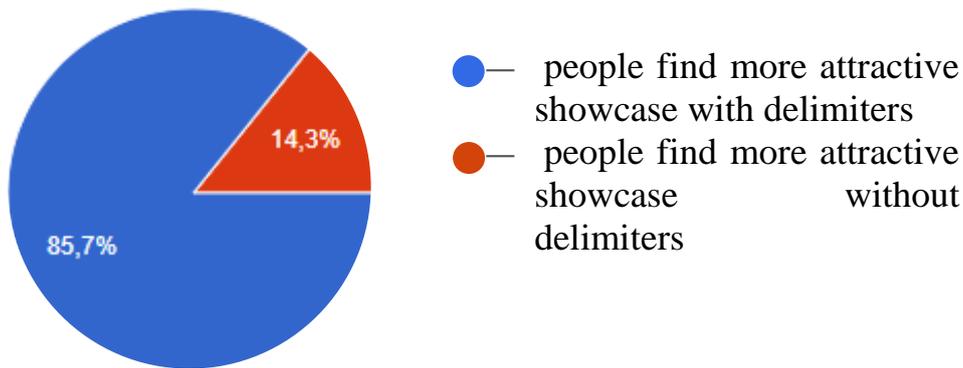


Fig.4 "Visual accents" rule (customers` perception)

The fifth law is "Grouping". 100% of people subconsciously grouped goods on a certain basis (Fig.5).

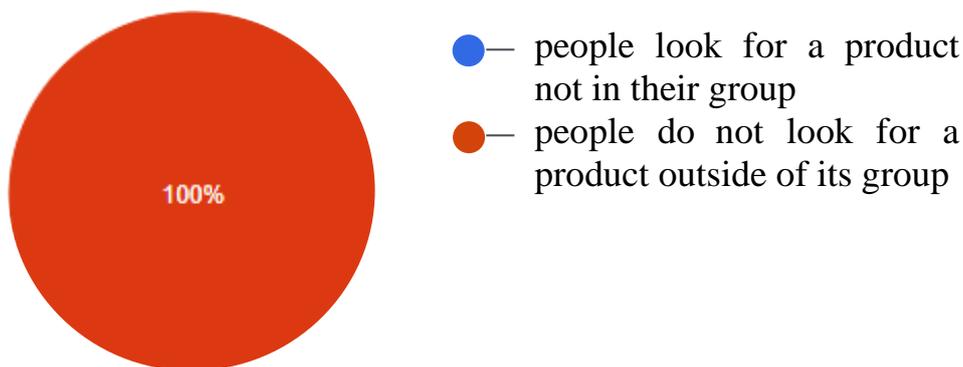


Fig.5 "Grouping" rule (customers` perception)

The sixth law is "2/3". This rule is also difficult to check through the gadget screen, but even so the results have shown that 48.6% of people drew attention to the showcase in the center, and 42.9% at its beginning (Fig.6).

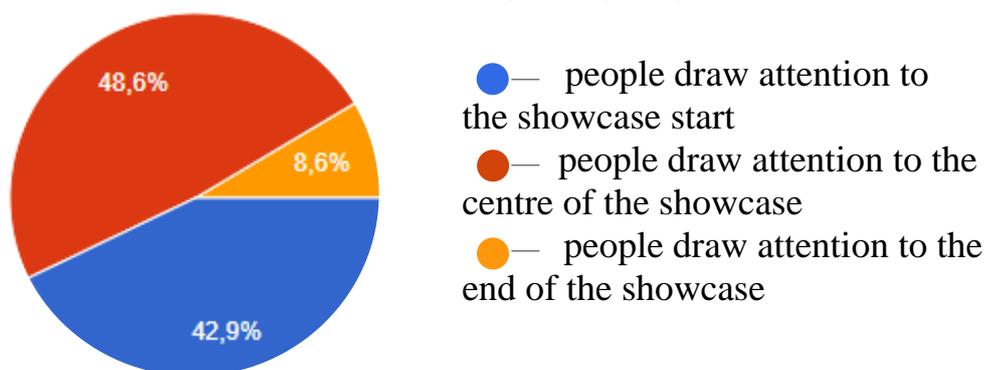


Fig.6 "2/3" rule (customers` perception)

The results obtained confirm that the competent presentation of goods leads to increasing the product ratings. By stimulating sales, sales and turnover of goods increase significantly.

Translation of the word "merchandising" – the art of trading – really transmits the whole essence of this concept. This science does not stand still and is in constant development. The only outcome is a satisfied buyer and the seller.

**References:**

1. Анализ эффективности основных методов мерчандайзинга (Опрос, проведенный автором). Режим доступа: <https://docs.google.com/forms/d/1k3ncLSA6W9-1kFm64oAUfhtYoKEqTbCw4ONDge7wgJk/edit>
2. Аутсорсинговая компания Leader Team. Визуальный мерчандайзинг. Режим доступа: <https://leaderteam.ru/merchandizg/vizualnyj-merchandajzing>. Дата обращения: Март 3, 2021.
3. В. А. Барабанщиков. Айтрекинг в психологической науке и практике, М.: Когито-Центр, 2015.
4. ГК **Lotsman**. (2016). Семь золотых правил мерчандайзинга. Режим доступа: <http://lotsman-pro.ru/novosti/sem-zolotyh-pravil-merchandajzinga.html>. Дата обращения: Февраль 25, 2021.
5. Auyang, S.Y. (1999). What do you see, and how? The cognitive infrastructure of vision. [Online]. Available at: <http://www.creatingtechnology.org/papers/vision.pdf>  
Accessed on: March 5, 2021

### **Ways to deal with the emotional burnout of staff during the quarantine period**

The coronavirus pandemic is driving the need to make changes in the way companies operate. Now many employees are forced to work remotely. Remote work has a number of advantages, but in addition, it carries a number of disadvantages. Together with the general economic, social and epidemiological tensions in the country, this becomes a source of stress for employees. Constant stress can cause burnout.

Burnout can include feelings of energy depletion or exhaustion, increased mental distance from one's job, or negative/cynical feelings related to one's job — including reduced belief that the person is able to perform the job and produce good results [1]. Emotional burnout leads to a decrease in professional efficiency and effectiveness.

Some employees may independently distinguish and identify the problem of emotional burnout. Sometimes friends, family, or a personal counselor can give advice and point out the problem. However, there are also those who will not be able to understand what is happening to them. Accordingly, the problem will only get worse. In the future, this will negatively affect the quality of the fulfillment of the tasks.

In order to prevent a problem, it is important to take care of the employees throughout their professional life. Don't wait until burnout occurs. After all, it is much more difficult to get out of such a state than to prevent it.

The first thing to do is to develop not only professional skills, but also to teach the staff to be mentally healthy. Most likely, company leaders facilitate the organization with various trainings and meetings with coaches that will help staff to develop as specialists. Top managers must pay serious attention to mental health of their employees. It is also necessary to organize trainings which will help to determine the level of their mental health, invite psychologists for group or individual work with them. The main goal is to teach employees to independently recognize and determine their emotional state. After all, if the problem is identified in time, the likelihood of adverse consequences associated with it is much lower.

The second thing that can help to combat burnout is a reward system. The fact is that in a pandemic, human productivity decreases. This is not an axiom. Nevertheless, many are under constant stress due to the current situation, which prevents them from working at full strength. During this period of time, support is more important to them than ever, it is important for them to feel their own importance. Moreover, the incentive system based solely on the results of their work does not in any way contribute to the realization of their needs. Some rewards should exist simply because people matter, not just because they can do something.

Moreover, having switched to remote mode, they are not idle. They are actively trying to adapt to new conditions, spending a lot of strength and energy on it. The adaptation process by itself does not increase the volume of tasks completed by the employee. However, at the same time, the employee subconsciously still expects rewards for the efforts made. Whether it's a gift card, extra break time, some bonus paid vacation hours, or amazing snacks in the break room. All this will let a personal know that he/she has value whether or not creating monetary value [2].

In addition to all of the above, you need to show empathy in relation to the employees. This will help them feel better, as someone understands them. Showing empathy can also build trust. Thus, the staff will listen more to the recommendations of the manager and will not accept any changes with hostility.

The third method is closely related to the previous one; it also concerns the reward system. The problem is that some employees try to compensate for the decline in their productivity by assigning more tasks to themselves and not taking rest. They are even more worried about this. In this case, it is worth encouraging weekends, the initiative for the team to spend their leisure time together (even online, it is quite possible). This instills in subordinates a culture of self-care [3].

The fourth thing that will help to minimize stress and prevent burnout is the correct setting of tasks. It is better to give instructions and adjust the assignment as early as possible. You should try not to do this shortly before the deadline [2].

It is important to remember that while working remotely, an employee is more involved in solving everyday problems than if he was at the office at that time. Most likely, at this moment his children and other family members are at home, who in one way or another require attention. Accordingly, the employee is actually busy solving more tasks than before. Therefore, any change that disrupts the hard-to-work process of work negatively affects the emotional state of a person.

Another way to prevent burnout is to reduce the workload. A good manager should notice signs of emotional exhaustion of his subordinates. Sometimes, to solve this problem, you need to give them a break instead of rushing and assigning new tasks. Thus, the pressure on them decreases, there are fewer reasons to experience stress.

The fifth method is to develop and provide employees with clear guidelines and resources to help them organize their workflow remotely. Many of them, in theory, can come to this on their own. Nevertheless, this will happen through trial and errors, quarrels with loved ones and nervous breakdowns. This method introduces some specificity and certainty in the process of adaptation of subordinates.

It is important to understand that combating burnout is not only a task for employees who face it, but also for managers. The implementation of the methods proposed in this work does not require large expenditures of time and financial resources from the employer. However, it will give a positive effect on the emotional health and productivity of the staff.

**References:**

1. Burnout: Facing the damage of 'chronic workplace stress' (august 2, 2019). *MedicalNewsToday*. Retrieved from <https://www.medicalnewstoday.com/articles/325943#What-is-burnout>.
2. 7 Tips for Helping Employees That Are Burnt Out (September 11, 2019). *When I Work*. Retrieved from <https://wheniwork.com/blog/tips-for-employee-burnout>.
3. 15 Tips to Deal With Employee Burnout as a Manager or Business Owner. Retrieved from <https://www.moneycrashers.com/tips-deal-employee-burnout-manager-business/>.

## Aging population of Ukraine and its economic consequences

Population aging is one of the most important demographic processes that has led to long-term consequences in many countries around the world. For Ukraine and European countries, this problem is more relevant than for other countries. In Ukraine, the crisis of the 90s and the beginning of the XXI century were marked with a rapid increase in the proportion of people older than working age. This trend began to manifest itself in the middle of the twentieth century.

What is population aging and what does it depend on? Population aging is an increase in the share of older people in the population, as a result of changes in the nature of population reproduction, births and deaths ratio, and migration.

According to the WHO, older people aged 60-74 years and 75-89 years are the growing population of the world. Taking into account the statistical data, it is established that the number of people over 60 in the world is constantly increasing (Fig. 1). According to WHO forecasts, in 2025 their number will increase 6 times compared to 1950. By 2050, the number of elderly people will reach 2 billion and exceed the number of children under 14.

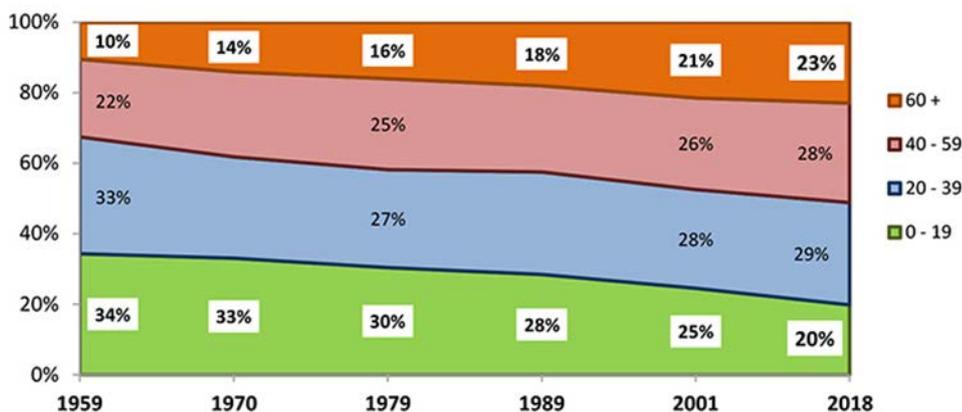


Fig. 1. Age structure of the permanent population of Ukraine in 1959-2018, %

Let us compare the aging processes in Ukraine and in the leading countries of the world. For example, in modern Germany children account for 13% while in Ukraine this number is 18%, but the level of demographic aging is 1.4 times higher than the average in Ukraine [14,15]. It is clear that in Western and Central European countries, demographic aging is primarily due to increasing of life expectancy. While in Ukraine this growth is extremely slow. Negative features of natural reproduction include the mortality of men of working age, as well as a fairly high, as for Europe, infant mortality.

In Ukraine, the share of people over 60 is 23.4%. In 2019, the number of retirees in Ukraine was 9.8 million. Therefore, as the number of labour force decreased, the demographic burden began to increase in 2014 and is still growing. In

2019, the demographic burden was 475 (247 – 65 years old and above, and 228 - up to 14 years old) [13].

By 2050, the population of the world is expected to increase rapidly. The biggest changes should be expected in the developed European countries, the United States, Japan and Australia.

Based on the growing demographic burden, the following economic consequences are inevitable (as the number of able-bodied people has decreased and the number of retirees has increased): the amount of pension expenditures will increase and the amount of tax revenues will decrease. It will lead to a lack of pension funds.

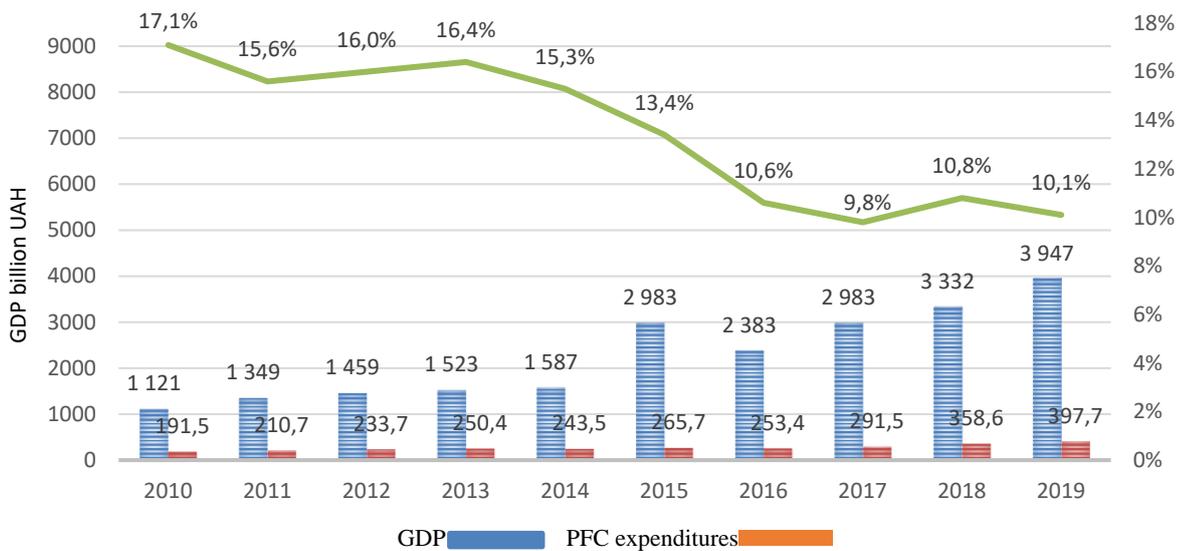


Fig. 2. The share of the Pension fund expenditures in GDP during 2010-2019, UAH billion

Looking at the government pension expenditures in Ukraine and European countries, it is clear that we spend a higher percentage of GDP than some leading European countries [2], but due to the difference in the total amount of GDP, it turns out that elderly people in Ukraine live in poverty, and in other countries - in abundance.



Fig. 3. State pension expenditures in 2018, %

The consequences of population aging in Ukraine include:

- increasing demographic burden;
- reduction of labor productivity, and the share of economically active population;

- reduction of tax revenues;
- delay in economic development.

Therefore, it is necessary to develop some effective strategies that will help the country overcome the aging consequences. Some of them may include:

- decrease of pension expenditures due to the reduction of state payments to "solidarity" pensions and increase of accumulative program resources;
- gradual abandonment of the fixed retirement age, following the example of developed countries. The established retirement age does not take into account individual characteristics of health, ability to work, education of the elderly. A person has the right to determine at what age to terminate professional activity.
- socio-economic policy should be aimed at prolonging the working life of the elderly; it will include the creation of optimal working conditions, flexible work schedules, the provision of part-time employment, etc. Elderly people have a rich stock of acquired professional skills and experience; removing structural barriers can further increase their productive potential.
- state and private programs of training, retraining and advanced training of the elderly require wide implementation.

So, aging of the population is a huge problem of the modern pension system. However, it should be understood that this is a logical consequence of the baby boom after World War II, the growth of welfare and employment of women in production, and so on. Increasing people's life expectancy is a "plus" for the country, but this phenomenon requires careful preparation in terms of the national economy. In the next few years, the solidarity system will not be able to ensure the payment of decent pensions, so it is worth thinking about long-term prospects due to the reduction of the shadow sector, raising the retirement age and the abolition of special pensions.

**References:**

1. Kudrin A. Aging population and the threat of budget crisis / A. Kudrin, E. Gurvich // Questions of economics. - 2012. - № 3. - P. 52–80.
2. Official site of the Pension Fund of Ukraine [Electronic resource]. Available: <http://www.pfu.gov.ua/pfu/control/uk/index>.
3. Official site of the State Statistics Service of Ukraine [Electronic resource]. Available: <http://www.ukrstat.gov.ua>
4. Terets V. Depopulation and population aging in the socio-economic context / V. Terets // Visnyk of Khmelnytsky National University. - 2009. - № 1. - P. 92–97.
5. Global Age Watch Index 2015. Insight report [Electronic resource]. Available: <http://www.reports.helpage.org>
6. Population Reference Bureau. [Electronic resource]. Available: <http://www.prb.org>
7. New course: reforms in Ukraine. 2010-2015. National report / for general ed. VM Heitz [etc.]. - K.: HBIЦ НБУВ, 2010. 232 с.
8. Svenchitsky M. Demographic and financial prerequisites for pension reform in Ukraine: forecast - 2050 / M. Svenchitsky, L. Tkachenko, I. Chapko. - K.: Аналити.-дорад. Blue Center. tapes, 2010. - 72 p.

9. An Avoidable Tragedy: Combating Ukraine's Health Crisis. Lessons from Europe. - K.: VERSO - 04 - 2009. - 64 p.
10. Hnybidenko I. Demographic aspects of national security of the state / I. Hnybidenko // Ukraine: aspects of labor. - 2007. - № 5. - 185p.
11. Demographic prospects of Ukraine until 2026 // Institute of Economics HAH of Ukraine. - Kyiv, 1999. - 55 p.
12. Demographic crisis in Ukraine; for order. VS Steshenko. - Institute of Economics HAH of Ukraine, 2001. - 560 p.
13. Statistical information [Electronic resource]. Available: [http // www.ukrstat.gov.ua / ukr / themes / 19 / theme\\_19.php? Code = 19](http://www.ukrstat.gov.ua/ukr/themes/19/theme_19.php?Code=19).
14. Official site of the Statistical Office of the European Union. [Electronic resource]. Available: <http://epp.eurostat.ec.europa.eu>
15. Official site of the European Fund. [Electronic resource]. Available: <http://www.eurofound.europa.eu/index.htm>

### Agricultural sector of Ukraine: development prospects

In the context of European integration of Ukraine's economy, agriculture and agro-industrial sector in general, which are traditionally considered as the important parts of the national economy, face new challenges in terms of growth, stimulation of the export potential, and risks, which limit the opportunities of Ukrainian agricultural producers.

Agriculture is a part of the agro-industrial complex (AIC). It includes three spheres presented in the chart below (Figure 1.1). The basis of agricultural production is land resources.

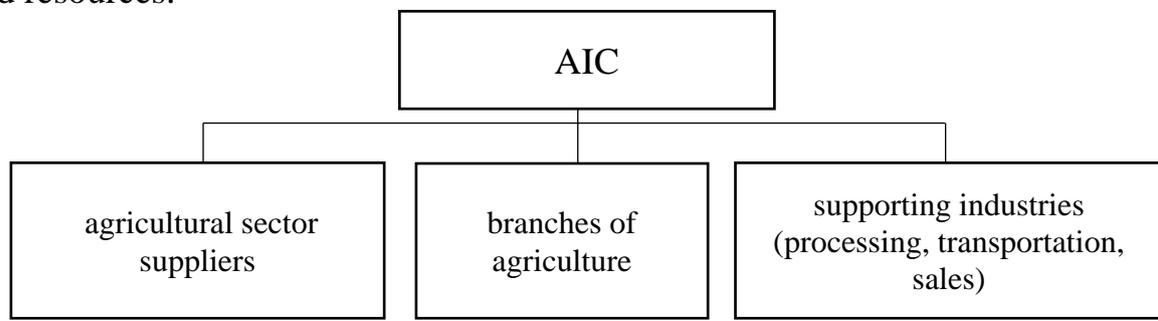


Figure 1.1 - Structural composition of the agro-industrial complex

Agriculture differs from other sectors of the economy in a number of features that determine its functioning, organization, economic and socio-economic relations (Figure 1.2) [1].

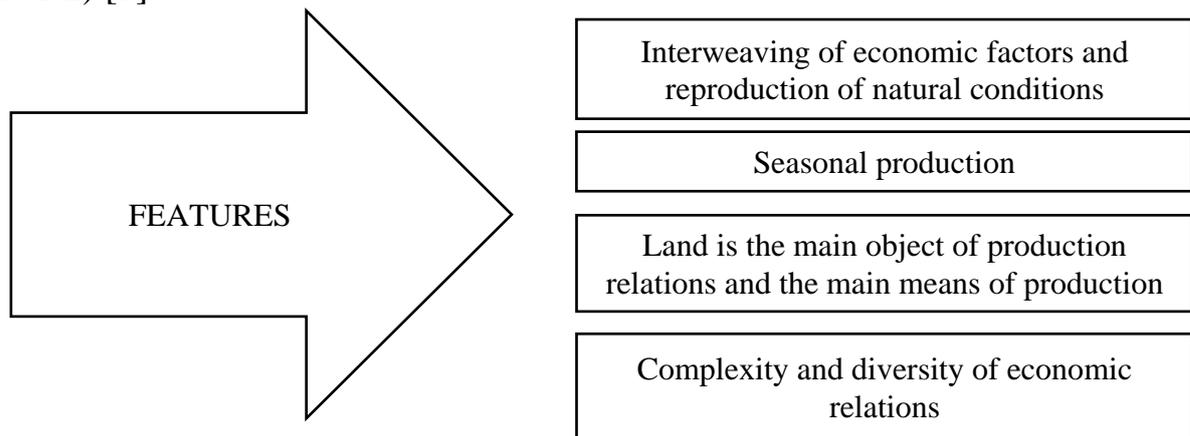


Figure 1.2 - Features of agricultural production

Underestimation of the agricultural sector importance in our country (traditionally, a strategic economic sector is metallurgy), led to the imperfection of its economic model, lagging behind the developed agro-industrial countries, exacerbation of the food problem.

The progressive development of the food industry sectoral structure involves increasing the share of the first and especially the third structural spheres, as it is evidenced by world experience. One of the most effective agro industries is the US food industry. It consists of three areas (the third combines not only processing, storage, marketing, but also infrastructure). In 2019, the share of the first sphere in the value of the final food products of the US agribusiness was 14%, the second had 10% and the third accounted for 76%.

So, agricultural production in Ukraine requires a revision of the strategic direction in favour of the development of new machinery and technology for agriculture and other sectors of the agro-industrial complex. It is necessary to create such systems in which the optimal interaction of four components would be achieved: man - machine - technology – environment [2].

The experience of the food industry state regulation in European countries shows a fundamentally new scheme of interaction between the state and economic entities. This approach involves the direct solution of economic problems through the creation of effective and transparent regulatory tools.

A quarter of all chernozem reserves on the planet are concentrated on the territory of Ukraine. Properly cultivated rich black soils give the highest yields, but today, for example, in Austria with its humus-poor soils, the yield of the same kind of wheat reaches 60 quintals per hectare, and in Ukraine the average wheat yield was 38-40 quintals even in the best years. This shows that in the modern sphere of agricultural production it is important not even to possess the unique land, but to use modern high-performance equipment and technology.

In addition to the stable provision of the country's population with quality, safe, and affordable food, Ukraine's agricultural sector is undoubtedly capable of making a significant contribution to solving the world problem of hunger.

Further entry into the world economic space, intensification of globalization, trade liberalization require adaptation to new and constantly changing conditions, and further improvement of agricultural policy accordingly.

Over the past five years, the agricultural sector of Ukraine's economy has maintained a growing trend. Its share in the gross value added (GVA) of the country has reached 13%, with the use of fixed assets worth over UAH 100 billion. The industry is one of the main budget-generating areas of the economy and ranks second in the commodity structure of exports (about 40%). The agro-industrial complex is also the main source of foreign exchange earnings in Ukraine and a key factor in maintaining the trade balance.

The potential of the agricultural sector in Ukraine is huge. Almost 45,000 enterprises already operate in agriculture. About 2,500 of them are large and medium. But while crop production is growing, domestic meat and dairy production is in a period of stagnation. As a result, the leading agro-industrial companies are engaged in the production of plant products, the share of which is about 69% in total. The activities of leading companies bring them about \$ 8 billion in annual revenue.

Thus, analysing the current state of the agricultural sector of Ukraine's economy, we can identify both positive and negative factors that affect it. The

resource potential has significant opportunities for further active development of the industry, and the state must take effective measures to create favourable conditions for the existence of all sectors of agriculture. This will help the goods of domestic producers prevail over the products of foreign companies, they will enter the world market, significantly increase profits, and payments in the budget, accordingly [3].

Researches show that the increase of agro-industrial production in Ukraine has led to a growth in exports of agricultural products. In 2019, Ukraine exported \$ 22.4 billion worth of agro-food, beating the record high of \$ 18.8 billion in 2018. Thus, for the second year in a row, Ukraine managed to update the historical record of agricultural exports. Last year, the share of products amounted to 44.6% of total exports from the country [4]. Ukraine's agricultural exports for 9 months of 2020 in monetary terms are declining compared to 2019, but its share in the overall export structure remains unchanged. Thus, the foreign trade turnover of food and agricultural products reached more than half of the previous year figure and accounts for \$ 15.5 billion, which is 44.2% of the total structure of Ukrainian exports [5].

Exports of these products exceed imports by 58%. In Ukraine, the foreign trade balance of four groups of agro-food products is generally positive, and food exports are almost 2.4 times higher than imports.

Therefore, the main priority areas for the development of agro economic relations are:

1. Elimination of the permanent deficit of working capital and increasing the volume of investments in agriculture over the next five years in the range of UAH 150-240 billion.

2. Development of trans regional agrarian formations of a corporate type, which could have high competitiveness in the market.

3. Control over the activities of agricultural holdings, having the large amount of the land under their control (25-28% of the total area) in order to avoid unemployment and moving assets out of the countryside, reduce social tension.

4. Legal support and regulation of basic environmental requirements of agricultural production.

5. Rationalization in the dissemination of innovation and practical implementation of research results.

6. Intensification of relations between the main participants of the agricultural sector - the state, business and science - and creation of the effective communication system.

Thus, the agricultural sector of Ukraine should become a leading link in the economy, which will contribute to its growth. It is possible to solve the outlined problems or to minimize them by means of the measures which will advance domestic production to the international markets; changes in the taxation system of the agricultural sector; improvement of the state control and lease relationships; establishing an efficient logistics system; monitoring the agricultural product market; rational use and protection of agricultural lands and a number of other measures.

**References:**

1. Башнянин Г.І. Політична економія [Текст] / Г.І. Башнянин, П.Ю. Лазур, В.С. Медведєв. – К. : Ніка-Центр, 2002. – 527 с. Дата звернення: 10.03.2020.
2. Воробйов Є. М. Економічна теорія : посібник вищої школи [Текст] / Є.М. Воробйов, А.А. Грищенко, В.М. Лісовецький ; під заг. ред. Є.М. Воробйова. – К. : Вища школа, 2001. – 442 с. Дата звернення: 10.03.2020.
3. Аграрний сектор економіки України: сучасний стан та перспективи розвитку [Електронний ресурс]. Режим доступу: <https://www.vgolos.zt.ua/ahraryny-sektor-ekonomiky-ukrayiny-suchasnyy-stan-ta-perspektyvy-rozvytku/>. Дата звернення: 10.03.2020.
4. Україна експортувала продуктів АПК на рекордні майже \$22,5 млрд в 2019 році [Електронний ресурс]. Режим доступу: <https://mind.ua/news/20207895-ukrayina-eksportovala-produktiv-apk-na-rekordni-majzhe-225-mlrd-v-2019-roci>. Дата звернення: 10.03.2020.
5. Аграрний експорт України — 2018-2020 роки: сировина, харчова продукція, зерно, рослинництво, молочка, тваринництво [Електронний ресурс] – Режим доступу: <https://agropolit.com/spetsproekty/843-agrarniy-eksport-ukrayini-2015-2020-roki-sirovina-harchova-produktsiya-zerno-roslinnitstvo-molochka-tvarinnitstvo>. Дата звернення: 10.03.2020.

## **Direct support in Ukraine: problems and prospects for development**

The history of mankind has created various methods of taxation and types of taxes. Each type of tax has its specific features and functional purpose and occupies a separate place in the tax system. Based on the form of taxation, all taxes can be divided into two groups: direct and indirect.

Macroeconomic processes that occur and cause an impact on the development of Ukraine's economy in the conditions of market relations formation are characterized by a low level of investment and innovation activity, using mainly pricing mechanisms to maximize the profits of economic entities.

One of the tools that can ensure the sustainable development of the economy as a whole, its territories, and each enterprise, is the taxation system.

Taxes in Ukraine are the main type of state revenue and perform two main functions - fiscal and economic. With the help of the fiscal function, the country's budget fund is formed, the implementation of the economic function allows the state to directly influence the process of social reproduction as a whole, stimulating or restraining the development of certain sectors of the economy, increasing or decreasing capital accumulation and influencing effective demand.

### **1. The essence of direct taxation**

Taxes are mandatory payments established by the highest body of state legislative power, paid by individuals and legal entities to the budget in the amounts and within the time limits provided by law.

Direct taxes are taxes levied on the acquisition and accumulation of material goods that depend on income or property and are paid directly by the owners of that income or property.

Indirect taxes are taxes that are determined by the amount of consumption and do not depend on the income or property of the payer, are in the form of a surcharge on the price of goods or services, and the payer of which is the final consumer of the goods or services.

The object of the first type of taxes is tangible capital, and certain types of income are subject to taxation (land tax, property tax, inheritance and gift tax).

The object of the second type of tax is an independent manifestation of personal capital, such as personal earnings, housing, profession (income tax, property tax, dividends).

The object of taxes of the third type is the total activity of material, monetary and personal capital in production (income tax, fishing tax) [8].

Today, direct taxes are mandatory payments that are paid directly by the payer to the state budget depending on the size of the object of taxation (corporate income

tax, personal income tax, real estate tax, tax on vehicle owners), and paying such a tax leads to a reduction in the value of the object of taxation.

Direct taxes are considered more socially just in terms of the solvency of their taxpayers because the object of taxation is income or profit [7].

The main characteristics of direct taxes are:

- direct taxes are levied on each business entity and are included in the price of products at the stage of production, and therefore affect the reproduction processes in enterprises;

- direct taxes affect investment activity, business activity, consumption and capital accumulation, as well as the development of inflation, as they reduce the income of payers;

- the amount of direct taxes and their deductions to the budget directly depends on the income received by the taxpayer [6].

Direct taxes have almost no effect on prices, but reduce the income of taxpayers - thereby affecting the volume of investment and consumer demand [5]. Their size depends on the scale of the object of taxation (tax on profits of enterprises, on land, from owners of vehicles and other self-propelled machines and mechanisms, on real estate (real estate)).

In turn, direct taxes are divided into two groups: personal and real.

Personal taxes are taxes that are set personally for a particular payer and depend on his income. In modern conditions, the most widespread are personal taxes such as income tax, income tax, fishing tax [3].

Personal taxes are set personally for a particular payer. Types of personal taxes are income, property, inheritance and gifts [9].

Real taxes are taxes that provide for the taxation of property, based on external signs. The payers are the owners of this property, regardless of their income.

These taxes include land tax, rent payments, vehicle owner tax, property taxes.

Ukraine's taxation system includes both direct and indirect taxes.

Direct taxation in Ukraine is based on four main types of taxes [7]: corporate income tax, personal income tax, land tax and vehicle owner tax. The level of direct taxation in Ukraine has tended to decrease in recent years.

The share of income tax in budget revenues is three times higher than the share of personal income tax and in market economies the opposite. An important reason for this situation is the low standard of living in most of the country's population, especially wages.

Direct taxes affect such indicators of financial and economic activity of the enterprise [2], as

- selling price of products,
- income from sales of products, cost of production,
- operating profit,
- net profit of the enterprise,
- speed of working capital,
- on the solvency and financial stability of the enterprise,
- formation of its financial resources and investment activities,

- product competitiveness
- and in general on the behaviour of entrepreneurs concerning any activity - operational, investment or financial.

The level of this impact depends on the system of direct taxation - the taxes themselves, the level of their fiscality, methods of collecting them, the stability and perfection of the system.

### **2. Analysis of the direct taxation system in Ukraine**

The main direct taxes in Ukraine, which provide most of the tax revenues to the budget, are corporate income tax and personal income tax.

The dominant position in the system of direct taxation belongs to personal taxes: corporate income tax and personal income tax;

their fiscal value is as follows: 93.5% - share in the system of direct taxation; 41.3% - the share in tax revenues of the budget, 31.5% - the share in total budget revenues.

According to the Budget Code of Ukraine, direct taxes are distributed between state and local budgets; therefore, their analysis should be carried out at both the national and local levels [5].

### **3. Improving direct taxation in Ukraine**

Direct taxes must meet the following important requirements, in particular:

- not to suppress, but to develop production;
- be used as a state tool for regulating social processes;
- to ensure a deficit-free state budget.

However, unfortunately, the current direct taxes do not meet any of these requirements. They are purely fiscal, ie unilaterally focused on raising funds for the budget and, as a result, do not provide the budget with the necessary funds [1].

Taking into account the objective conditions and peculiarities of the development of the national economy, the following directions can be chosen for further improvement of the direct taxation system within the framework of the adopted Tax Code:

increasing the level of responsibility of taxpayers for timely and full payment of payments due to the budget, including the establishment of material and criminal liability, with simultaneous encouragement and moral incentives to pay taxes;

optimization of the ratio between direct and indirect taxes, primarily in the direction of coordination and differentiation of income tax rates for legal entities and individuals [10];

improving the procedure for administering direct taxes;

streamlining the provision of benefits to legal entities and individuals; elimination of unjustified income tax benefits, which distort value indicators in the economy and reduce the competitiveness of producers.

Direct taxation is one of the brightest forms of financial relations between the state and taxpayers. Analysis of the current system of direct taxation in Ukraine shows that its formation and development occurs without proper theoretical justification. At present, this system is characterized primarily by a high and uneven

tax burden on the income of economic entities, which complicates the positive changes in the industrial and social spheres in Ukraine.

From the above, we can conclude that the fiscal function of direct personal income taxes in Ukraine today is more or less effective. The fiscal weight of corporate income tax and personal income tax in the state budget revenues is approximately the same. Their fiscal value in budget revenues is about 1/3 of the state budget revenues.

### **References**

1. Borisyuk O. V., Sagan M. S. Features of collecting direct taxes in Ukraine. - Scientific Bulletin of Kherson State University. - 2014. - Issue 5. Part 4. - p. 134-136.
2. Hryniuk R. M. Development of the system of direct taxation in Ukraine / R. M. Hryniuk // Modeling of regional economy. – 2011. - № 1. - P. 280-286.
3. State Fiscal Service of Ukraine - [Electronic resource]. - Access mode: <http://sfs.gov.ua/diyalnist-/rezalt/231177.html>
4. Ozerchuk O. V., Raynova L. B. Fiscal efficiency of direct taxes in Ukraine and factors that influenced it. - Investments: practice and experience. - 2014. -№ 8. - P. 87 – 92.
5. Official site of the State Statistics Service of Ukraine. - [Electronic resource]. - Access mode: <http://www.ukrstat.gov.ua>
6. Official site of the Institute of Demography and Social Research of the National Academy of Sciences of Ukraine - [Electronic resource]. - Access mode: <http://www.idss.org.ua>
7. Tax reform is a challenge for Ukraine. - [Electronic resource]. - Access mode: <http://gazeta.dt.ua>
8. Amendments to the Tax Code have become known. - Ukrainian Pravda. - December 22, 2015 - [Electronic resource]. - Access mode: <http://www.althoughda.com.ua/news/2015/12/22/573489/>
9. Finance teaching. Way for students. Higher education institutions / S. L. Londar, O. W. Tymoshenko. – Vinnytsia: New book, 2009. – 384 p.
10. Gotsak Yu. Measures to reform direct taxation in Ukraine. - Scientific blog of Ostroh Academy. - 27.06.2014- [Electronic resource]. - Access mode: <http://naub.oa.edu.ua/2014/zahody-reformuvannya-pryamoho-opodatkuvannya-v-ukrajini/>

### **Regular management as a method of overcoming the crisis**

The word "crisis" is no longer perceived as painfully today as it was several decades ago. Most likely, the question is that we are increasingly faced with crises, local and global, and, like everything we are used to, they have ceased to look so frightening.

However, this does not mean that there is no need to adapt to them. On the contrary, now it needs to be done more often and more carefully. Regular management can be an effective tool for this purpose.

Regular management implies the formalizing of employees' work and creating conditions for deliberate performance of a required number of actions [1]. In fact, this is classical Western management, the essence of which is to find an effective method of doing work and make it a standard (regulate). Work is understood, among other things, as the managerial activity of managers [2].

In other words, you formulate a set of principles for your team/project/organization, translate them into actions, and (most importantly) track their fulfillment and follow them yourself. Eventually, they become an integral part of your team's work and are applied automatically. The process requires only insignificant corrections, and sharing these principles when onboarding new employees.

These principles can be formulated as:

1. A given task should be analyzed before you start working on it.
2. A given task should be performed 100%.
3. Any obstacles on the way to 100% performance of a task should be promptly reported to the manager and all stakeholders.
4. A suggestion on how to solve the problem is more valuable than information about its occurrence [1].

The introduction of regular management implies not only the formation of an algorithm for action in a specific situation to eradicate chaos, but also control of strict adherence to established norms.

The main properties of regular management as a company management system are the following:

- The work of employees of any level is formalized through regulations and rules and is carried out in accordance with them.
- The results of the implementation of any task are transparent and can be assessed according to the formulated criteria.
- Ability to plan resources. Clearly formulated and implemented corporate rules of the game: what is allowed and what is not.

- Lack of large-scale wars and intrigues within the company. Formalization of areas of responsibility. General criteria for assessing the quality of task performance.
- Employees in the framework of regular management are professionals interested in “horizontal” and “vertical” careers, development of personal and managerial skills.
- Everyone works according to the rules of regular management: both the top officials of the company and line employees [2].

Applying regular management can be compared to moving production from manual assembly to full automation. On the one hand, processes that previously required effort, time and manual control are developing according to an established schedule. The manager, on the other hand, must control the system itself and solve tasks that cannot be automated.

This is especially relevant at the stage of the company's growth, since the process of transition from one stage of the company's life cycle to another is itself a certain crisis. During this period, the formation of the main business processes, an increase in staff, an expansion of the range of activities, an increase in turnover, an increase in profits, and the addition of assets take place. In most cases, this stage is a “turning point” in the history of the firm. As a result, multifactor crisis may become [3].

At the same time, it is very important to analyze the possibility of introducing regular management. Analyzing and evaluating the organization from the point of view of the observer, the manager and employees are presented with a complete picture of a chaotic situation and the options for its solution that regular management offers.

The systems of the company that are covered by regular management include finance, logistics, business plan, organizational structure of the company, accounting, marketing [4].

Along with some disadvantages of this system (the high initial cost of investments required to build such a system, and a slow reaction to market changes due to the large amount of time spent on the decision-making process in such companies), the following advantages can be highlighted:

- good handling;
- the ability to build a business of any size;
- low personnel dependence;
- clear formation of the personnel reserve;
- high return on staff;
- appropriate collegiality;
- an increase in the value of a ready-made business due to the cost of intangible assets and an autonomous operating business system [3].

Regular management should complement and properly modify business processes, increase the efficiency of tasks and goals. This requires the following activities:

1. Acceptance by top management (founders and owners) of the principles of regular management and strict adherence to them. The head of the organization is responsible for the result of this implementation project and provides all the conditions for its integration with the business processes of the company.
2. Involvement of the staff. All employees must take part in the project being implemented: open discussions are held on the knowledge and experience of employees, an opportunity is given to set goals for their activities in the company, an analysis of the level of staff satisfaction with the new system is carried out, and shortcomings are identified.
3. Assessment of the company's real capabilities in using the system, establishing areas of application.
4. Planning and monitoring of implementation, taking into account the current tasks of the company.
5. Distribution of new powers of employees in the field of technological process control.
6. Conducting an audit of the effectiveness of regular management for the organization.

Regular management, if implemented correctly, is an effective tool for overcoming crisis situations at the enterprise. However, it is important to remember that this is not the only and far from ideal remedy. As the company grows and develops, the management system must also be changed.

## References

- 1) Regular Management in an IT Team. Luxoft Training. Retrieved from <https://www.luxoft-training.com/news/regular-management-in-an-it-team/>.
- 2) Как внедрить регулярный менеджмент в своей компании (часть 1): цели, базовые принципы, предстартовая подготовка. «Открытая студия». URL: <http://openstud.ru/blog/for-businessmen/regular-management-targets/> (дата обращения 14.03.2021).
- 3) Регулярный менеджмент: особенности внедрения новой системы. Онлайн-школа Premium Management. URL: <https://premiummanagement.com/blog/reguljarnyj-menedzhment> (дата обращения 14.03.2021).
- 4) Регулярный менеджмент как метод преодоления кризиса. Тренинговый портал Украины. URL: <https://www.trn.ua/articles/5433/> (дата обращения 14.03.2021).

## **Financial components of decentralization in Ukraine**

The beginning of the transfer of financial instructions for the development of local governments is an important step in the formation of quality public administration, so such a process can have an effective impact on the economic development of the country. Decentralization, the process of reforming regional self-government, was launched in Ukraine in 2014.

The information resources define decentralization as the transfer of finances and powers from public authorities to local governments; the basis for reforming the governance of regions and territorial units, and as a basis for disseminating the principles of local self-government in accordance with European standards; the method of territorial organization of power, in which the state transfers the right to make decisions on certain issues to the structures of the regional independent level [1-3].

In the Concept of Local Governance Reform and Territorial Organization of Power in Ukraine, one of the tasks was to “achieve optimal distribution of powers between local self-government bodies and executive bodies” and “create appropriate material, financial and organizational conditions to ensure local self-government bodies exercise their own and delegated powers”.

For the second process, concerning financial independence to ensure personal authority, and therefore, the initiation of financial decentralization, the following principles are identified: the availability of resources to exercise the powers of local governments; provision of funds to be transferred from the state budget to the local one; securing for the local budget part of the capital received from the payment of income tax of newly created legal entities; granting the right to regulate the rates of local taxes and fees [4].

Due to the strengthening of political circumstances in 2014, the Concept, which provides changes in the Constitution of Ukraine, was not adopted, but it did not destroy the desire to transform and implement the process of regulating the local budget.

The changes introduced to the Budget and Tax Codes of Ukraine started the process of financial decentralization in 2015. Due to this, local governments received additional budgetary powers; fixed revenues to be delivered to the budget; ensured the financial independence of the budget from the central one; received 60% personal income tax to the local budget, provided that the communities merged into one and formed a united local community [5].

The dynamics of growth in the number of united local communities, own revenues of the general fund of local budgets, the share of local taxes and fees in own

revenues of local budgets, and state support in the development of united local communities are shown in Table 1 [6].

Table1

The growth of the number of united local communities and their financial indicators

Year	Number of united local communities	Own revenues of the general fund of local budgets	Growth of local budgets (share of local taxes and fees in own revenues of local budgets)	State financial support for the development of communities and regions
2015	159	UAH 98.2 billion	26,6 %	UAH 3.7 billion
2019	1029	UAH 250.5 billion	27,5 % (forecast)	UAH 20.75 billion

From 2015 to 2019, the number of united local communities increased by 870 territorial communities, local budgets increased by almost 1%, and state financial support for development increased by a record UAH 17.05 billion. The authorities have created favorable conditions for the further growth of the united local communities and the development of their financial capacity.

In 2020, revenues to local budgets reached UAH 290.114 billion, so we can predict that this figure will increase and in 2021 the united local communities will receive an increased share of profits than in previous years [7], but this value can change due to the pandemic situation in the world influencing the economic situation in Ukraine.

The second stage of the centralization in Ukraine is to be finished in 2021.

The main tasks for this stage are the following: improving of the existing local budgets performance; the final forming of united local communities, outlining the program of their socio-economic development. As for to 2021, united local communities were to develop the plan of anticipated incomes and expenditures of their budgets. These values will inform self-government bodies about possible state of their capital and the steps for local financial capacity development.

The financial component of decentralization in Ukraine, which includes increasing the share of financing and own revenues to local budgets, obtaining a stable personal income tax, the right to decide how to use and where to invest, has positively affected the budget system and financial position of local governments. This is evidenced by the development of the number of united communities, financial support from the Ukrainian government, and the growth of local budgets. The increase in these indicators demonstrates the success of the reform, so Ukraine has an unmistakable economic path of development that will improve the lives and situation of Ukrainians.

## References

- 1.Офіційний державний сайт України: «Децентралізація»: – [Electronic resource]. Access mode: <https://decentralization.gov.ua/about>
2. Жаліло Я.А., Шевченко О.В., Романова В.В. та ін.” Децентралізація влади: порядок денний на середньострокову перспективу. Аналітична доповідь.” Національний інститут стратегічних досліджень. – К.: 2019. – 115 с.
- 3.Енциклопедія державного управління: у 8 томах. Т. 8: Публічне врядування / наук.ред.колегія: В. С. Загорський, С. О. Телешун та ін. Львів: ЛРІДУ НАДУ, 2011. 630 с.. – [Electronic resource]. – Access mode: [http://academy.gov.ua/NMKD/library\\_nadu/Encycloped\\_vydanniy/ec33d206-7309-4034-a00f-074bcb7916ce.pdf](http://academy.gov.ua/NMKD/library_nadu/Encycloped_vydanniy/ec33d206-7309-4034-a00f-074bcb7916ce.pdf)
4. Про схвалення Концепції реформування місцевого самоврядування та територіальної організації влади в Україні : схвалено розпорядженням Кабінету Міністрів України від 1 квітня 2014 р. № 333-р . – [Electronic resource]. – Access mode: <https://zakon.rada.gov.ua/laws/show/333-2014-%D1%80#Text>
- 5.Закон України “Про внесення змін до Бюджетного кодексу України щодо реформи міжбюджетних відносин”. – [Electronic resource]. – Access mode: <https://zakon.rada.gov.ua/laws/show/79-19#Text>
- 6.Міністерство розвитку громад та територій України. Моніторинг процесу децентралізації влади та реформування місцевого самоврядування: станом на 10 січня 2020. – [Electronic resource]. – Access mode: <https://decentralization.gov.ua/uploads/library/file/526/10.01.2020.pdf>
7. Міністерство розвитку громад та територій України. Моніторинг реформи місцевого самоврядування та територіальної організації влади: станом на 10 лютого 2021. – [Electronic resource]. – Access mode <https://decentralization.gov.ua/uploads/library/file/690/10.02.2021.pdf>
- 8.Decentralisation in Ukraine. Achievements, expectations and concerns. UCIPR 2017. – [Electronic resource]. – Access mode:[https://www.international-alert.org/sites/default/files/Ukraine\\_Decentralisation\\_EN\\_2017.pdf](https://www.international-alert.org/sites/default/files/Ukraine_Decentralisation_EN_2017.pdf)
9. Податкова база громад і районів для підготовки бюджетів 2021 р. – орієнтир від фінансових експертів. – [Electronic resource]. – Access mode: <https://decentralization.gov.ua/news/12977>

**Section 02 Environmental Problems and their Solutions**

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**Research of the level of snow cover pollution in the zone of influence of motor transport**

Cars are the source of up to 80% of air pollution in large cities. The main cause of environmental pollution by vehicles is incomplete and uneven fuel combustion. Snow cover has a high absorption capacity and accumulates all the components that pollute the atmosphere. Therefore, it is advisable to assess the level of snow pollution in the area of influence of highways in the Dnipro.

To make analysis of snow cover there were used snow specimens picked out in the middle of winter in February 2021 in three areas of the Dnieper. They were selected at different distances from the highway on Nadiya Alekseenko Street, without redistribution of the roadside, and at a distance of 5 and 15 m from it. The snow samples were drafted for the entire depth of the snow cover to the base of the occurrence using plastic pipes and placed in a plastic bag. The total of 9 types of snow cover was singled out. Then, the snow samples were delivered to the laboratory and melted in chemical glasses.

The water samples were analysed for three indicators: pH - environment, mineralization and oxygen-redox potential (ORP). The research results are given in table 1.

A significant transformation of the mineralization of melt water was discovered at a distance of up to 1 m from the highway. This is due to the consumption of salt mixture from the wheels of vehicles on the snow. Such excess salt content in the snow cover can lead to significant soil contamination and inhibit the growth of plants, grass and trees along the highway a few meters wide from the highway. Once in the soil, the salt mixture can spread to a much wider area due to the filtration of meltwater in the soil.

There is a suggestion to develop such a composition of the salt mixture that is effective and, in its turn, will minimize the impact of excess salts. The reduction of motor vehicle pollution should be mainly conducted by improving of the ecological characteristics of the fleet of operated motor vehicles. This improvement can be achieved through a gradual renewal of the operated fleet by replacing decommissioned vehicles with more "environmentally friendly" or by upgrading the operated vehicle by equipping them with neutralizers, gas equipment, etc.

Table 1 - Analysis of test melted snow, for selected in the area of influence of highways.

Place of choice	pH	Mineralization, mg / l	ORP, mV

Purified water (drinking)	6.3	11	231
Distilled water	6.2	3	255
Tap water	7.4	221	251
Sample of melted snow (roadside)	6.846	5504	214
Sample of melted snow (5m)	6.67	83	243
Sample of melted snow (15m)	6.365	39	246
Sample of melted snow (roadside)	7.4	5504	269
Sample of melted snow (5m)	6.3	64	286
Sample of melted snow (15m)	6.44	32	275
Sample of melted snow (roadside)	6.37	1735	286
Sample of melted snow (5m)	6.83	42	275
Sample of melted snow (15m)	7.1	28	252

### References:

1. Мислюк О. О., «Хімічний склад снігового покриву як індикатор аеротехногенного забруднення урбоєкосистем» / О. О. Мислюк, Є. В. Мислюк, Л. М. Соломка // *Вісник ЧДТУ*. – 2010. – № 3. – С. 126–131.

2. Купчик О. Ю., «Викиди автомобільного транспорту як джерело забруднення атмосферного повітря міста Чернігова» / О. Ю. Купчик // *Молодий вчений*. – 2015. – № 2 (17). – С. 17–20.

3. Грабовська Т. О., «Снігова індикація як показник забруднення навколишнього природного середовища м. Біла Церква викидами автотранспорту» / Т. О. Грабовська // *Питання біоіндикації та екології*. - 2014. - Вип. 19, № 1. - С. 49-62.

4. Самохвалова В.Л., Фатєєв А.І., Ворон В.П., Лучникова Є.В., «Особливості вивчення та визначання забруднення снігового покриву важкими металами в зонах сталих аеротехногенних емісій забруднювачів». *Науковий вісник УЖНУ. Серія: Біологія*. Вип. №.26 --2009.-С. 103-113.

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## **Phytoremediation of reclaimed coal dumps in Western Donbas**

Mining is a process, which produces a lot of waste with high concentration of heavy metals and toxic elements. These lands have a low pH, low concentration of organic and low vegetation. However, there are many solutions to this problem.

It is very important to choose method for decision of this problem correctly. The right way depends of the following factors: 1) physical structure; 2) chemical and 3) biological function. [1]

The first step is analyzing general condition of the soil from coal dumps and chose correct substrate that is possible to add for increasing physical stability of this sample. It will allows us to understand which toxic elements are in the soil after chemical analysis. The main idea of this experiment is to see in which form this elements are in the soil. After considering the results, it is clear if it is necessary to add some chemical reagent to increasing immobilization of toxic elements or produce to activate these elements.

After the first phase, it will be possible to choose the right method. In addition, it is important to understand that some methods of remediation are expensive, some take a lot of time.

One of the promotion method of reclamation of coal dumps is phytoremediation. Phytoremediation is the treatment of pollutants or waste (as in contaminated soil or groundwater) by the use of green plants that remove, degrade, or stabilize the undesirable substances (such as toxic metals). There are different kinds of phytoremediation: phytoextraction; phytostabilisation; phytodegradation; rizofiltration and etc.

Phytostabilisation is one of the perspective method and will be considered in this scientific work. Soil from coal dumps of Western Donbas have a low concentration of organic, low pH and high concentration of heavy metals such as: Pb, Co, Cd, As, Cr. [2] Biochar and biocompost are solutions for this soil. It can be prognosed that pH and concentration of organic will increase and this substrate can immobilize heavy metals. [3] When organic substance (biocompost) is added it is expected to change physical parameters of the soil, to increase organic components for instance: C and Ca, by improving ion exchange reaction. An important factor is to choose the right organic substance that can increase the oxidation-reduction reactions in the substrate, increase soil moisture and stimulate biological activity. [4]

Immobilization of heavy metals, increasing of pH level, increasing of ion exchange, change of physical structure of soil, water balance of substrate, and increase of level of carbonates and phosphates is predicted in addition to biochar. [5]

For analyzing the obtained results, it is planned to conduct a general analysis of physicochemical parameters of soils such as: pH, specific electrical conductivity of

the soil (EC), gross test, test on the concentration of toxic elements and liquid metals in plants and soil. With the intact soil sample we will determine the content of nutrients for plants, namely ions: NO<sub>3</sub><sup>-</sup>, NH<sub>4</sub><sup>+</sup>, PO<sub>4</sub><sup>3-</sup> (spectrophotometrically) and the concentration of mobile forms of the elements, by obtaining water extraction with ammonium acetate buffer (pH = 7) and ammonium acetate solution with the addition of citric acid (pH = 4).

It is important to choose the right phytoindicator that will improve the biological component of the substrate. Among the plants for phytostabilization, the following options are considered: *Polygonum aviculare* L.), *Artemisia vulgaris*, *Achillea millefolium*, *Ambrósia*, *Triticum* L., as these plants are pioneers in the steppe zone of Ukraine and typical for this region. These plants are not capricious to the substrate, they easily take root in degraded areas. These phytostabilizers are acclimatized to this region, and therefore there is no need for an adaptive period for these plants.

The general content of microelements in soils and plant tissues is planned to be determined on the basis of the method of inductively coupled plasma mass spectrometry (ICP-MS).

Before choosing the method of phytoremediation of coal dumps, it is necessary to analyze the physical, chemical and biological parameters of the substrate. The chosen method must be on the balance of the “cost – time” system.

## References

1. Larney FJ, Angers DA: The role of organic amendments in soil reclamation: a review, *Can J Soil Sci* 92: 19—38, 2012;
2. Красовський С.А. Огляд технологій фіторекультивуваці відвалів вуглевидобування. // Молодь: наука та інновації: Матеріали VIII Всеукраїнської науково-технічної конференції студентів, аспірантів і молодих вчених (Дніпро, 25 листопада – 27 листопада 2020 року). – Д.: НТУ «Дніпровська політехніка», 2020. Т.10. – с. 73-74
3. Larney FJ, Angers DA: The role of organic amendments in soil reclamation: a review, *Can J Soil Sci* 92: 19—38, 2012;
4. Langer WH: Potential environmental impacts of quarrying stone in Karst—a literature review, U.S. Geological Survey Open-File Report 01—0484. 2001.
5. Beesley L, Marmiroli M: The immobilisation and retention of soluble arsenic, cadmium and zinc by biochar, *Environ Pollut* 159:474-480, 2011.

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### **Optimization of transport flow speed on the section of O. Polya av. in Dnipro**

Under the organization of traffic is now understood a set of engineering and organizational and measures aimed at ensuring optimal vehicle speed, safety and convenience for all road users, ensuring the necessary capacity of the existing road network. In developed countries, the following main measures are taken to reduce traffic congestion: ensuring uniform and free traffic, reducing traffic intensity and banning freight traffic through densely populated areas, transferring transit highways and freight roads from residential areas, construction of noise protection structures and greenery. [1] The growth of the car fleet and the volume of traffic leads to an increase in traffic, which in the case of Ukrainian cities leads to a transport problem. Traffic delays, frequent stops and traffic jams at intersections are the causes of increased pollution of the city's environment by incomplete fuel combustion. [4] The purpose of this work was to study the traffic intensity and traffic flow in the area of O.Polya Avenue in order to optimize the flow of vehicles and improve the impact of vehicles on the ecology of the city. Observations and determination of traffic intensity and traffic flow were carried out on O.Polya Avenue, observations were carried out from November 1.11.2020. to 21.11.2020 from 09:00 to 12:00 When forming information about the state of traffic, first of all, the necessary data characterizing the traffic flow are the intensity of traffic flow, flow density, speed. [3] The results of the calculations are entered in table 1.1

The calculation of the environmental effect of traffic flow optimization took into account the calculation of emissions (II)(carbon monoxide). The calculation was performed according to the method of calculating emissions of pollutants and greenhouse gases into the air from the use of fuel by vehicles [6]. The calculations factored into the types of transport involved in the traffic flow: 40% - cars running on gasoline, 35% - cars running on diesel fuel, 20% - on liquefied gas, 5% - urban electric transport, which at fuel consumption and emissions calculations were not taken into consideration. For petrol engines, tabular data for passenger cars and passenger buses were considered. For diesel engines, tabular data for trucks and passenger buses were taken note of. Accordingly, the technical condition of the cars was taken into account. The results of the calculations are listed in table 1.2.

Table 1.1  
Transport flow parameters

No	Car speed, Va, km/h	Safety distance, Dbi, m	Dynamic size, La, m	The density of stream, qi, car/km	Traffic intensity, Ni, car/h
1	10	5,579	10,579	94,523	945,234
2	20	9,651	14,651	68,255	1365,102
3	30	14,215	19,215	52,044	1561,315
4	40	19,270	24,270	41,203	1648,102
5	50	24,818	29,818	33,537	1676,826
6	60	30,858	35,858	27,888	1673,254
7	70	37,390	42,390	23,590	1651,317
8	80	44,415	49,415	20,237	1618,952
9	90	51,931	56,931	17,565	1580,858
10	100	59,940	64,940	15,399	1539,892
11	110	68,440	73,440	13,617	1497,815
12	120	77,433	82,433	12,131	1455,726
13	130	86,918	91,918	10,879	1414,304

Table 1.2  
Traffic flow density and carbon monoxide emissions

Car speed, Va, km/h	The density of transp. stream, qi, car/km	CO emissions, t / year
10	94,523	1322,26
20	68,255	1138,59
50	29,818	193,05
60	35,858	160,52

As a result of the research, it is possible to draw a conclusion that at observance of speed of the car of 50-60 km / h there will be:

1) improving the capacity of the intersection, which leads to the absence of congestion at rush hour and the accumulation of a large number of vehicles, thereby reducing the emergency situation on the roads and the load on the driver;

2) reduction of fuel consumption, on average by 2 times, which leads to significant savings;

3) significant environmental effect - reduction of emissions by 85% (from 1138.59 tons / year to 176.785 tons / year).

Therefore, to ensure the optimal flow rate, it is recommended to install the sign 5.30 "Recommended speed" on the road section. The area of the sign extends to the nearest intersection.



**References:**

1. Джигирей В.С. Екологія та охорона навколишнього природного середовища: Навчальний посібник / К.: Знання, 2006.- 319 с.
2. Кременец Ю. А. Технические средства организации дорожного движения: Учебник для вузов. – 2-е изд., перераб. и доп. – М.: Транспорт, 1990. – 254 с.
3. Клинковштейн Г. И., Афанасьев М. Б. Организация дорожного движения: Учебник для вузов. – 5-е изд., перераб. и доп. – М: Транспорт, 2001 – 247 с.
4. Лобанов Е. М. Транспортная планировка городов. М:Транспорт,1990.-240 с.
5. Левашев А.Г. Михайлов А.Ю. Головных И.М. Проектирование регулируемых пересечений : Учеб. пособие– Иркутск: Изд-во ИрГТУ, 2007. – 208 с.
6. Транспортна екологія. Методично-інформаційні матеріали до самостійного вивчення дисципліни та виконання індивідуальних завдань для студентів/ А.В.Павличенко, С.М.Лисицька, Дніпропетровськ, Національний гірничий університет, 2012.-39 с.
7. Draft environmental impact report. November 2003, CSIR Report No. ENV-S-C-2003 110A.
8. Douaud A., Girard C. Which are the engine and fuel technologies for the sustainable development of road transport? // *WEC Journal*. - 1997.-July. - pp. 1021.

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### Prolonging life of underground Kryvbass - a myth or reality?

Underground mining operations in Kryvbass are the focus of attention of both mining engineers and ecologists. The research done is actual due to the fact that without performing work to consolidate the broken rock the miners won't have access to the upper levels in order to extract iron ore in previously technologically abandoned pillars [1]. Our city Kryvyi Rih may face the fate of other depressed regions - mines will be closed, open pits will be expanded, the working population will leave, the environment will get worse, and medical institutions will be closed.

General characteristics of subsidence of the surface over the mine workings [4]

Administrative unit	Undermined area, km <sup>2</sup>	Total area of subsidence, km <sup>2</sup>	Depth of subsidence (from - to), m	Total area of flooding within subsidence, km <sup>2</sup>	Area of subsidence on built-up territory, km <sup>2</sup>	Number of cities in subsidence zone
Volynska oblast		26.20	2.5-3.0			
Dnipropetrovska	720.83	156.11	0.7-15.0	46.56	22.35	3
Donetska	2417.00		0.02-6.8	90.00		23
Ivano-Frankivska	1.6	0.30	0.1-2.1	0.15	0.20	3
Luhanska	2200.00		5.0-7.0		703.80	
Lvivska	177.00	100.00	0.01-4.0	5.00	19.50	6
<b>Ukraine, total</b>	<b>5516.43</b>	<b>282.61</b>		<b>141.71</b>	<b>745.85</b>	<b>35</b>

The technology of iron ore mining at the Kryvyi Rih deposits does not include backfilling of the worked-out area unlike the method used at the Zaporizhzhya Iron Ore Combine, the chamber is filled with a hardening mixture there. At Kryvyi Rih mines, in fact, a lot of rock must be turned into a monolith [2]. However, when studying the world experience and taking into account the actual situation, we were empirically able to find a way to turn the broken rock into a monolith - thanks to which it is possible to stop the flow of fresh water from the upper levels through the

blasted rock and not pump out salty mine water into sedimentation ponds causing harm of agricultural lands and rivers.

The proposed method is based on the physical properties of dust to settle on horizontal, vertical and ceiling surfaces, and properties of fine dust to become even more fluid than water [2]. The dust carried by compressed air fills the free space in the broken rock, and since it is fed in a certain sequence, depending on the interaction with moisture and by fraction - the larger ones are inert to moisture and the smaller ones have a greater ability to penetrate and harden in a humid environment - a pillow is formed to which a liquid solidifying solution is fed. Starting from the surface or from a technologically expedient depth, dry and liquid mixtures are injected into vertical or horizontal blast holes through injectors, forming monolithic stages. With an increase in the fixing depth, the distance between the steps increases, and the productivity also increases.

Summing it all up, we can conclude that having consolidated the broken rock, miners will be able to extract not only previously technologically abandoned ore, but also rocks that contain previously unmined rare metals.

The composition of the fixing mixtures includes fillers obtained during the processing of waste dumps consisting of shale, poor and oxidized ores and amphibolites, i.e. in the process of preparing the material for consolidating the broken rocks, additional construction materials and metallurgical raw materials will be obtained.

**References:**

1. Akimenko N.M., Belevtsev Ya.N., Horoshnikov B.I. and others. Geological composition and iron-ores of Kryvoy Rog basin. Moscow: Gosgeoltechizdat, 1957, 280 p.
2. Anikeeva N.F. Evolution of several metamorphic ores of Krivoy Rog. Petrographic edition VSEGEI, Moscow: Gosgeoltechizdat, 1955, #1, p. 91-130
3. International Mining, #1, 2021
4. <http://www.geo.gov.ua/ekzogenni-geologichni-procesi/>

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### Slime molds and urbanization

Nowadays urbanization increases, and in coming decades 68% of the world's population is expected to live in cities. For instance, the traffic will increase along with economic development. The cities will expand their territories, and it should be organized process. It should be noted the problem with city planning and creating economically efficient road networks.

The purpose of studying the field of slime molds and urbanization.

The aim of the article is a detailed overview of bio technologies in the investigating slime mold's network.

The idea of bio-oriented technologies is quite important, so the team of experts from Los Angeles (LA) performed a research about investigating LA road network from biologic perspective based on the slime mold named myxomycete *Physarum polycephalum* (Myxomycota).

*Physarum polycephalum* is a giant multi-nucleated but unicellular fast-growing plasmodial protist that possesses tubes called pseudopodia, using for feeding and movement. Myxomycota can be found in understory or dark wet places consuming microorganisms (fungal spores, yeasts, bacteria etc.). It is the most notable among all organisms; it is been widely used in physiological experiments in protoplasmic streaming and nuclear behavior. *Physarum* is a widely used test-object for studying mitosis, primary intelligence and cell motility as it has simple anatomy, yellow colouring and easy method of *in vitro* cultivation. [1]

First of all, it should be mentioned that the researchers made a 3D printed topographical map of the LA downtown, an area of 12 to 15 km with diverse landscape: hills, rivers, flat basins and mountains. To have a measurable effect of plasmodium behavior all the elevation values were enhanced 2.5 times. 12 cm × 15 cm printed maps (1:100,000 scale) were marked with a dot of permanent paint in fixed locations where the food source (oat flakes) could be placed identically through replicated trials. Seven food source locations were chosen intentionally to flatten with major intersections of both highways and major roadways in Downtown Los Angeles.

For each trial, each 3D topographic map was placed in a large 20 × 20 cm square petri dish containing an absorbent towel soaked in deionized water. After sanitization, a thin coat of autoclaved non-nutritive 2% agar was painted over the surface of the 3D maps. The agar media provided a superior growing surface to bare plastic sufficiently thin enough not to distort scaling of the 3D maps. Agar was allowed to solidify and ready for the placement of slime mold and oat flakes at fixed starting locations.

The dry sclerotium (dormant stage) of the slime mold was cultivated during 48 hours in the dark and humid 25°C incubator. Further the plasmodium and oat flakes were placed onto the map for 72 hours to let *Physarum* fully explore and spread around it. Seventeen trials of same duration (72 hours) were conducted, photos were being taken in every 6 hours. At the end of each trail the distances between flakes were measured using specific software.

The statistical analysis was made to compare the plasmodium road network with pre-existed man-made.

In the end of research, it emerged that *Physarum* road network was 65 km ± 13 km (average ± standard error) of equivalent length shorter than man-made current network. [2]

It should also be added that with growing urban population, the traffic is growing simultaneously. The cities need to improve their roadway networks as it is expected to save a lot of commute time, reduce air pollution with all its consequences and be more economically efficient for logistic companies. The research of slime mold's ability to build a network has showed a way of solution, as the network made by *Physarum polycephalum* was shorter than engineered by humans for more than 60 km.

In conclusion, we can say that creating urban roadway networks is only one example of using biologic studies in solving social-economic problems on local and global levels. Except that studying *Physarum* primary intelligence can help us in studying our own, so that mechanisms are repeated. Solving global ecological problems cooperating with environment is easier and more effective.

### **References:**

1. *Physarum polycephalum* (2017) [Online] Available at: [https://microbewiki.kenyon.edu/index.php/Physarum\\_Polycephalum](https://microbewiki.kenyon.edu/index.php/Physarum_Polycephalum) (Accessed 7 Feb 2021)
2. Deen S., Kuzmenko T., Asghari H., Willette DA. 2020. Investigating Los Angeles' urban roadway network from a biologically formed perspective. *PeerJ* 8: e8238 <https://doi.org/10.7717/peerj.8238>
3. Webster, J., Weber, R. (1925). Introduction to fungi (3<sup>rd</sup> ed.). Cambridge University Press.  
ISBN 978-0-521-80739-5

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### Environmental impact of the motor transport

Issues of ecological safety of the motor transport are a part of ecological safety of the country. The importance and acuteness of this problem have been growing from year to year. The fact that release of pollutants in the atmosphere from vehicles increases on average by 3,1% per a year causes alarm.

Overall GHG from Transport in EU28

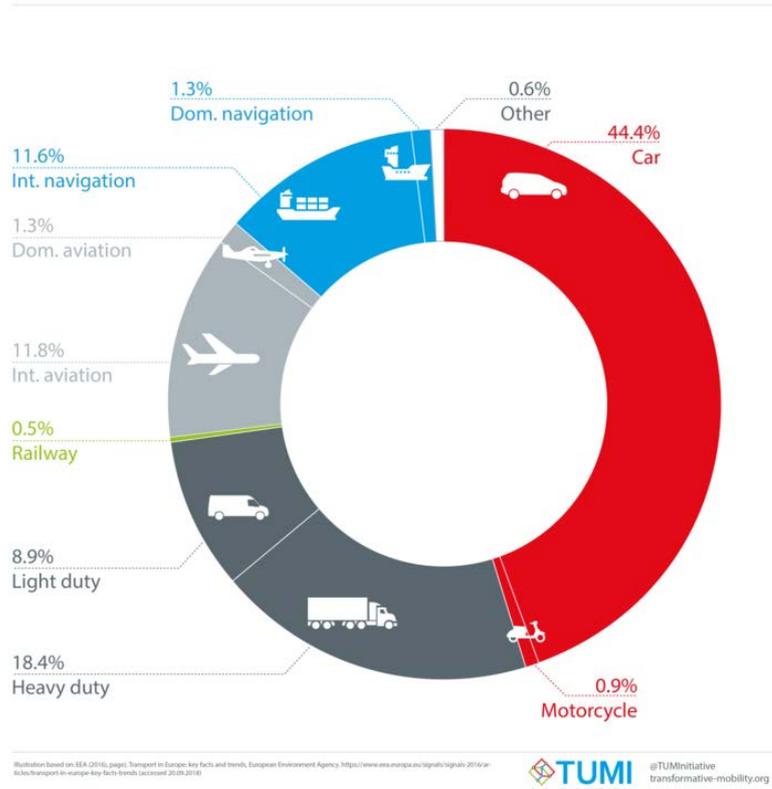


Fig. 1 - Ecological damage caused by transport

Now there are more than half a billion of cars in the world. Statistics shows that cars are owned by every tenth of Ukrainian inhabitant and in big cities every fifth one has got the car. The main source of urban air pollution in Ukraine is traffic. Exhaust gases in the cities are especially dangerous because they pollute air at the level of 60-90 cm from the Earth's surface on average. It exceeds threshold limit values of harmful substances by 5-10 times. Cars emit dioxide, carbon oxide, nitrogen oxide, formaldehyde, benzene, benzoporyne, soot (about 300 toxic substances in total) into the atmosphere. During road travel a car releases lead impurity from gasoline polluting soils by this heavy metal. As aftereffect of asphalt tire scuffing rubber dust being unhealthy causes air pollution. The car weekly consumes as much oxygen as its four passengers breathe in per year. Car washing

produces contaminated water containing engine oil causing waterbody pollution. Cars are a source of noise pollution as well.

It is necessary to reduce harmful impact of cars on the environment as much as possible. The internal combustion engine remains the main driving force of the car. In this regard the only step to a solution of power problem of the motor transport is to create alternative types of fuel. New fuel has to meet a lot of requirements: substantial raw material resources, low cost, maintenance of engine capacity, reduction of harmful substances emission, and incorporation into current fuel supply system.

Three main modernizations of cars which could become a solution to current ecological situation can be provided: hydrogen as fuel, electric vehicles, and hybrid engines.

From the ecological point of view hydrogen is the most promising fuel for cars. Technically, the storage tank becomes the place where an exchange of electrons between molecules of two gases (hydrogen and oxygen) occurs. Therefore, energy is emitted with water as its by-product. One kilogram of hydrogen contains three times as much energy as gasoline. Current production cost of hydrogen is five dollars, but its energy capacity equals to one liter of gasoline. However, hydrogen is highly volatile (the filled stationary car with the idle engine constantly loses fuel), highly explosive (it is impossible to store the car in a garage or in a container), because of a small running time between gas stations it demands very volumetric petrol tank etc.

Another alternative solution is to use electric vehicles. They will considerably improve environmental situation. The electric vehicle does not consume carboniferous fuel and does not pollute air by exhaust gases, works almost silently, not flammable and is easily controlled. Disadvantages related to the high cost of the car, lack of infrastructure, small mileage between gas stations, heavy car mass in comparison with the car with DVS hamper full-scale use of electric vehicles.

Hybrid engines can be used everywhere as “intermediate” and commercially more justified option. For example, the liquefied gas has all qualities of full-fledged fuel for internal combustion engines. It is recognized around the world as cheap, environmentally friendly fuel outperforming gasoline in many properties. It is important that natural gas conversion procedures do not demand a car design changes allowing using both gasoline and gas motor fuel.

To reduce pollution of atmospheric air planted borders are recommended. Dense green wall of deciduous trees with young plantation and bushes in the understory isolates transport corridor providing additional green area especially useful in urban and industrial zones.

The solution of environmental problems caused by motor transport demands considerable financial resources which cannot be raised by current manufacturers. Therefore, it is necessary to set the economic leverage stimulating acquisition and operation of environmentally friendly vehicles and fundraising for their production.

**References:**

1. D. Gkatzoflias, C. Kouridis, L. Ntziachristos and Z. Samaras. COPERT 4. Computer programme to calculate emissions from road transport. User manual (version 9.0). European Environment Agency, 2012.
2. L. Budd, S. Griggs and D. Howarth [ed.]. Transport and Sustainability. Bradford, GBR, Emerald Group Publishing Limited, 2013. 4: Sustainable Aviation Futures. ISBN 978-1-78190-595-1.
3. J. Borken, "Assessment of Transport's Impact on Health and Environment for Germany", European Conference of Transport Research Institutes, Brussels. [Online] 2003. [Cited: 03 04, 2014.] <http://www.ectri.org/YRS03/Session-1/Borken.pdf>.
4. T. Litman, "Smart Transportation Emission Reduction Strategies. Identifying Truly Optimal Ways to Conserve Energy and Reduce Emissions", Victoria Transport Policy Institute, 2015.

**Section 03 Innovations in Engineering, Energy Efficiency and Alternative Sources of Energy**

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**New horizons, perspectives and reality of Engineering**

Science does not stand still, so the time has come for the Fourth Industrial Revolution. Many companies and even the government are struggling to keep up with it, because these are opportunities that blur the boundaries between the physical, digital and biological realms.

The Fourth Industrial Revolution is about how technologies such as artificial intelligence and the Internet merge with the physical life of humans. For example, voice assistants, facial recognition, or digital health sensors. Therefore, it can raise income levels and improve the people's quality of life around the world. New technologies have made it possible to increase efficiency and pleasure in our lives: order a taxi, book a flight, buy groceries and listen to music - now all this can be done remotely.

With the new technological revolution, incredible and useful inventions and discoveries are so close to us. There are some rumors about next innovations nevertheless we have already been familiar with some of them :

**1. New materials**

Nowadays, new materials are constantly entering the market with properties that were impossible to imagine just a few years ago. Overall, they become lighter, stronger, recyclable and adaptable.

Let's have a look at one of the most advanced nanomaterials - graphene, which is two hundred times stronger than steel, and a million times thinner than a human hair, and which is an efficient conductor of heat and energy. When graphene becomes price competitive, it will be able to provide significant breakthroughs in manufacturing and infrastructure. It could cause great changes in the economies of countries dependent on any one particular commodity.

Also, innovative solutions have appeared in the field of thermoactive plastics. They can support the production of reusable materials that were previously considered unrecyclable, but today find a wide variety of applications, from mobile phones and circuit boards to components in the aerospace industry.

**2. Clean technology**

When the first industrial revolution took place, our ancestors did not know that coal mining meant the onset of what could become a climate crisis for our planet. The information is that by 2030 at least 50% of electricity should come from renewable sources, up from about 30% today.

These days renewables have already overtaken nuclear energy in electricity generation, so the Fourth Industrial Revolution will see us living in a cleaner and greener world, despite the fact that we are increasingly associated with energy consumption.

### **3. Virtual/Augmented Reality and Visual Innovation**

With the advent of virtual reality, architects can now “walk” users through a building before it is built, transportation engineers can simulate road driving, and tools adapted from video game technology can create realistic interactive experiences that help project stakeholders make faster decisions. And by connecting building information modeling (BIM) to virtual reality and augmented reality tools, it could be the next step towards reaping the greatest benefits from going beyond 3D.

The possibilities of virtual and augmented reality are changing our industry alongside with valuable and exciting new visual experiences.

### **4. Biomechanical devices and prostheses controlled by the effort of thought**

Relatively recently, the first prototypes of "smart" prostheses with feedback (emulation of tactile sensations) have appeared, which allow a person to feel what the prosthesis "feels". Also, devices separate from a person, controlled only through a mental interface (sometimes with invasive contacts, but more often it looks like a head hoop with a dry electrode), have already been created - computer games and simulators, manipulators, transport, etc. and inventions of new similar devices.

### **5. Genetic engineering – rejuvenation**

The first anti-aging technologies have already been invented, but they either only hide the cause, or the result quickly fades away, or the cost of the procedure is immense.

Human life will not be endless, but soon the people of the future will live longer and with minimal age-related changes. The first experiment has already been carried out, during which the technologies have allowed to extend the lifespan of human fibroblasts and to delay age-related changes by 15-20 years. According to the girl's opinion who agreed to this procedure, she began to feel younger and better. Her telomeres have increased from 7.33 thousand to 8.12 thousand base pairs, which is equivalent to a rejuvenation of 20 years.

In addition to above-mentioned technologies, there are already many other discoveries, or they are planned to be implemented, for example, 3D printing, robots, various nanotechnologies and biotechnologies, neural networks, genetic modification, food synthesis and much more. And all this is being created because the new industrial revolution already today creates such conditions for the development of technologies, in which it becomes possible to create an information technology environment for a person, more like a fairy tale than reality.

### **References:**

1. <https://www.cnbc.com/2019/01/16/fourth-industrial-revolution-explained-davos-2019.html>
2. <https://www.weforum.org/agenda/2016/01/the-fourth-industrial-revolution-what-it-means-and-how-to-respond/>

Section 03 Innovations in Engineering, Energy Efficiency and Alternative Sources of Energy

3. <https://www.finam.ru/analysis/newsitem/chetvertaya-promyshlennaya-revolyuciya-20170322-150818/>
4. <https://www.information-age.com/clean-tech-fourth-industrial-revolution-123474475/>
5. <https://ebaengineering.com/new-technology-future-aec-what-it-means-students-educators-practitioners/>
6. <https://trends.rbc.ru/trends/industry/6048e0629a794750974c67a7>
7. <https://www.tadviser.ru/index.php>

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### **Solar energy - an alternative or a myth?**

World energy consumption has been showing a stable growth for several decades. For the period from 2005 to 2015, the average annual growth was 1.9%, and the expected growth in the period from 2015 to 2035 was 1.3% per year. Therefore, the problem is the constant increase in the needs of mankind for energy sources. At the moment, humanity consumes energy from sources such as oil, gas, coal, nuclear energy, hydropower, alternative sources. But for natural resources there is a problem of their limitedness, although at the moment they provide 97.3% of all energy consumed [1]. This leads to an increase in interest and the development of the alternative energy industry, the main components of which are such types of renewable energy as:

- hydropower;
- wind energy;
- energy of biomass and biofuel;
- solar energy;
- geothermal energy.

According to forecasts, the consumption of renewable sources will increase to 10% in 2035, while the consumption of traditional energy sources - in particular coal and oil - will decline [1].

The development of alternative energy in Ukraine is relevant for the same reason as in the whole world - the depletion of traditional energy sources. This leads to the need to import energy, as a result of which electricity prices rise: from 2014 to 2021, tariffs increased by 300%, 400%, 30% and almost 10% for all consumption levels (up to 100 kWh / month., 100-600 kWh / month, from 600 kWh / month and regardless of the volume of consumption, respectively). Such changes lead to an increase in interest in alternative types of energy, both on the part of the population and on the part of the state. But in order to understand which type of energy is the best, it is advisable to carry out a comparative analysis based on the criterion of the cost of a unit of energy (MWh) generated from the above sources (Fig. 1). As you can see, solar energy is the second only to oil and wind energy in terms of cost. But at the same time, it is necessary to take into account the different purposes of use. Oil products, for example, are mostly used in the transportation industry and only a small part in the generation of electricity. While the rest of the types of energy are mostly involved in the generation of electricity and / or in the generation of heat.

Solar energy (solar energy) is a direction of alternative energy based on the direct use of solar radiation to obtain energy in any form. Solar energy uses renewable energy sources and is environmentally friendly, that is, it does not produce harmful waste during the active phase of use.

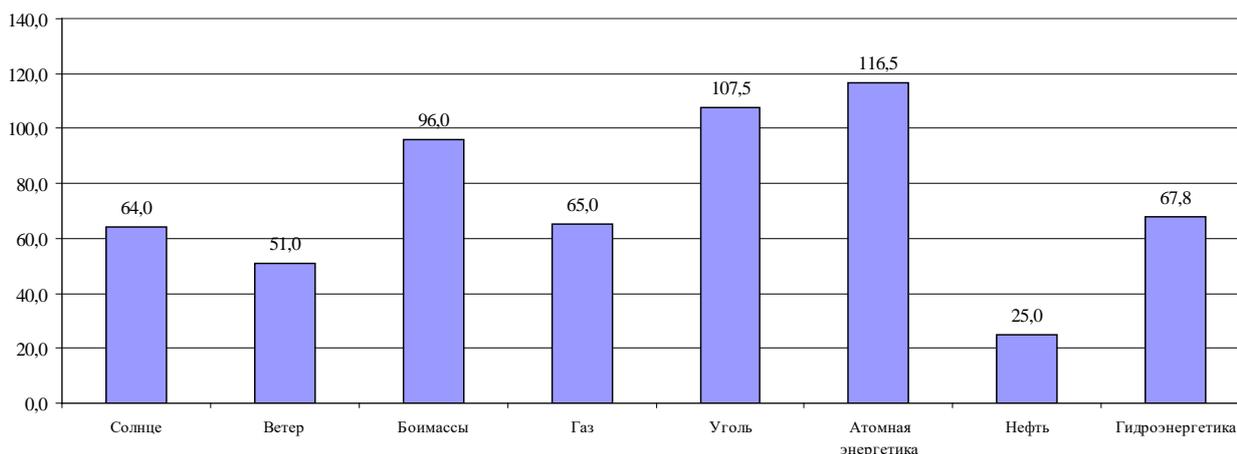


Fig. 1. Average cost of energy production (2015), USD / MWh [9], [10]

To understand the attractiveness of the solar energy market, it is necessary to take into account certain features of solar energy, such as the dependence of power and the amount of energy produced on climatic conditions and the territorial location of solar power plants.

The solar energy market in Ukraine began to develop actively with the introduction of the "green tariff" in 2009. Green tariff is a special tariff at which the state, represented by the state enterprise Energorynok, buys from enterprises and individuals electricity produced using renewable energy sources - sun, wind, biomass, as well as water (small hydroelectric power plants). The validity period of the "green" tariff is fixed by law until 2030.

As of 2019, the total capacity of industrial power plants in Ukraine is about 500 MW, while since 2010 the total capacity of industrial power plants has increased 62.5 times.

The total indicator of the potential and currently technically achievable level of solar energy use is 27.74 10<sup>5</sup> tons of oil equivalent per year (31.57 billion kWh / year).

In general, the solar energy market can be divided into two main segments:

- photovoltaic technologies (based on the use of special modules (panels), with the help of which sunlight is converted into electricity);
- solar thermal technologies (based on the use of not the luminous power of sunlight, but its temperature).

Photovoltaic (photovoltaic) solar technologies are based on the use of special panels with cells consisting of two layers of different semiconductor materials (for example, silicon), with the help of which sunlight is converted into electricity, which is then transmitted to the power grid, and in autonomous stations by installing batteries it is possible to store electricity for use, for example, at night. Solar power plants consist of solar modules connected in a single circuit, inverters and other equipment.

In terms of the size and purpose of the installation, solar power plants can be private (domestic) or industrial (commercial).

Private solar power plant - a solar power plant (relatively low capacity), the main purpose of which is to provide a private household with electricity. The main purpose of installing such a station is the desire of a private person to reduce the cost of electricity consumed by a household (although the possibility of selling excess energy received is not excluded).

Industrial solar power plants are engineering structures that convert solar radiation energy into electricity, located over a fairly large area. The purpose of such a station is to make a profit from the sale of electricity.

In Ukraine today there are approximately 10 thousand private and more than 2 thousand industrial solar power plants [6].

In turn, technologies for concentrating solar energy (CSP - Concentrated Solar Power), another name - solar thermal electricity (STE - Solar Thermal Electricity), or solar thermal technologies, are based not on the luminous power of sunlight, but on its temperature.

Elements of systems using these technologies concentrate thermal energy, which allows the generation of steam, which then propels the classic turbine and electric generator system. Such systems can work without stopping at any time of the day, even in the absence of the sun, because part of the energy can be stored for a certain time in a special thermal storage and gradually used for energy production. Concentration solar power plants are environmentally friendly and reliable enough to meet the growing demand for electricity around the world [5].

The positive factors influencing the development of the market, it is advisable for solar energy in Ukraine, should include:

- steady growth in prices for traditional energy sources;
- environmental requirements laid down in the Association Agreement between Ukraine and the EU;
- Ukraine's development program, which aims to provide 11% of the country's energy needs from alternative sources [2];
- "green" tariff;
- lack of competition for the consumer (all produced energy is bought by the state);
- favorable geographic location;
- reduction of prices for equipment;
- long period of operation (20-25 years);
- public availability and free of charge resource of solar energy.

–But at the same time, the use of solar energy equipment is complicated by the following problems:

- dependence on currency and currency fluctuations;
- high cost of equipment in terms of national currency;
- the main attractive factor is the “green” tariff, which is gradually decreasing and is only a temporary stimulus for development;
- high cost of electricity storage technologies;

Summarizing, it should be noted that the solar energy market in Ukraine is growing rapidly from year to year. Many positive factors, including the “green” tariff

set by the state and the geographical location of Ukraine, make the market attractive for investors. At the same time, the solar energy market in Ukraine faces several challenges.

First, the prices for electricity generated by solar power plants are set not by producers, but by the consumer - that is, the state. Producers are completely dependent on the "green tariff" and are unable to sell it to other consumers.

Secondly, the limited duration of the "green" tariff. The tariff is valid until 2030, there is no information on the availability of subsidies from the state in the future. At the same time, it is not known how affordable energy storage devices will become. That is, there is uncertainty about the presence of energy consumers in the future.

**References:**

1. BP Global, BP Statistical Review Of World Energy 2016. - 2016.
2. State Service of Statistics of Ukraine [Electronic resource]: Energy saving on the basis of new dzherel for 2007-2015 rock. - Access mode: <http://www.ukrstat.gov.ua>.
3. State agency for energy efficiency and energy safety of Ukraine [Electronic resource]. - Access mode: <http://sae.gov.ua/uk>.
4. Alteco [Electronic resource]. - Access mode: <http://alteco.in.ua/>.
5. Concentration (heliothermal) technologies of solar energy - CSP / STE [Electronic resource]. - Access mode: <http://renewnews.ru/info/technologies/csp/>.
6. TOP solar power plants in Ukraine by capacity [Electronic resource]. - Access mode: <https://karbon-cns.com.ua/top-solnechnyh-elektrostantsij-ukrainy-pomoschnosti.html>.

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### **Innovations in mechanical engineering**

Mechanical engineering is one of the most important sectors of the national industry because the level of its development influences the status of all other industrial sections and innovative vector of the country. Machine-building industry is the core sector of economy, which determines the level of efficiency, automation and the capacity of resources of the national production. Therefore, an urgent task is to identify the level of innovative development of machine-building industry of Ukraine. Scientific interest in studying the issues of innovative development of the machine-building industry enterprises is associated with the need of forming a competitive economy based on the promotion to a potentially new level, as well as to further increase the contribution to solving the problems of socio-economic development of the country. Experience shows that regions with a developed industrial complex are able to maintain high rates of economic growth.

The dynamics of engineering industry development largely reflects the state of the economy of the country. The decline at the turn of the decade was caused by the consequences of the global financial and economic crisis. In this regard it seems appropriate for us to distinguish three periods: the period of a steady growth, the period of a crisis collapse, and the period of gradual restoration of pre-crisis positions, stabilization and a subsequent slowdown in the industry growth [1].

Before the crisis the machine-building industry was characterized by high and steady growth rates. Anti-crisis measures introduced at most enterprises in the industry assumed austerity measures to save resources, time, and money. In the most difficult situations it was necessary to reduce production capacities and staff.

Significant technological gaps in comparison with Western enterprises included low profitability of the industry, low investment attractiveness, and the underdeveloped system of industrial cooperation (industrial subcontracting).

The investment projects were implemented with a distortion and did not affect the modernization of the enterprise, management system, and personnel training. The cornerstone was often not a new product and its modernization, but an increase in the production capacities for the release of an obsolete product [2].

Such a situation did not contribute to the recovery of previously lost positions in the engineering industry and required the formation of a new development strategy for the engineering complex, which must include an innovative component. The strategy for the innovative development of engineering in Ukraine is of particular importance associated with the central role of mechanical engineering for other sectors of the economy, resource intensity and a significant scientific potential. In order to introduce progressive changes in

mechanical engineering, it is necessary to have a scientifically based strategy for its development taking into account changes on the market [3].

A strategic resource for the development of mechanical engineering is technology. It forms the basis of the production potential. Changes in the quality of technological resources determine the dynamics of product quality. Production technology management is the most important factor in the dynamics of technical and economic indicators that determine the trends of economic performance in the context of the interaction of factors of the external and internal environments of the enterprise. So, the strategic goal for the development of the mechanical engineering complex of Ukraine should be the creation of new innovative machine-building sub-sectors and development of traditional machine-building sub-sectors oriented to modern production standards and investment demand, and the transformation of the machine-building complex into one of the main sources of sustainable economic growth. The fields of further research are:

- the determination of the types of activities in mechanical engineering, the so-called poles of innovation as significant lever for economic and productive systems;
- the separation of the directions of innovative activities in machine-building in the context of changing the structure of the industry.

The evaluation of innovative development of the industry must be fulfilled by taking into account the combination of structural, index and situational approaches. For this purpose, the four directions must be chosen:

- the manufacture of computers, electronic and optical products;
- the production of electrical equipment;
- the manufacture of machinery and equipment, not enlisted to other groups;
- the production of motor vehicles, trailers and semitrailers, etc.

With the increasing role of innovation as a key factor in socio-economic development and technological modernization of production, innovations in mechanical engineering are strategically important. In these conditions, the readiness of the state to create and promptly implement effective mechanisms to solve the issues of modernizing the economy, ensuring its growth and competitiveness is of particular importance. The introduction of the project management mechanism in the regional structure of managing the mechanical engineering industry will solve the large-scale problem of modernization and help achieve the innovative development of domestic mechanical engineering through the implementation of targeted programmes with targeted funding.

### **References**

1. Н. А. Дубровіна Інноваційна та інвестиційна діяльність вітчизняного машинобудування Український економічний вісник 3(11), 2014.
2. Vash, E. L. (2006) The main problems of the mechanical engineering complex during the implementation of the accelerated mechanism for economic environment development *Economic Journal* 13 pp 17–27.
3. Andrianov, V. (2013) System of balanced indicators of sustainable development of the economy until 2020 *Society and Economics* 1–2 pp 5 – 25.

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### **Engineering of the new millennium: the fourth industrial revolution and new world trends**

Our world is constantly improving and never stands still. It also refers to engineering. The main goal of engineering is to improve people's living standards. Over the centuries, the progress has been made with the improvement of tools, production technologies, the creation of new means of transportation, and so on. Now, in the 21st century, a new trend of computer engineering has emerged. It is to transfer all daily and monotonous work to computers, causing the start of the fourth industrial revolution.

The fourth industrial revolution, also known as Industry 4.0, is the transition to full automation of absolutely all processes and stages of production: all materials and elements necessary for the production of goods are ordered automatically in the right quantity; production products are created with specialized programs as virtual models, where they are checked by simulations for compliance with their technical requirements and finally produced with equipment having a remote configuration. In some cases, the manufacturer can monitor the condition of products throughout their all life cycle, from the start of operation to recycling, monitor the conditions of use and systematically update software. There are four main principles in Industry 4.0: compatibility, availability to information, technical support, detailing of management decisions.

Compatibility is the ability of computer equipment and people to interact with each other through the Internet of Things.

Availability of information is the provision to customers of accurate virtual models of real products, systems, functions that show their physical properties. It allows getting detailed information about the product: stages of production, conditions of proper operation and others.

Technical support is a partial or total transfer of human work to automated computer systems. They can be automated data compilations, their visualization and further use in calculating operations, replacing people in repetitive or dangerous work, and so on.

Detailing of management decisions is a description of work processes using clear algorithms of their execution. Its main goal is to provide the maximum amount of information for the development of technical support of a particular process.

Thus, all mentioned-above principles lead to the gradual complete replacement of manual labor by computerized systems. Such situation contributes to the development of all branches of engineering, giving new directions of development for computer engineering: the creation of systems of smart houses and factories,

autopilots, etc.; and updating others; the use of robotic systems in production, construction, etc. As a result, such engineering areas as the Internet of things, edge computing, 3D printing, artificial intelligence, digital twins and many others began to develop actively.

Internet of Things involves the interaction of computer systems with each other using the Internet without human intervention. So, today it is often used in systems of smart home or factories.

Edge Computing technology is actively used for automation. Its principle is that all information is processed directly in the places of its appearance (sensors, cameras) or in computers connected to a small group of them, which makes it possible to give the main computer only important data and not load it, as cloud computing does. Examples of using this technology can be conveyor sensors, which independently process the received information and transmit only data on the state of certain objects to the host computer.

Artificial intelligence is one of the fastest-growing technologies of our time. This program is created as a semblance of human logic so that it can be used in all areas of activity. The most frequent task of this technology is to think over further actions and assess the chances of certain situations, so it can be used as autopilots, to find suspicious banking transactions and in other like systems. This technology is also used to create autonomous robots.

Digital Twins is one of the most useful technologies for engineers right now. It provides the ability to create virtual models of desired objects with their further verification to avoid unnecessary resource costs. All this allows engineering teams to receive real-time information about how their product will behave in different situations.

3-D printer technology is currently being highly developed in the world. It became possible due to such advantages as full automation, no overspending and waste due to one technological stage which also makes the product stronger. Besides, this technology allows to perform structurally complex objects which are difficult to do in traditional ways. All these advantages lead to the conclusion that 3-D printing is a profitable solution for a small-scale production, aerospace and automotive industries in the manufacture of limited components. In medicine 3-D bioprinting of bones, organs and living tissues is being planned soon, while implants and medicine tools have already been printing with 3D printers. In construction industry, this technology is used for the construction of low-rise buildings. It also allows to make effective insulation with printing pores.

Therefore, all the above processes lead to the replacement of manual labor getting workers in the role of controllers. It means that nowadays most of the products are produced by automated machines and it significantly increases their quality. Engineers are able to implement the most complex projects because computer systems are able to analyze data quickly and perform the most complex and accurate calculations without errors, which are practically incapable for man. It significantly reduces time preparation, cost of work and provides an opportunity to develop large-scale projects with final result. Also, all these changes affect engineer's

skills and necessary knowledge, there is a growing need for professionals who can come up with creative and unusual solutions because all calculations and controls are performed by a computer.

**References:**

1.<https://delo.ua/business/chetverta-promislova-revoljucija-chogo-nam-ochikuvati-334676/>

2.<https://3ddevice.com.ua/faq-voprosy-i-otvety-o-3d-printerakh/chto-takoe-3d-pechat/>

3.<https://rg.ru/2019/08/08/3d-pechat-zdanij-vhodit-v-praktiku-massovoj-zastrojki.html>

4.<https://www.forbes.com/sites/bernardmarr/2019/11/22/the-5-biggest-technology-trends-disrupting-engineering-and-design-in-2020/?sh=7c7b7c78676a>

5.<https://www.engineeringpassion.com/top-engineering-trends-to-watch-in-2020/>

6.<https://www.itweek.ru/iot/article/detail.php?ID=198653>

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### Perspectives of renewable energy in Ukraine

Development and accumulation of renewable energy is a major direction of all industries. Since 2010, percent of alternative energy sources has increased more than twice.

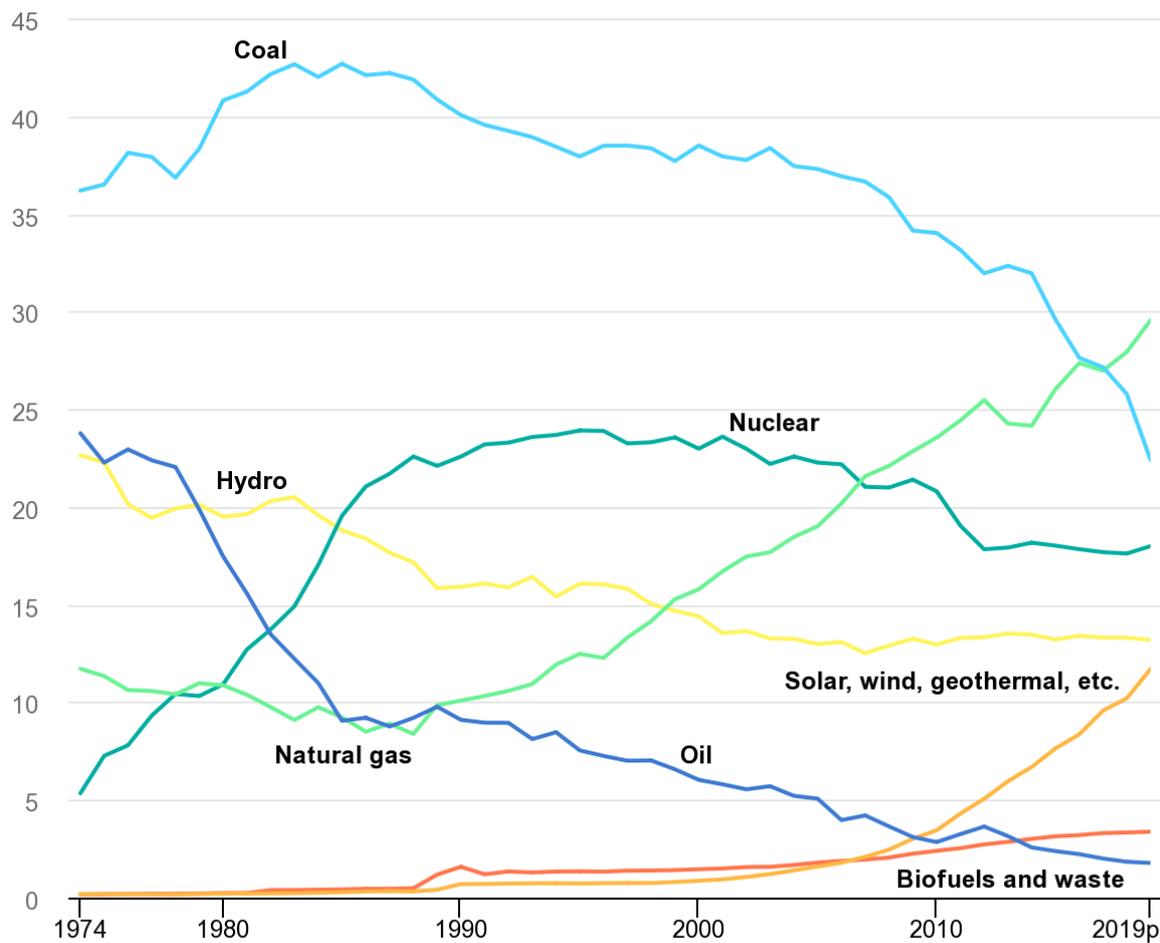


Figure 1. Global tendency of electricity energy sources by IEA[1]

According to the information in **Fig. 1** we can see that renewable sources of energy are already more popular than oil. And if a tendency in decrease of coal sources and increase in solar, wind etc. will not change, in 5-6 years renewable sources will provide more electricity than coal and oil together. That is how global statistics look, but what about Ukraine? What alternative source is already being developed?

So, what sources of energy are available in Ukraine now. According to the data provided by Ukrainian government in 2019 53,9% of all energy in the country were produced by nuclear power plants, 37,3% by TPC and CHP, 5,1% by hydroelectricity and 3,6% by solar, wind and biofuel stations. But in 2020 this data looks different:

51,2% by nuclear power plants, 35,2% by TPC and CHP, 5,1% by hydroelectricity and 7,3% by solar, wind and biofuel stations. Based on that it can be noticed that for one year the percentage of renewable sources has doubled and solar stations (5,576 MWp) and wind stations (1,207 MWp) are the main focus. Of course, it cannot happen every year but if we look at more width period (Figure 2) we can see a stable growth. But the issue is still under the question.

Percent of renewable energy in all Ukrainian electricity system

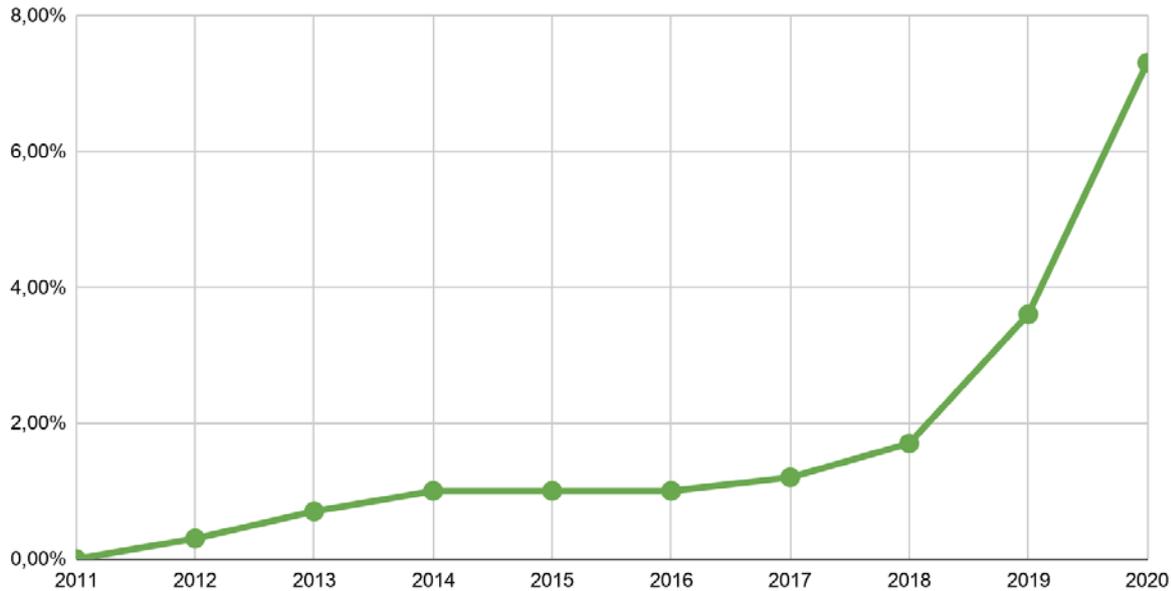


Figure 2. Growth of renewable energy sources in Ukraine

There are a few reasons to worry about. If a rate of percentage growth of solar and wind stations in total energy production rises even faster, it can provide a collapse of the economy. That is way it is necessary to take into consideration two important things about specific features of solar power stations.

Firstly, the climate in Ukraine is temperate continental, and in average there are 105 rainy or snowy days in a year. So, it is important to have a stable backup power source or accumulate power. Secondly, the issue of materials. The energy is “green” but the accumulator for stable work of the grid is expensive and consists of toxic materials. With time it will change, but for now it may be a problem.

The wind power has the same drawbacks as solar, namely, unstable work. Moreover, it can cause bigger electricity tariffs because of expansive in-service accumulators and huge areas of solar panels. But instead of building a big number of accumulators it can be prevented by combining the power sources like hydro or nuclear stations as it was done in France.

Biofuel can be a promising industry. Biogas and biomass are considered to be stable sources of energy and can be produced from animal and agriculture farm wastes. To increase the number of sites producing electricity, 6% of fields can be allocated for growing corn silage that can be used as a fuel to cover nearly 50% of all fuel needs. But it should be noted that a better solution is combining it with Biomass

and using as additional power supply. The reason for that is ecosystem disturbance caused by the farming of great areas of land. In 2020 biomass and biogas together produced only 177 MWp, for example, household's SP produced 618 MWp.

So, we can say that this part of Ukrainian energy industry only starts to grow and will not take a leading position during next 5 years. However, it may become a good additional energy source for the agricultural industry, but it is really a great risk to turn it into a main power source.

It should be concluded that "green" energy has a great potential, and Ukraine is taking major steps to increase the percentage of alternative sources in the power grid. But it should be done more carefully and without any doubts. According to the information provided by National Energy and Utilities Regulatory Commission there is a big chance of "green" energy benefits in the case of energy crisis in Ukraine.

**References:**

1. Electricity Information: Overview, Statistics Report, July,2020, [Online]. Available: <https://www.iea.org/reports/electricity-information-overview>
2. State Service of Statistics of Ukraine, [Online]. Available: <https://ukrstat.org/en>
3. Ukraine 2050., Green energy transition concept, [Online]. Available : [https://mepr.gov.ua/files/images/news\\_2020/14022020/eng\\_pdf\\_%D0%B7%D0%B5%D0%BB%D0%B5%D0%BD%D0%B0%20%D0%BA%D0%BE%D0%BD%D1%86%D0%B5%D0%BF%D1%86%D1%96%D1%8F%20\(1\).pdf](https://mepr.gov.ua/files/images/news_2020/14022020/eng_pdf_%D0%B7%D0%B5%D0%BB%D0%B5%D0%BD%D0%B0%20%D0%BA%D0%BE%D0%BD%D1%86%D0%B5%D0%BF%D1%86%D1%96%D1%8F%20(1).pdf)
4. Green economy options for Ukraine: opportunities for greening the energy sector, Jeneva-Kyiv,2018, [Online]. Available: <http://www.green-economies-eap.org/resources/Ukraine%20Energy%20ENG%2027%20Jun.pdf>
5. National energy and utilities regulatory commission, [Online]. Available: <https://www.nerc.gov.ua/>

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## Simulation and investigation of the influence of constructive parameters of the bicycle frame on its ergonomic properties

The modern world is impossible to imagine without the widespread use of such an environmentally friendly means of transport as bicycle. Around the world, a large number of developers have created many different models of this mode of transport. The development of this industry is associated with the emergence of new technologies, materials, and design concepts. There are many types of bicycle frame designs. Determining and studying the influence of the design parameters of a bicycle on its movement, ease of operation and use is an urgent scientific and technical task.

The idea of the project is to use a modern computer and mathematical modelling device to combine and identify the relationships between the design parameters of the frame and the ergonomic properties of the bike. The use of the obtained results makes it easier to choose a bicycle corresponding to a person's body parameters.

The parametric model of the frame is shown in the sketch of the computer program SolidWorks [1] (Fig. 1). A parametric three-dimensional model of a bicycle frame is based on this sketch. The calculation of the model was performed using the SolidWorks Simulation package, which implements the finite element method. The accuracy of the obtained results is proved by solving this problem using analytical methods, the difference in the results does not exceed 5%.

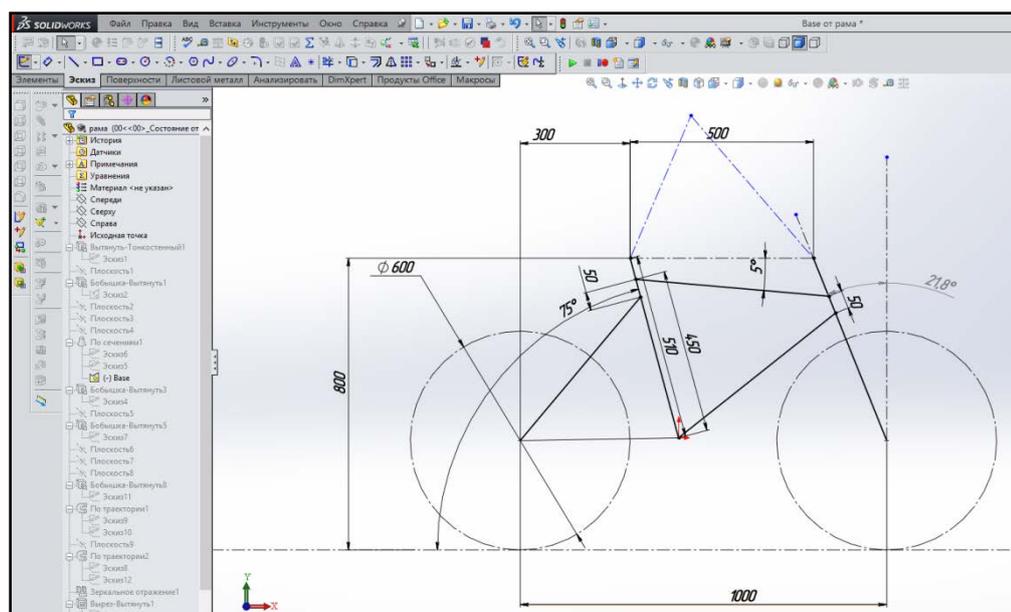
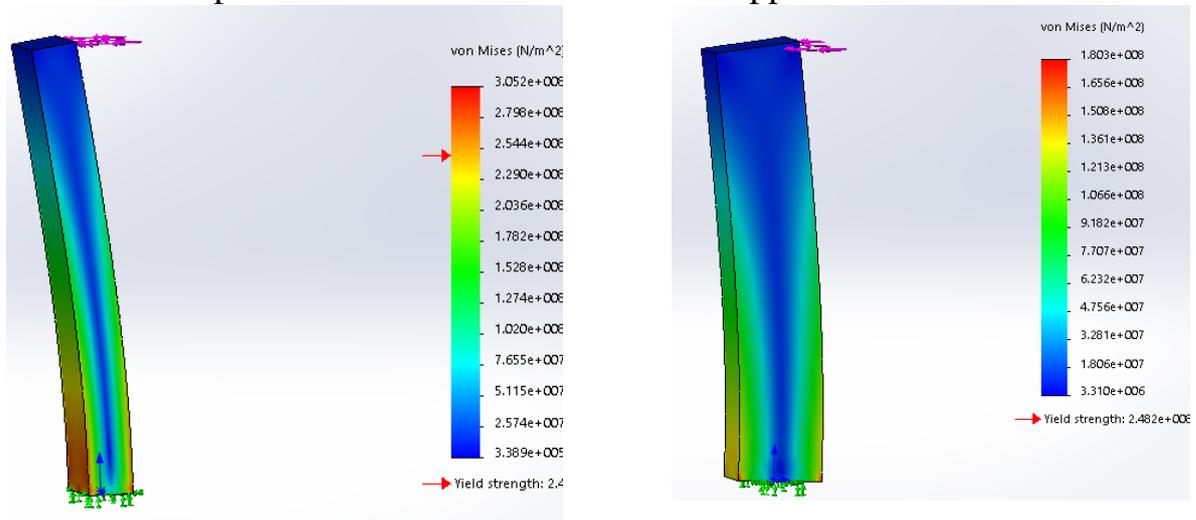


Figure 1 - Parametric sketch of a bicycle frame in Solidworks

The results of the calculation of the influence of the cross-sectional orientation on the beam stress are shown in Fig.2. It is estimated that the location of the longest cross-sectional side perpendicular to the applied force increases the stiffness and strength of the beam, but the greatest effect is given by the location of the longest cross-sectional side parallel to the line of action of the applied force.



a) Section dimensions  $10 \times 20$  mm    b) Section dimensions  $20 \times 10$  mm

Figure 2. The effect of cross-sectional orientation on the beam stress

Thus, the shape of the cross-sectional and the material of which it is made have a great influence on the strength of the beam. The higher the overcrossing along the force line, the stronger the beam is. That is why the profile of the lower tube of the bicycle is in the shape of an ellipse, the longest pivot of which is placed vertically.

As a result of numerical investigations, it was found that the radius of the bicycle turning circle is directly proportional to the length of the wheelbase and to the cosine of the front wheel's inner cushion; the grip of the kernel affects how the bicycle reacts to a turn (the shorter the grip, the more manoeuvrable and less stable the bicycle); the lower carriage gives more stability, which allows easier braking, but there is a greater risk of snagging the pedal in the ground; the higher carriage gives more clearance, which allows more rotation, but gives less stability. The seat tube grip shifts the rider's weight and affects the parameters of wheel traction; a smaller handlebar grip allows more control of the bicycle.

The strength of the frame made of steel 3 and aluminium alloy 6061 was analysed, which showed that the weight of the frame made of aluminium alloy is reduced by 2 times compared to a steel frame, the level and localization of stresses remain the same, but the stiffness decreases. The price of a bicycle with an aluminium frame is almost 10 times higher than the price of a bicycle with a steel frame.

## References

1. About bicycles: interesting facts [Electronic resource]: Access mode: <https://elitebike.ua/vse-o-velosipedah-interesnye-fakty-uk/> - Title. screen.
2. GOST R 52111-2003 Bicycles. General technical conditions [Electronic resource]: Access mode: <http://docs.cntd.ru/document/gost-r-52111-2003>. - Name with title. screen.
3. Zinoviev DV Fundamentals of modeling in SolidWorks. 1st ed. / ed. MI Azanova. –M.: DMK Press, 2017. - 240 p.
4. Guznenkov VN SolidWorks 2016. Three-dimensional modeling of parts. - M.: MFTY, 2018. - 128 c.
5. Anuryev VI Handbook of designer-machine builder: in 3 vols. Vol. 1. - 8th ed., Reworked. and ext. Ed. IN Zhestkova. - M.: Mashinostroenie, 2001.
6. Aluminium alloy 6061 [Electronic resource]: Access mode: <https://aluminium-guide.ru/alyuminievyy-splav-6061/> - Title. screen.
7. Aluminum frames [Electronic resource]: Access mode: <https://journals.sagepub.com/doi/full/10.1177/1687814017739513>
8. Structural analysis and optimization of bicycle frame designs. 2017 [Electronic resource]: Access mode: <https://journals.sagepub.com/doi/pdf/10.1177/1687814017739513> Accessed on [22.03.2021](https://journals.sagepub.com/doi/pdf/10.1177/1687814017739513)

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**Analysis and Calculation of Technological Parameters of "Step Shaft"  
Forging in the Conditions of LLC "DNEPROPRESS STEEL".  
Analysis of the Range of Products of the Shop**

Forging-thermal shop at "DNEPROPRESS STEEL" intended for the production of forgings from carbon and alloy steel grades, forging and pressing engineering. Production of shop is small-scale, on separate types — individual forgings.

The factory produces forged steel billets (forgings) from carbon and alloyed steels by hot free forging, using hydraulic presses with a force of 12.5 MH, 20 MH, 40 MH, working in conjunction with a force manipulator 20t.

The forgings are tested for mechanical properties, hardness control and ultrasonic testing.

Forgings are produced by free forging on hydraulic presses and steam air hammers.

The nomenclature of manufactured products of the shop represents the following types of forgings:

- shafts of round section  $\text{Ø}250\text{—}460\text{mm}$  L 1500—7300mm;
- shafts of square cross section 250—400mm L 1500—6000mm;
- plates, size 120X300—750mm L 1500—4500mm;
- shafts of round section with ledges;
- shafts of round section with a flange;
- shafts of round section with a recess;
- disks, disks with openings, gear wheels  $\text{Ø}1000\text{mm}$  H 180—520mm;
- —rolled rings  $\text{Ø}800\text{—}1200\text{mm}$  H 250—600mm;
- cylinders with holes  $\text{Ø}400\text{—}700\text{mm}$  L 2500mm.

The initial material for forging production under presses is an ingot weighing from 1t to 18t.

**Ways to improve equipment and technological process.**

The ultimate goal of the technological process is to expand the range of products, improve its quality and production efficiency. To achieve the ultimate goal, technology as a science and practical activity must be developed in the following priority areas:

- Complex automation of production processes;
- Introduction of resource-saving and energy-saving technologies, modern methods of packaging, storage and transportation of products;

- The need for new types of raw materials for reducing the need for its import and increasing raw materials resources;
- Equipment upgrades according to scientific and technological progress.
- Introduction of management systems to monitor the condition of products;

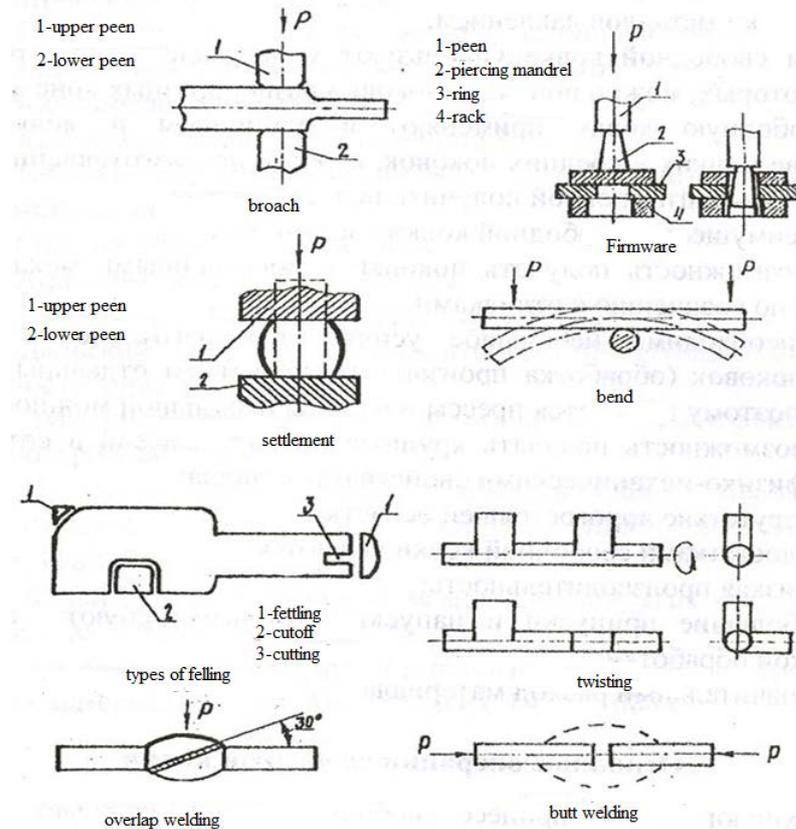


Figure 1. Basic free forging operations

### Substantiation of rational technological process for a detail manufacturing

Technological scheme of forging is a sequence of basic technological operations, as a result of which forgings of the required quality and configuration are obtained.

In the technological process operations are used: drawing, upsetting, piercing, cutting, reeling.

According to the method of forging, they are divided into [1]:

Forged - made with sledgehammers, hammers and heavy presses. This method increases the ductility of the metal, but the accuracy of shapes and sizes of forgings is inferior to stamped blanks;

Stamped-produced in the stamp by deformation of the metal into a mold.

The main factors that determine the choice of the optimal technological process of forging for further machining are: configuration and geometric dimensions of the part, the ratio of its individual elements, steel grade, technical requirements for manufacturing, scale and specific production conditions.

Due to rising prices for raw materials and energy, there is a need to improve existing technological processes. When choosing a technological process, it is necessary to proceed from the fact that the process must be economical, maximally mechanized and meet safety requirements. Therefore, the improvement of the technological process of forging production is primarily due to the reduction of the amount of metal consumed for forging.

The main disadvantages of this production process are: low productivity, large overhangs on forgings, large allowances tolerances, i.e. increased metal consumption.

The main stages of development of the technological process of forgings production are: technical and economic comparison of possible forging options and an approximate choice of forging method; development of a forging drawing according to the drawing of the part; determination of the volume and weight of the workpiece according to the drawing of the forging, taking into account the metal waste during the manufacture of forgings; determining the size of the required forging and determining the appropriate dimensions of the workpiece; establishing the types, quantity, sequence of forging operations for the manufacture of forgings, as well as the selection or design of the appropriate tool; development of a thermal mode of heating, heating and cooling of forging; selection of type and size of equipment for forging; calculation of the composition of the working team and time norms for forging.

Drawing up of drawing is carried out according to GOST 7062-90 "Forgings from carbon and alloy steels, made by forging on presses" [2].

For steel grade 40X, the recommended forging interval is 1200-700 °C. The schedule of heating of cold billet is shown in Picture 2. The total heating time is 8 hours. Cooling after forging is carried out in an unheated well.

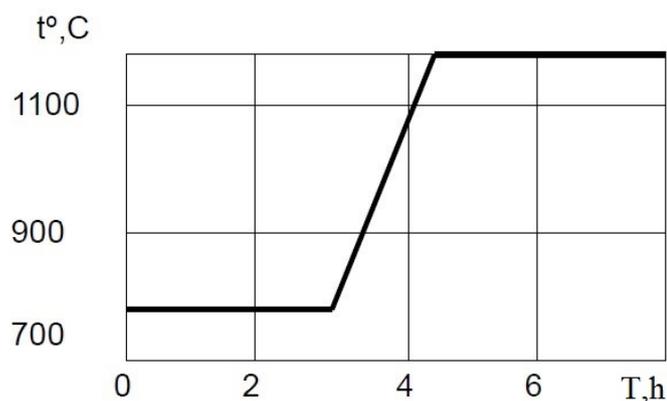


Figure 2. Schedule of heating the workpiece, °C

After forging and stamping, forgings are subjected to heat treatment, which changes the structure of the metal and improves the mechanical and technological characteristics of the metal, such as machinability.

The main stages of development of the technological process of forging are [3]:

- Drawing up of the forging with purpose of allowances and definition of weight of forging;

- Determination of the mass and dimensions of the billet, and the choice of ingot or rolled products for the billet;
- Choice of the basic, auxiliary and finishing forging operations and their sequence, and also the main and auxiliary tools and applications;
- The choice of forging equipment of the necessary power and overall dimensions;
- Installation of modes of heating and cooling of forging, types and the sizes of heating devices;
- Determining the composition of service personnel and time norms for forging;
- Development of measures for the organization of the workplace and labor protection.

The order of the technological process:

- First, heat our workpiece to a temperature 1200<sup>0</sup>C;
- After heating, the workpiece is subject to bleaching, i.e. giving it a cylindrical shape and eliminate the versatility of the ingot;
- The next operation is the upsetting, it consists in increasing the cross-sectional area of the workpiece while reducing its height, the upsetting is performed by plates for upsetting;
- Further, there was a drawing to the main diameter of Ø238mm;
- After was a drawing to the main diameter, a ledge 449mm was made;
- The next operation was drawing the ledge in diameter Ø197mm;
- Next, the size of the obtained forging was checked;
- After checking the dimensions, heat treatment was performed;
- The last stage was the quality control department.

In the main part the forging "Step shaft" was designed. The weight of the workpiece, considering the loss of metal during its processing was calculated. An eight-lobed forging ingot with a weight of a decent part of 1.27 tons and an average diameter of 435 mm was selected as a blank. The temperature range was selected within 1200-800 °C. The calculations of the equipment forces, which showed that the required forces are equal to 16.8 MH, were performed, therefore a press with a force of 20 MN was chosen for all operations. Next, the devices for the production process and the tool were selected. At the end of the main part, calculations of hourly productivity, which is 535 kg / h were performed.

**References:**

1. Methodical instructions: TECHNOLOGY OF FORGING AND STAMPING PRODUCTION Section I. Free forging / AG Tuboltsev - Dnepropetrovsk NMetAU 2008
2. GOST 7062-90 Forgings from carbon and alloy steel made by forging on presses
3. Forging and volume stamping of steel: Handbook / MV Watchmen. - 2nd edition, reworked. - M.: Mechanical engineering, 1967-1968. - T. 1-2. (97-116s, 246s.)

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### **Wind energy as an alternative source of electricity**

In modern Ukraine, a large amount of electricity is restored from non-renewable sources. (gas, coal, oil, uranium). According to experts, the reserves of these energy resources will last for another 40-100 years. Every year they are mined in increasingly hard-to-reach places. Therefore, their extraction becomes more expensive and the economic efficiency of the use of fossil fuels is rapidly declining. Humanity, already faced with an energy crisis, is trying to find new, environmentally friendly, and renewable sources of electricity, more profitable in terms of cheapness and transportation.

These non-traditional ways of obtaining, transmitting, and using energy are called alternative energy (green energy). That is, such kind of energy is obtained from natural renewable sources and does not harm the environment. The most popular sources of alternative electricity in Ukraine are wind and sun.

The wind has a certain speed (in average annually and monthly), direction, intensity of gusts and duration of calm. All this determines the expediency of building wind turbines on the territory of the country. The most relevant places for the installation of turbines are the seacoasts and steppe zones.

Since all these conditions common for our country are harmoniously intertwined, foreign companies invest their funds in the construction and operation of wind turbines thus contributing to the development of electricity in the country and increasing job vacancies.

At the moment an energetic sector dealing with wind energy production boosts, as the largest companies are making huge investments in projects for the development of alternative energy in Ukraine. This is Trident Energy, a domestic company that attracts leading European contractors. Vestas is a huge internationally renowned company based in Western Denmark. And the world leader in the production of clean energy, GE Renewable Energy, working in partnership with DTEK. LLC "Furlander Windtechnology" is the first and still the only enterprise in Ukraine for the production, installation, and maintenance of wind power plants (WPP) of multi-megawatt class. DTEK RES is one of the largest producers of electricity from renewable sources in Ukraine.

Providing at the legislative level a "green" tariff for the purchase of alternative electricity in our country makes Ukraine very attractive for the investors, who, in turn, create new jobs for specialists in this area, including graduates from our university and allow to reduce energy resources imported due to frontier. According to the Energy Strategy of Ukraine until 2035, the total share of renewable sources by 2035 should be 25%.

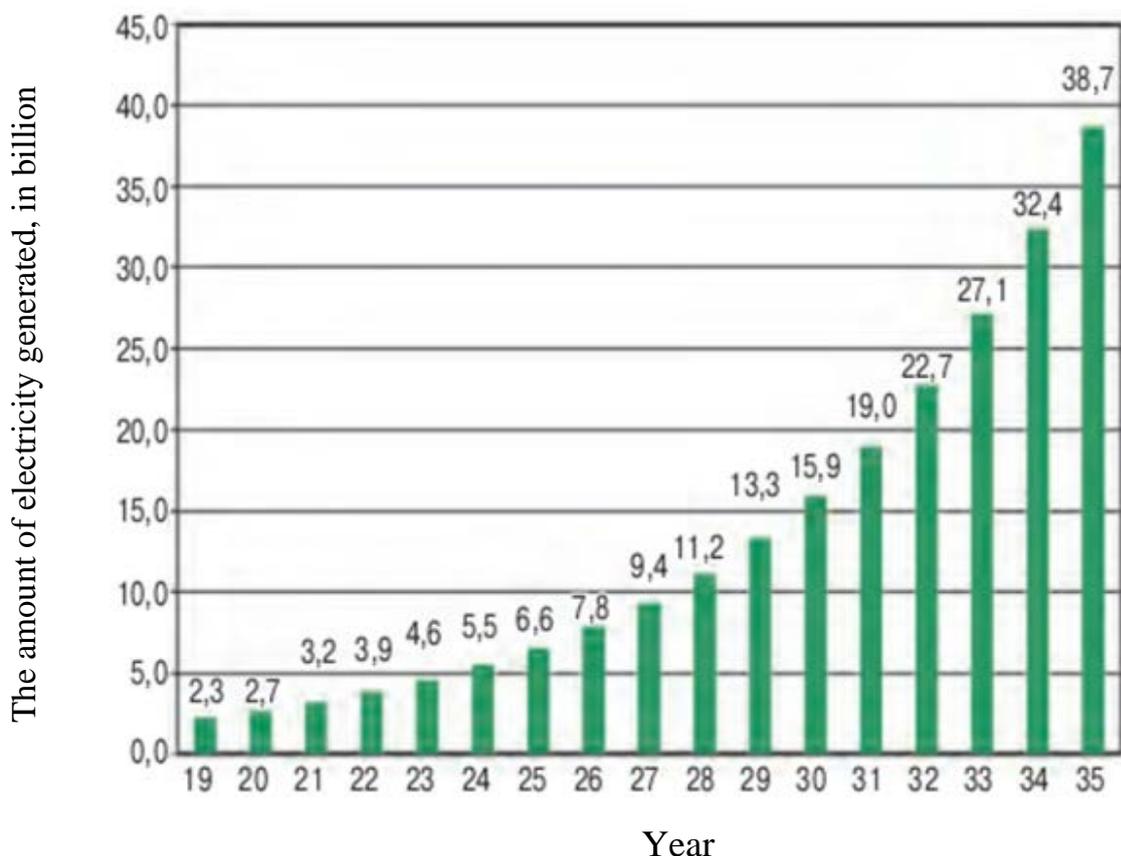


Fig. 1 Growth dynamics of electricity production from renewable energy sources to meet the conditions of the "Energy Strategy of Ukraine."

It should be concluded that Ukraine has a great potential for the development of wind power. The reasons for that are good location and favorable weather conditions for most of the year. To achieve sustainable development in the field of alternative sources of energy sufficient funding and development of this direction, it can become very successful in the green electricity market.

**References:**

1. Sustainable development DTEK. [Online]. Available: [https://renewables.dtek.com/en/sustainable\\_development/](https://renewables.dtek.com/en/sustainable_development/)
2. Ветроенергетика в Украине. [Online]. Available: <https://tridentenergy.ua/ru/wind-power-present-and-future/>

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### **Features of modern drive systems use in the mining industry**

Until a few decades ago, the claim that thyristor DC drives are the most advanced technologies for the mining industry had a right to exist. This is no longer the case today. And largely due to the fact that the reduction in power consumption while improving the technical characteristics of the AC drive has become absolutely real thanks to the development of mechatronics, electronics and program control.

This article is devoted to the solution of the actual scientific and applied problem of the modern quick-acting drive systems, frequency characteristics, dynamic compatibility with the mining machines' dynamic characteristic.

The research is done with the help of methodology of experimental study of armature current of DC drive and stator current of AC drive, as well rotational speeds, powers consumption, vibrations and displacements of pressure swivel head crosspiece and their harmonic analysis of transient graphs in the start drilling modes.

Analyzing the experimental data [1-10] obtained in the mining and geological conditions of mining and processing plants, the following generalizations one can be made:

1. Increase in the speed of the bit rotation leads to increase in the frequency and amplitude of the drill rod oscillations;
2. Axial pressure on the drill rod practically does not affect the values of the frequencies of forced vibrations;
3. With increase in drilling depth, the vibration amplitudes increase due to a decrease in the rigidity of the transmission (since with an increase in the depth of the well, the operating rotation frequencies become lower).

In the drilling rig SBSHs-250N in the with an AC transistor drive there has appeared new regularity: with an increase in the rotational speed of the drill bit, the unacceptable oscillation amplitudes of the drill rod appear at frequencies lower than in the SBSH-250MN-32 drilling rig with a DC drive.

Factors causing vibration of the drill string during rock destruction can be divided into two classes:

1. External disturbances arising from the interaction of the roller cutter with the face and the impact of the rod during drilling on the inner surface of the well;
2. Internal disturbances arising from the natural vibrations of the drill rods.

In the amplitude-frequency characteristics spectra of the SBSHs-250N drill rig vibration a harmonic appears at the frequency  $f = 15.92$  Hz, which does not depend on the rotation frequency. The remaining harmonic components are subject to the same laws as for the SBSH-250MN-32 drilling rig. The appearance of harmonics of oscillations of the drill string, which are independent of its rotation frequency, indicates the manifestation of the internal dynamics of the drill string in the drilling

process. Thus, in the SBSHs-250N drilling rigs, when developing drive systems, it is necessary to take into account the natural vibration frequencies of the drill string.

At a rotation frequency of 120 rpm, there has been the approach of intrinsic and forced oscillations of the drill string, that is, the latter operates in a mode close to mechanical resonance, which negatively affects the durability of the nodes and the drilling rig as a whole.

The main disadvantage of an analog DC drive is its low noise immunity, difficulty in setting, and instability of parameters. A tachometer-generator is used as a speed feedback sensor, which has the same disadvantages as a collector motor. For reversible drives, a diode bridge has to be installed after the tachometer-generator, which limits the control range at low speeds due to the loss of feedback. In the case of mining mechanisms with different drives in the program mode, a frequency converter is much preferable, since digital encoders such as resolvers or sin / cos converters are used as a speed sensor, which makes it possible to build systems with stability of rotation. The presence of additional devices (options) of frequency converters allows increasing the functions of the latter: increasing the number of inputs and outputs, using modern buses and communication protocols, using the drive in positioning devices, monitoring the temperature mode of the motor and drive, using the drive in the virtual cam mode (variable rotation speed for one revolution of the shaft) and much more.

Modern microcontrollers that control the frequency converter allow processing data for a period of several tens of microseconds (ten years ago this time was 200 ms), which made it possible to expand the control range with feedback up to 1: 1000 with an accuracy of maintaining the speed of 0.2 revolutions throughout range, which brings frequency drives closer to servo drives.

However, given the steady growth in the variable speed drive market, the size of the DC drive market is expected to remain more or less stable for some period.

## **References**

1. Хілов, В.С. (2013) Системи керування автоматизованими електроприводами кар'єрних верстатів шарошкового буріння: монографія. Д.: Національний гірничий університет, 256 с.
2. Khilov, V.S. (2013) A solution to the problem of frequency compatibility between drive system and dynamic parameters of drilling rings. Energy Efficiency Impotent of Geotechnical Systems, 93-103.
3. Хілов, В.С. (2012) Дослідження інформаційно-аналітичних властивостей електромеханічної системи при нелінійній корекції за завданням потужності. Науковий вісник, (2), 92-97.
4. Кожевников, А.А., Хілов, В.С., Бельчицкий А.П., Борисевич А.А. (2012) Экспериментальные исследования технологи бурения с импульсным вращением инструмента. Науковий вісник НГУ, (6), 86-91.
5. Пивняк, Г.Г., Бешта, А.С., Хілов, В.С. (2004) Управление приводом вращения става шарошечного бурения на основе асимптотического идентификатора состояния. Электротехника, (6), 23–26.

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### **Solar power as an alternative energy source in the modern world**

Existing energy sources are divided into traditional and alternative. The traditional minerals include oil, gas, and coal. Their biggest drawback is that they are non-renewable resources. This is the first factor that motivates to recognize the need to use other energy sources. Sooner or later, even the richest deposits will exhaust themselves, so the search for new options for energy becomes more relevant every year. Today alternative energy sources (AES) are already widely used for solving energy problems, not only commercially, but also in the private sector. The availability of technologies for producing energy from inexhaustible sources allows you to build a house with volatile environmentally friendly infrastructure in remote areas, and to solve energy problems of the existing facilities.

These alternative sources of energy, as the energy of sunlight and wind are used for energy and water heating, geothermal heat of the earth - for heating and cooling buildings. Converting solar energy into electrical energy takes place by means of photovoltaic wafers of silicon - the most common element on the planet. Solar cells based on silicon wafers have a long resource life - more than 25 years and, depending on the production technology, to retain 80% of its efficiency during the whole life. The amount of energy obtained from solar panels varies and depends on the location and solar activity in different seasons. The efficiency of energy conversion in solar cells is up to 20%, depending on their production and the purity of silicon [1]. The technology is developing rapidly and the performance indicator is constantly growing.

The leading non-polluting source of energy is the sun. Currently only an insignificant part of the solar energy is used due to the fact that the existing solar cells have a relatively low efficiency and are expensive to manufacture. However, do not immediately refuse from virtually inexhaustible source of clean energy: According to experts, solar power could alone cover all conceivable human needs for energy for thousands of years. It is also possible to increase the efficiency of solar power plants in several times, and placing them on the roofs of houses and with them, we will provide housing heating, water heating and operation of household appliances, even in temperate latitudes, not to mention the tropics. For the needs of the industry, requiring a lot of energy, you can use the kilometer wasteland and desert, completely lined with powerful solar systems. But before that solar energy gets a lot of difficulties with the construction, deployment and operation of solar energy installations on thousands of square kilometers of the earth's surface. Therefore, the total share of solar energy has been and will remain relatively modest, at least in the foreseeable future. Over billions of years the sun every second emits enormous energy. About a third of the energy of solar radiation reaching the Earth, it is reflected and scattered in interplanetary space. Much solar energy goes into heating

the Earth's atmosphere, oceans and land. Currently, the national economy often uses solar energy in solar energy installations (different types of solar greenhouses, greenhouses, desalination, water heaters, and dryers). Solar rays are collected at the focus of a concave mirror; most refractory metals are melted. Work is underway to build solar power stations, solar energy for home heating, etc. [2]. Practical applications are semiconductor solar batteries, allowing directly convert solar energy into electricity.

Lack of resources in remote regions, in conjunction with the rapid development of technology has led to a situation where the production of solar cells is rapidly gaining momentum, and the cost of final products with each passing year becomes more and more accessible to consumers with an average income. And if yesterday solar installations the technology was available only for the space program, it is already a mini-solar power plants, like mushrooms, growing on the roofs of houses and garden plots.

**Solar power** is used to process solar radiation, transforming it into electrical energy. The solar energy system can be constructed as a circuit on the thermodynamic conversion of solar energy, and direct conversion scheme latter into electrical energy (using photocells). In the first case the first solar radiation is converted into heat and only then (using a heat source) is converted to electrical. [3]. In the second embodiment, the conversion of solar energy into electricity is done at the expense of the electronic properties of solar cells (through the use of "photoelectric effect"), i.e., used solar modules.

The category of solar energy storage can be attributed to the so-called collectors or heat accumulators, which, like the photocells, are installed on the roofs of buildings and houses. The collector is a construction of the connecting pipes and tanks, painted in black color. Structures with similar coverage due to strong absorption of solar radiation can heat the water contained in them up to 70 degrees Celsius. And in sunny weather is heating possible even at zero temperature of the ambient air. The number of heated water, its operating temperature, and the period of heat accumulation depends only on the used container size.

#### **References:**

1. Gemma Herranz, Gloria P. Rodriguez. Uses of Concentrated Solar Energy in Materials Science. -Spain: INTECH, 2010. ISBN 978-953-307-052-0, 399 p.
2. Vissarionov V. I., Deriugina G. V., Kuznetsov V. A., Malinin N. K. Solar energy. Textbook for high schools. Moscow: Publishing House MEI. 2008., 320 p.
3. Miroshnichenko L. I. Physics of the Sun and solar-terrestrial relations. Tutorial. Moscow: University Book, 2011. ISBN 978-5-91304-191-3. 174 p.

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### Electric vehicles: advantages, disadvantages, and prospects of use

An electric car is a car that uses one or more electric motors to drive. An electric vehicle can be powered through a collector system by electricity from external sources, or it can be self-contained with an independent source of electricity, such as a battery, fuel cells, or an electric generator that converts fuel into electricity. The electric motor provides the electric vehicle with a constant level of torque, powerful and smooth acceleration.

The line graph below illustrates the number of electric vehicles in different regions of Ukraine. It shows that the number of electric vehicles in Ukraine in 2020 increased significantly in a region such as Odessa, while in Luhansk it reached the lowest point. Between Vinnytsia and Chernihiv, Volyn and Chernivtsi, this figure remains stable. If we compare such cities as Kharkiv and Donetsk, Kiev and Vinnytsia, Lviv and Volyn, the situation is quite different. The chart shows a sharp increase in Kiev, Lviv, and Kharkiv, and a significant drop in Vinnytsia, Volyn, and Donetsk, respectively (Fig. 1).

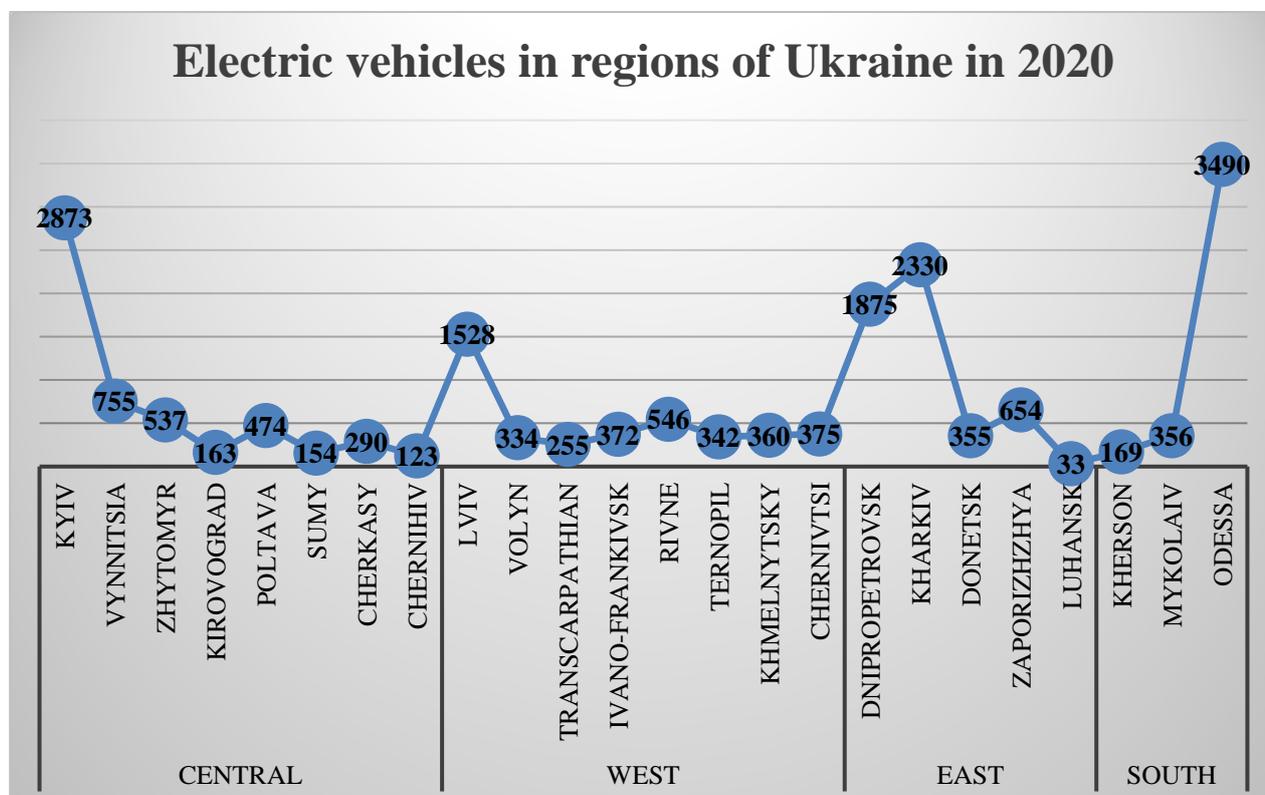


Figure 1. Electric vehicles in regions of Ukraine in 2020

During the research and analysis of this issue, we found out some advantages and disadvantages of using cars equipped with an electric motor. There are three main points, such as environmental friendliness, ease of use, and economic benefit.

The first is the impact on the environment. Exhaust gas pollution is a well-known fact. In addition, gasoline and diesel engines create a greenhouse effect on the Earth's surface. The use of electric vehicles does not involve such problems, which significantly affects the preservation of the environment.

The second is ease of use. The main difference between electric cars and conventional cars is the absence of an internal combustion engine and a transmission. Instead, there is a special battery that needs to be charged. This makes the electric car more mobile.

Finally, the last point is the profitability in service. The electric car allows saving money on fuel, while fuel costs are among the main expenses in servicing cars. In addition, the electric car can be charged from a conventional 220 V outlet that once again emphasizes the convenience of electric vehicles.

The graph below shows that the number of registered electric vehicles in Ukraine fluctuates from the fourth quarter of 2016 to the first quarter of 2018. Further, we observe that this number increases sharply and steadily from the first quarter of 2018 to the third quarter of 2018. It then moves forward unchanged, but in the first quarter of 2019, the number increases, reaching its highest point in the third quarter of 2019. In the fourth quarter of 2019, it began to fall (Fig. 2).

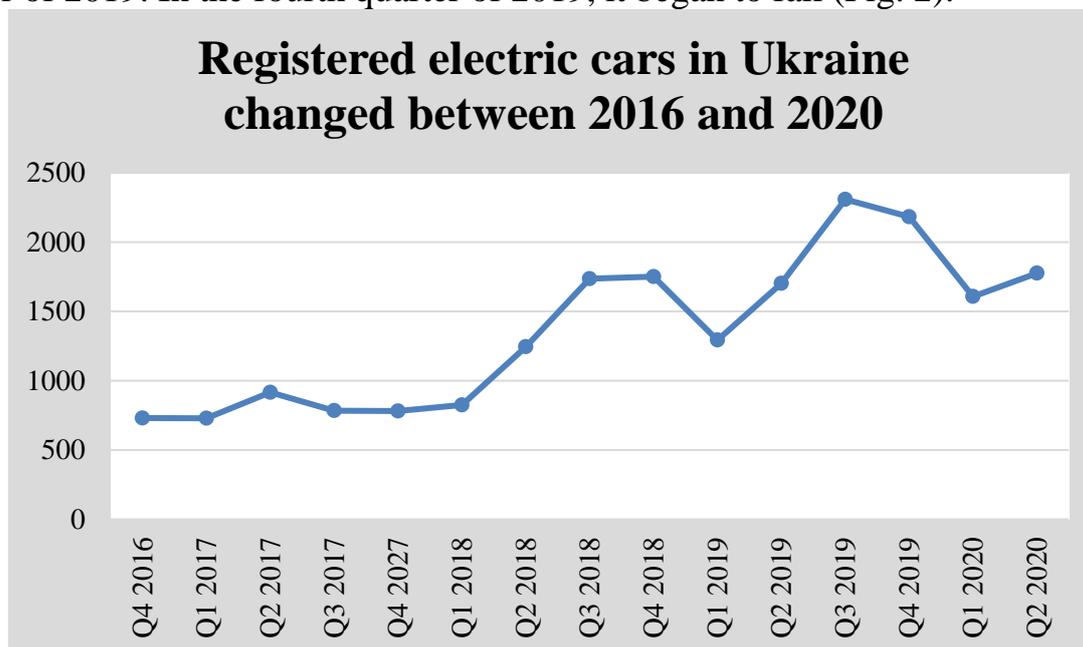


Figure 2. Total number of registered electric cars in Ukraine between Q4 2016 and Q2 2020

However, despite the fairly convincing and strong arguments in support of this issue, there are three main disadvantages: the financial barrier, the battery, and the time to refuel. First, it is the high cost of a new electric vehicle. The reason is that electric cars brought to Ukraine are still very expensive because of using the innovative technologies in them. For example, the cost of the most popular electric car, the Nissan Leaf, ranges from 12 to 16 thousand dollars, while the sensational

Tesla Model 3 will cost about 80 thousand dollars. The second is the battery. The average range of the battery is 130-150 km, and in winter 80-90 km (in the cold period, the capacity drops), which does not allow travelling long distances. The last thing is the speed of refueling. You will spend a few minutes refueling the car with regular fuel, but to charge the electric car in "high-speed" mode, you will need 30-60 minutes of time. However, manufacturers recommend "correct" charging, which lasts 4-8 hours.

The bar chart illustrates the number of the most popular manufacturers in the automotive industry among electric vehicles, such as Nissan, Tesla, Chevrolet, Volkswagen and Fiat (Fig.3).

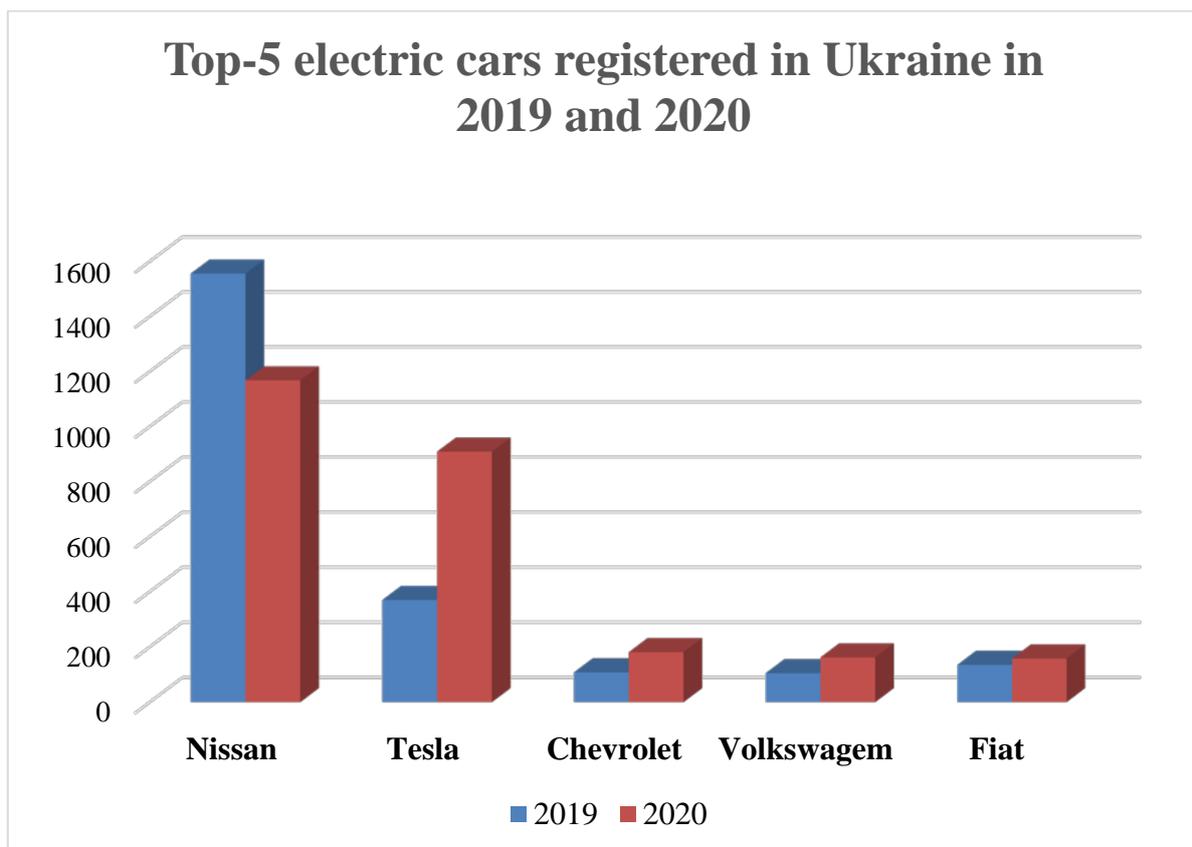


Figure 3. Top-5 electric cars registered in Ukraine in 2019 and 2020

The bar chart shows that we compared 2019 and 2020 and analyzed which manufacturers Ukrainian consumers chose. At first glance, it is clear that regardless of the year, Nissan occupies a leading position. With Tesla, the situation is different, in 2020, the number of consumers begins to grow. If we compare manufacturers such as Chevrolet and Volkswagen, the situation is almost the same. In 2020, the number of people using electric cars is growing. As for the almost unchanged indicator, this place is occupied by Fiat, where the number of consumers is growing by only 17 percent.

To complete the consideration of such an issue as EV (electric car), we want to reveal the prospects for the development of the use of electric vehicles. More and more people in developed countries are thinking about how the consumer behavior affects the environment, and are trying to minimize the negative impact. If initially it

was only about the environmental aspect of consumption, then in the last decade the social aspect has been added to it.

In 2021, it is important for the consumer not only how much carbon dioxide is released into the atmosphere, but also, for example, in what conditions workers work. That is, people choose products and services that correspond to their values and attitudes. The global trend of 2021 is the pursuit of responsible consumption, a reusable and personalized approach. The modern consumer has changed: buying a product is not just a waste of money, but also a way of self-expression and identification. As an example, we can combine people's awareness and urgent issues with the environment as never before. Thus, we get generations who care about what our planet will look like tomorrow. People are becoming more aware of what is developing with the help of electric cars.

By the way, in a number of European cities, entry to the historical center is allowed only for electric vehicles. Only an EV can remain indefinitely in the ecological zone of Madrid Center, Spain. In Milan, the entrance to the center for electric cars is free, while others have to pay.

Therefore, during the study, we came to the conclusion that the reasons for making a decision to abandon the use of cars powered by an electric motor are becoming less and less. Despite its shortcomings, scientific data, such as graphs and charts with statistics show that more and more people are choosing electric cars. As for the forecast for the future development, modern EV have proven that they are not only unpretentious in maintenance, but also environmental friendly. It confirmed once again that there are fewer and fewer objective reasons not to make a choice in their favor. The automotive industry is developing rapidly and electric vehicles can soon become a main part of it.

## **References**

1. Car Emissions and Global Warming. (n.d.). Retrieved April 18, 2017, *Ucsusa: web-site*. <https://www.ucsusa.org/resources/car-emissions-global-warming#.WPbPS4jytPY>
2. Electric car forecast to 2040, *Woodmac: web-site*. URL : <https://www.woodmac.com/our-expertise/capabilities/electric-vehicles/2040-forecast/>
3. Narins, T. P. 2017. The battery business: Lithium availability and the growth of the global electric car industry. *The Extractive Industries and Society*. doi:10.1016/j.exis.2017.01.013
4. Sales of electric vehicle in Ukraine, *Hevcars: web-site*. URL: <https://hevcars.com.ua/reviews/statistika-prodazh-elektromobilej-v-ukraine-za-6-mesyaczev-2020-goda/>
5. Tariq Muneer, Mohan Lal Kolhe and Aisling Doyle. 2017. Electric Vehicles: Prospects and Challenges, American Elsevier: New York.
6. The most popular electric cars on the Ukrainian market. *Ukraudoprom: web-site*. UPL: <https://ukraudoprom.com.ua/najpopulyarnishi-elektromobili-na-ukrayinskomu-rynku>

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### **Simulation of turnover and calculation of the optimal stock of goods in the warehouse using the online service packer3d**

One of the important tools for optimizing inventory management is to calculate the optimal size of delivery. The task of procurement logistics and inventory management is to provide uninterrupted material resources that meet established quality standards, with the lowest total costs and costs of material flow, including a nominal price, delivery costs, inventory costs etc. This paper discusses a main problem that arises in any logistics system related to warehousing and inventory management, namely, their optimization, i.e., maintaining the optimal level of inventory. When calculating the cost of transport services, we must take into account the costs given in the formula (1)

$$S = \$_d + \$_s + \$_l, \quad (1)$$

$\$_d$  – costs of delivery;

$\$_s$  – costs of storage;

$\$_l$  – costs due to lost profits.

This means that enlarging a transportation object results in decreasing delivery costs, but at the same time it causes the cost of storage to increase because keeping additional goods in the warehouse must be paid. As the volume of traffic decreases, the cost of storing the goods decreases as well, while the cost of delivery and the cost of lost profits increase. Based on these dependencies, there is a task, the purpose of which is to find the optimal volume of the order of goods, which will minimize the overall variable costs associated with the order and storage of stocks.

To model the optimal volume of a product order, Wilson's formula (2) is usually used, which determines the optimal volume of a product order. Many logistics experts consider this formula to be simple and popular, but often refuse to apply it explaining that this formula has a number of serious limitations and assumptions.

$$Q^* = \sqrt{\frac{2CR}{PF}} = \sqrt{\frac{2CR}{H}}, \quad (2)$$

$Q^*$  – the optimal size of the order;

$O$  – order placement costs;

$R$  – monthly demand for the product;

$P$  – the cost of purchasing a product unit;

$F$  – stock storage cost ratio;

$H$  – storage costs per unit of goods per month.

Assumptions for the optimal delivery size formula are as follows:

- resource consumption is continuous and uniform;
- the period between two adjacent deliveries is constant;
- demand is met completely and instantly;
- transit and insurance stocks are absent;
- storage capacity is not limited;
- costs for placing and executing the order do not depend on the size of the order and are constant during the planning period;
- the price of products supplied during the planning period is constant;
- the cost of maintaining inventories per unit of time per unit time is constant and does not depend on the amount of funds invested in inventories and terms.

The above assumptions impose many limitations of a practical nature, without which the reliability of the calculations according to this formula is under serious doubt. To overcome some limitations, many modifications of this formula have been developed to solve various problems. The disadvantage of using this formula is a challenge to select the desired modification of Wilson's formula, which leads to inaccurate calculations and may adversely affect enterprise performance.

An alternative to find the optimal stock of goods in the warehouse is the online service Packer3D (Fig.1.Screenshot of the program). This software allows you to dynamically receive statistics, as well as simulate various situations in the warehouse. The advantages of the program include:

1. Ability to analyze the work of the warehouse for 30 days by its own parameters, which allows you to assess the feasibility of your work plan in the warehouse.
2. Real-time optimization, which allows you to improve the work of the warehouse and consider the predicted changes.
3. Ability to change sales by month.
4. Obtaining statistics by day, as well as at the beginning and end of the day.

These statistics include:

- quantity of goods in stock;
  - number of goods sold;
  - the number of days before the arrival of the ordered goods;
  - quantity of ordered goods / number of days before delivery.
5. Obtaining statistics by month:
    - profit for several months (unlimited number);
    - the number of goods in lost sales;
    - lost profits (on lost sales);
    - quantity of goods in the warehouse (average quantity per day);
    - number of purchases of goods;

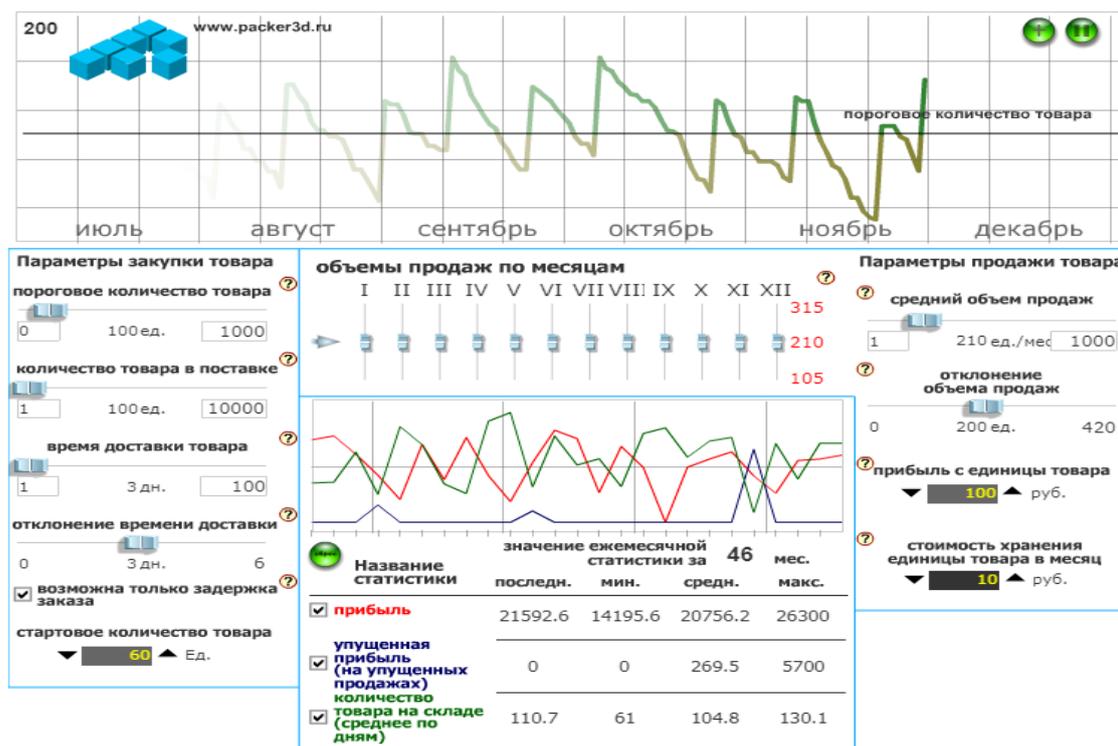


Fig.1. Screenshot of the program

The proposed model, like any other, is only an example of the process of turnover in a real warehouse or store. In real life you have to take into account a lot of additional subtleties and parameters. However, the use of such simulations can still be very useful for optimizing the composition.

### References:

1. On-line сервис моделирования товарооборота и расчета оптимального запаса товара на складе [Electronic resource] – Access mode: <http://www.packer3d.ru/online/goodscirculation>
2. Об алгоритме моделирования товарооборота [Electronic resource] – Access mode: <http://www.packer3d.ru/online/goodscirculation/about>
3. N.Seleznova and I. Kazakova, “Use of Wilson’s formula for determining the size of the economic order of industrial enterprises”, Automobile and Road Institute «DonNTU», Ukraine

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### Automated heat pump heating system using non-traditional energy sources

Heating systems are one of the most expensive to use fuel and energy resources (not less than 30% of total consumption). This leads to a constant search for various solutions to increase the energy efficiency of heating systems [1,4]. In addition, air conditioning systems have become widespread. A large amount of thermal energy, calculated in millions of GJ, is wasted into the environment through the outdoor units of air conditioners [2-3]. This leads to the search for new ways to increase the energy efficiency of heating and air conditioning systems.

In the developed system, based on the use of heat accumulators, solar collectors, and heat pumps for heating and air conditioning systems, the average value of the energy conversion factor is 6..7 units, and the peak values reach 15 units. While classic heat pump systems have an energy conversion factor of only 3..4 units, which is a common value for this parameter in standard heat pump heating systems. This is due to the temperature difference between the soil / water evaporator and the condenser in the heating system. This system is already patented by the author [5].

The developed model is based on the problem of improving the heating and air conditioning system in which the introduction of new structural elements and their combination achieves the possibility of a different nature of thermal energy circulation, and the ability to adjust heat flux parameters without energy loss, and thus expand the scope of cost reduction. The problem is solved by the fact that in the known heating and air conditioning system of the building, including the heat source, the heat pump and the radiator heating element are connected to the main heat exchanger, according to the utility model, the heat source is made in the form of a solar collector and heat accumulator associated with the introduced additional heat pump. Figure 1 shows a simplified diagram of the developed system.

1 - heat accumulator, 2 - solar collectors, 3 - heat exchanger of air conditioning system, 4 - heat pump of heating system, 5 - radiator system of the building.

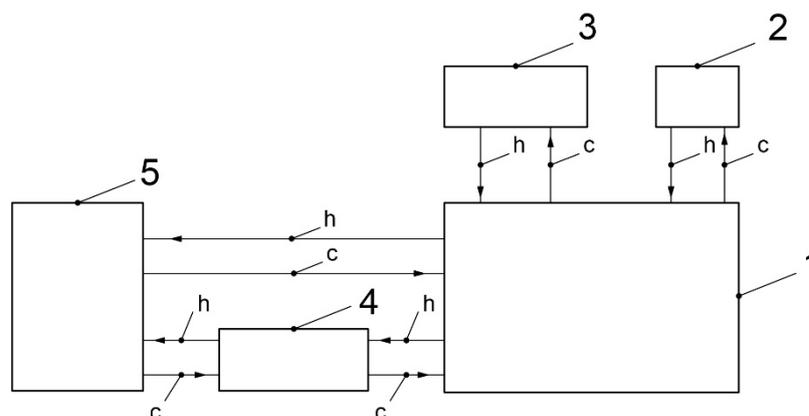


Figure 1 - Simplified scheme of the proposed heating and air conditioning system

This preserves the possibility of direct supply of water from the heat accumulator to the heating system of the building, as the estimated value of water temperature at the beginning of the heating period reaches 45-47 degrees Celsius. And this temperature is enough to cover the heat load in October for the climatic zone of Dnipro. Thus, it is possible to eliminate the cost of electric drive of the heat pump for 2-3 weeks, which gives additional savings of energy and money.

After the heat load starts to require higher values of the coolant temperature in the heating system – the heat pump 4 is switched on. The heat pump evaporator removes heat from the heat accumulator 1, which is a source of high potential energy compared to soil and reservoirs. Due to which, more efficient operation of the heat pump heating system is achieved.

According to the results of calculations, we get the value of savings from the use of the developed system - up to 35% of energy per year, compared to conventional heat pump heating and air conditioning. Currently, the study of ways to improve the efficiency of the proposed system by implementing an automated control system for the parameters of this system.

### References

1. Разумний Ю. Т. Енергозбереження [Текст]: навч. посіб. / Ю. Т. Разумний, В. Т. Заїка, Ю. В. Степаненко – Д.: Нац. гірн. ун-т, 2005.– 166 с.
2. Корчемний М. Енергозбереження в агропромисловому комплексі [Текст] / М. Корчемний, В. Федорейко, В. Щербань. – Тернопіль: Вид-во: Підручники і посібники, 2001. – 976 с.
3. Олишевский И. Г. Обоснование рациональной технологии утилизации теплоты системы кондиционирования для горячего водоснабжения / Г.С. Олишевский, И.Г. Олишевский // Вісник Дніпропетровського університету. Серія: Ракетно-космічна техніка. / Дніпр. нац. ун-т ім. О. Гончара. – Дніпро, 2019. – № 4. – Т. 27. – Вип. 22 – С. 35-41.
4. Олишевский И. Г. Обоснование метода утилизации теплоты системы кондиционирования для теплонасосной системы отопления / Г. С. Олишевский, И. Г. Олишевский // Інформаційні системи, механіка та керування / НТУУ «Київський політехнічний інститут». – Київ. – 2017. – № 17. – С. 86 – 94.
5. Патент №140657 на корисну модель, Україна, МПК (2006), F24D 3/00, F24D 3/18 (2006.01), F24D 17/02 (2006.01). Система опалення та кондиціонування будівлі. (2019). Олішевський І.Г., Олішевський Г.С., Гусєв О.Ю.; заявник і власник патенту НТУ «Дніпровська політехніка». – №u2019 07962; заяв. 11.07.2019; опубл. 10.03.2020; Бюл. №5. – 7 с.

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### Promising tendencies for open pit motor vehicles

Motor vehicle is one of the most mobile types of open pit transport facilities being adapted to the varying conditions of mining operations. High independence level, possibility to operate in terms of routes with complicated profile, and heavy duty make it almost critical in the process of deep level extraction. However, it has disadvantages as well. High transportation cost, limited climbing power, toxic emissions contaminating open pit atmosphere, and high rates of accidents and traumatism are among them [1].

Diesel-trolley cars have become the first attempt to improve performance of motor vehicles [2] (Fig.1).



Fig. 1. Diesel-trolley cars within transport incline

In terms of diesel-trolley cars operation, both movement and reciprocal switching in a stope, on a waste dump, and in unloading points are performed using diesel-mechanical propulsion. While moving within inclines and roads from the surface, motors are powered by a catenary. In this context, diesel motor of an electric locomotive is idle initiating pollution. Continuous operation of diesel motor results in contamination of an open pit atmosphere originating ventilation problems being especially challenging in summer. Table 1 explains changes in engineering factors of a dumper operating in diesel mode and in trolley one (according to data by Siemens Company [3]).

Table1. Comparative characteristics of diesel trolley car

Performance mode	Diesel	Trolley
Velocity, km/h	12.2	23.7
Diesel oil consumption, l/h	367	37.4
Power consumption, kW/h	-	1930

There are two current tendencies of open pit motor vehicle progress:

- application of the robot-based and self-propelled diesel open pit dumpers [4] to improve safety and reduce labour costs. The abovementioned relies upon the use of standard (Fig.2) or re-designed machines determining their location with the help of global positioning systems, remote control, and smart control taking the advantages of various sensors to control traffic conditions (Fig.3); and
- application of battery-powered machines [5], Fig.4.



Fig. 2 Belaz-751P-based dumper robots

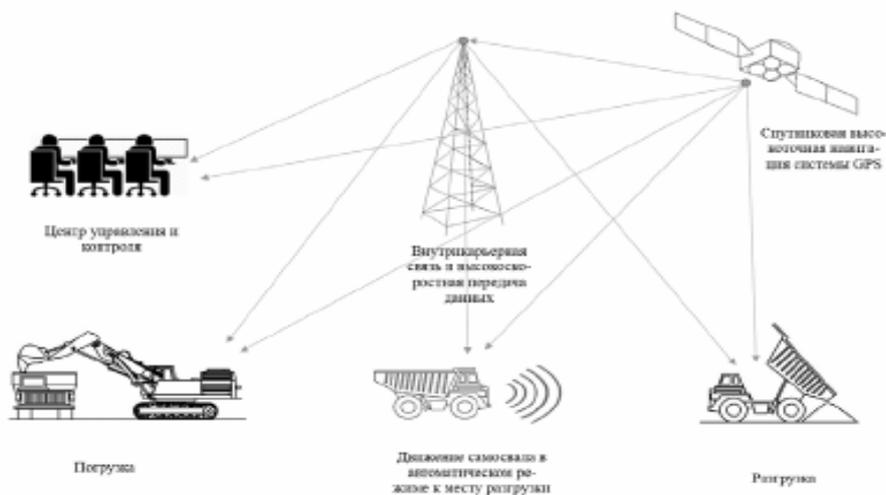


Fig.3 Control system for the dumper robots.



Fig. 4. Battery-powered open pit dumper.

Artificial intelligence makes it possible to neutralize a human factor role as well as atmospheric influence (i.e. poor visibility due to lack of light or precipitations); however, it cannot solve exhaust gas problem. Use of battery-powered machines raises a number of problems connected with the fast battery discharge; the battery overheating at excessive gradient; the charge density reduction at low temperature; short battery cycle life; and long charging period.

We think, the most expedient idea is to apply battery-powered trolley cars with robotic control. In this context, battery capacity may be minimal to help the device operate within short horizontal sites in the neighbourhood of stopes and at loading points. The battery may be charged in the process of movement along routes equipped with catenaries. In this context, during a dumper lowering to an open pit, it is quite possible to organize of motor-wheel operation in recuperative mode with power output through a catenary.

Further studies by the author will concern the development of the transport and technological systems.

## References

1. Sobolev, A.A. The global tendencies to improve and upgrade transport systems in the context of open pit mining/*MECHANICS OF 21<sup>ST</sup> CENTURY*#19: 2020 Pp. 38-43
2. Yeremeiev, V.I. The opportunities to apply diesel-trolley cars in deep open pits *ALROSA PJSC / V.I. Yeremeiev, & V.V. Zabelin // Gorny Zhurnal – #1. – 2001. Pp.70-72.*
3. Stepuk, O.G. & Zuyenok, A.S. Diesel-trolley facilities of BELAZ: the opportunity to use them for mining industry/ *Gorny Zhurnal – #1– 2013. Pp.52-55*
4. Khazin, M.L. Robot-based open pit dumpers// *News of the Ural State Mining University. 2020. Publication 3(59). Pp. 123-130.*
5. <https://itc.ua/news/shveytsartsyi-sozdali-45-tonnyiy-elektrosamosval-e-dumper-s-batareey-rekordnoy-emkostyu-700-kvt-ch/>

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### **Development of End-to-end Roll-bonding Technology for Reinforced Al-based Composites with Enhanced Ability to Impact Energy Absorption as well as the Fire Resistance**

The reinforcement of aluminum matrix with steel mesh by roll bonding was the focus of several recent papers. Stolbchenko, Makeieva, Grydin and others [1] investigated different types of meshes and their orientation in composites based on the alloys EN AW 6063 and EN AW 5056. They found that a mesh displacement with a 45° wire orientation to the rolling direction increases the formability of the composites during the roll bonding process and the subsequent mechanical tests. In another study, [2] the above-mentioned authors concluded that a net of wire mesh enhances the tensile strength of the entire composite if there is a sufficient bond between the matrix layers and the wire. A similar result was achieved by Huang, Wang and Liu [3], who processed a solid aluminum substrate (the so-called solid-liquid cast-rolling bonding (SLRCB)) into a composite material by twin-roll casting. In this case, the strength of aluminum 1060 could be raised by almost 30% using mesh made of austenitic steel 304. Another study on roll bonding [4] was aimed at finding an optimal reduction for composites based on the alloy EN AW 5083 reinforced with diagonally oriented wire mesh. The authors analyzed the deformation of both the mesh shape and the wires, taking three factors into account: cell distortion, wire thinning (stretching) and wire ovalization.

It was observed that these three components increased in parallel with the rolling reduction. The authors concluded that a rolling reduction between 35% and 45% at 500°C results in the best combination of tensile and impact properties in the composite material. Furthermore, Gülenç et al. reinforced an aluminum plate with steel mesh using (picture 1) the explosive welding process [5]. They found that aluminum specimens with an inserted wire mesh have a higher capacity to adsorb impact energy, which reaches its maximum when the mesh is oriented at 45° to the rolling direction. In addition, Hufenbach et al. observed a significant rise (up to 400%) in fracture toughness for an AM50 alloy when austenitic steel mesh inlays were integrated [6]. In this study, a gas pressure infiltration method was applied to produce the composite material. Although various methods can be used to manufacture flat composites made of an aluminum matrix and an austenitic steel mesh reinforcement, roll bonding appears to be the most promising solution, as it is much more consistent and easier to control during large-scale production than the other processes mentioned above. Additionally, it enables a continuous manufacturing process.

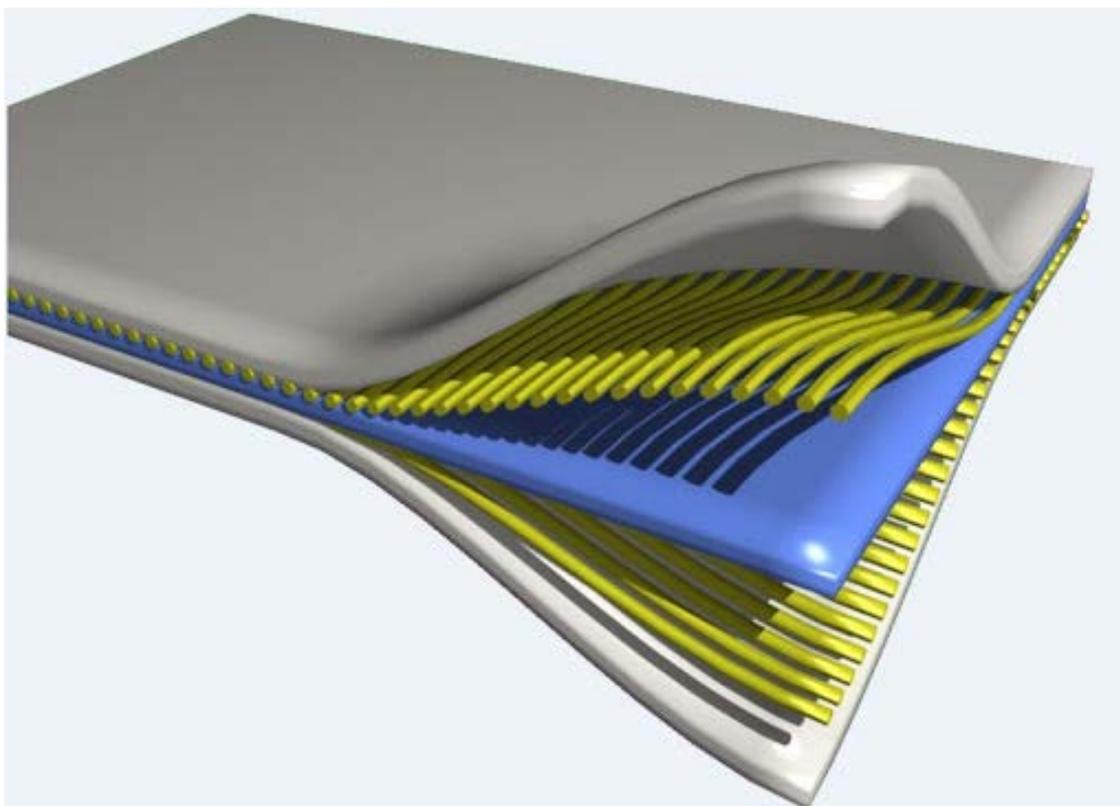


Figure 1. Reinforced composite

The scientific component of the project is based on fundamental knowledge of the plastic flow of metals under conditions of high hydrostatic pressure with time-varying components of the stress tensor, as well as changes in the principal stresses. Such an alternating stress state, according to published data, as well as from the results of our own research, leads to the appearance of three main components of the deformation in the reinforcing phase: deformation of the net cell, deformation of wire of the net, as well as their ovalization (flattering). These three components of the deformation develop unevenly along the deformation zone during rolling. An analysis of the nature of the development of the components of the deformation of the reinforcing element allows one to determine rational rolling parameters that contribute to the deformation of the net cell to a certain limit and uniform stretching of net wires. Wire ovalization in this case must be braked.

Previous studies conducted by the project manager and executors confirmed the possibility of obtaining reinforced composites with a high level of mechanical properties (impact absorption energy, tensile strength, etc.) by rolling in a narrow temperature-deformation interval. But in these studies, certain «bottleneck» of such technology was identified. The most significant among them is the uncontrolled deformation of a relatively rigid grid in a “soft” medium of an aluminum matrix. Research within the framework of the project will be focused specifically on eliminating this drawback while maintaining the conditions for a reliable connection of two matrix layers.

The main steps to the goal of the project:

- Creation and verification of an adequate finite element model of rolling-bonding of reinforced composites.

- The rationale for choosing a net configuration according to the following criteria: minimum localization of stresses in the corners, a resource of plastic properties, and the ability to form a compound with a matrix.
- Determination of the parameters for preparing the surface of the net and matrix, which will ensure that net elements are filled with matrix metal without the formation of air «pockets».
- Determination of the deformation parameters zone during rolling, which will ensure uniform deformation of the reinforcing layer and reliable connection of the matrix layers.
- Determination of the rolled composites fire resistance, their ability to absorb impact energy, as well as opportunities for further deformation of composites by bending.
- Generalization of research results and development of technology for manufacturing reinforced composites by rolling. Production of prototypes.

**References:**

- [1] Stolbchenko M., Makeieva H., Grydin O., Frolov Y., Schaper M., 2018. Roll bonding of steel netreinforced aluminium strips. *Materials Research*. 21/2, 1-11. <http://dx.doi.org/10.1590/1980-5373-MR-2017-0941>
- [2] Stolbchenko M., Makeieva H., Grydin O., Frolov Y., Schaper M., 2018. Strain parameters at hot rolling of aluminum strips reinforced with steel netting. *Journal of Sandwich Structures and Materials*. 0/0, 1–21. <https://doi.org/10.1177/1099636218792539>
- [3] Huang, H., Wang, J., Liu, W., 2017. Mechanical properties and reinforced mechanism of the stainless steel wire mesh–reinforced Al-matrix composite plate fabricated by twin-roll casting. *Advances in Mechanical Engineering*. 9/6. <https://doi.dox.org/10.1177/1687814017716639>
- [4] Frolov, Y., Stolbchenko, M. Grydin, O., Makeeva, H., Tershakovec, M., Schaper, M., 2019. Influence of strain parameters at rolling on the properties of wire-reinforced aluminium composites. *International Journal of Material Forming*.12/4, 505-518. <https://doi.org/10.1007/s12289-018-1431-6>
- [5] Gülenç, B., Kaya, Y., Durgutlu, A., Gülenç, I., Yildirim, M., Kahraman., N., 2015. Production of wire reinforced composite materials through explosive welding. 2016. *Archives of Civil and Mechanical Engineering*. 16/1. 1-8. <http://dx.doi.org/10.1016/j.acme.2015.09.006>
- [6] Hufenbach, W., Ullrich, H., Gude, M., Czulak, A., Malczyk, P., Geske, V., 2012. Manufacture studies and impact behaviour of light metal matrix composites reinforced by steel wires. *Archives of Civil and Mechanical Engineering*. 12/3, 265-272. <http://dx.doi.org/10.1016/j.acme.2012.06.005>

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### **The Ability to Manage Sales Activities as an Important Aspect of Existence of an Enterprise in the Labor Market**

All buyers when buying products look at the content and expiration date in order to determine the quality of the product. But with metal it is much more difficult, to reveal defects and quality of metal can either an expert, or the person who has previously consulted the expert. So, now all enterprises are oriented to improving the efficiency of sales of metal products, which directly depends on the supplier, on their use of the latest technologies and equipment. All the production operations must work organically to obtain maximum profits and minimum costs of the enterprise.

Sales is the process of promoting goods from producer to consumer, which includes transportation of goods, warehousing, storage, maintenance of stocks at the desired level, promotion to wholesalers and retailers, pre-sale preparation, ordering, documents and insurance, cargo movement control and sales goods [1].

The main purpose of sales is the realization of the economic interest of the producer (entrepreneurial profit) on the basis of satisfying the effective demand of consumers [2].

The need for sales activities as an important component of international economic activity of the enterprise is due to the multifaceted significance of this activity for any enterprise [2]:

- in the field of sales, the result of all the efforts of the enterprise aimed at the development of international economic activity and obtaining maximum profit is finally determined;
- by adapting sales activities to customers' demand, creating maximum benefits for them before, during and after the purchase, the manufacturer has a much better chance of winning the competition in the international market;
- sales activities continue the production process, taking on the completion of goods and their preparation for sale (sorting, packing, packaging);
- during the sale the needs of foreign consumers are identified and studied more effectively [2].

For the manufacturer, the quality of raw materials plays an important role. If raw materials are not of good quality, then the production will spend more money and time to combat the cleaning of harmful residues, processing of this metal.

In general, the quality of metal products is determined by four technological processes, which cannot be considered separately (Table 1). [3]

<i>Process</i>	<i>Brief description</i>
Liquid metallurgy,	Chemical composition, Metal purity, content of

including steel casting	elements and homogeneity of distribution, defects
Heat treatment	The structure (type of obtained crystal lattice), size and shape of the grains, obtained properties, distribution of properties of product by thickness, internal stresses, defects
Metal Forming	The shape and sizes of product, defects, homogeneity of the metal structure, stresses
Tooling	Surface quality, dimensional accuracy, local stresses

Table 1. The influence of metallurgical processes on parameters of metal quality.

On the way from the semi-finished product to the finished product, the metal requires additional processing, which is as follows:

- Product design. If you look at the products by geometric indicators, this quality indicator is the most easily controlled.
- Welding. The influence of the welding process on the properties of the product includes two factors that determine the quality of the metal - the chemical composition, which can change during welding and the temperature, the change of which can affect the structure of the metal and its properties.
- Tooling. Violation of tooling and quality of tool itself can lead to a local increase in temperature, as well as to plastic deformation of the metal.
- Material protection. The type of covering, its thickness and adhesion to the metal must prevent the penetration of aggressive environment to the metal surface and prevent corrosion development [3].

To properly manage the enterprise, increase the efficiency of sales of metal products, managers need to know how to manage sales activities properly, because it is a multifaceted process that is aimed at making a profit and requires some knowledge. The following scheme describes the sales management style.

To improve the operation of the sales system at the enterprises of metal products, the following solutions can be offered:

- to improve the sales planning subsystem. At trade enterprises, deviations from the rate of sale of goods and an increase in the company's market share from the planned strategic goals are often manifested. To eliminate these shortcomings, it is necessary to more clearly outline the strategy of the enterprise, to determine its market share, to forecast sales of goods, based on modern methods and models [4].
- To establish criteria for hiring managers, to develop professional development, competence and professionalism of managers through training, courses; to develop a system of motivation to improve the efficiency of managers.
- To introduce the latest techniques and methods of production, introduce the practice of metallographic analysis of potentially dangerous and problematic areas of products, including as a method of establishing the causes of defects.

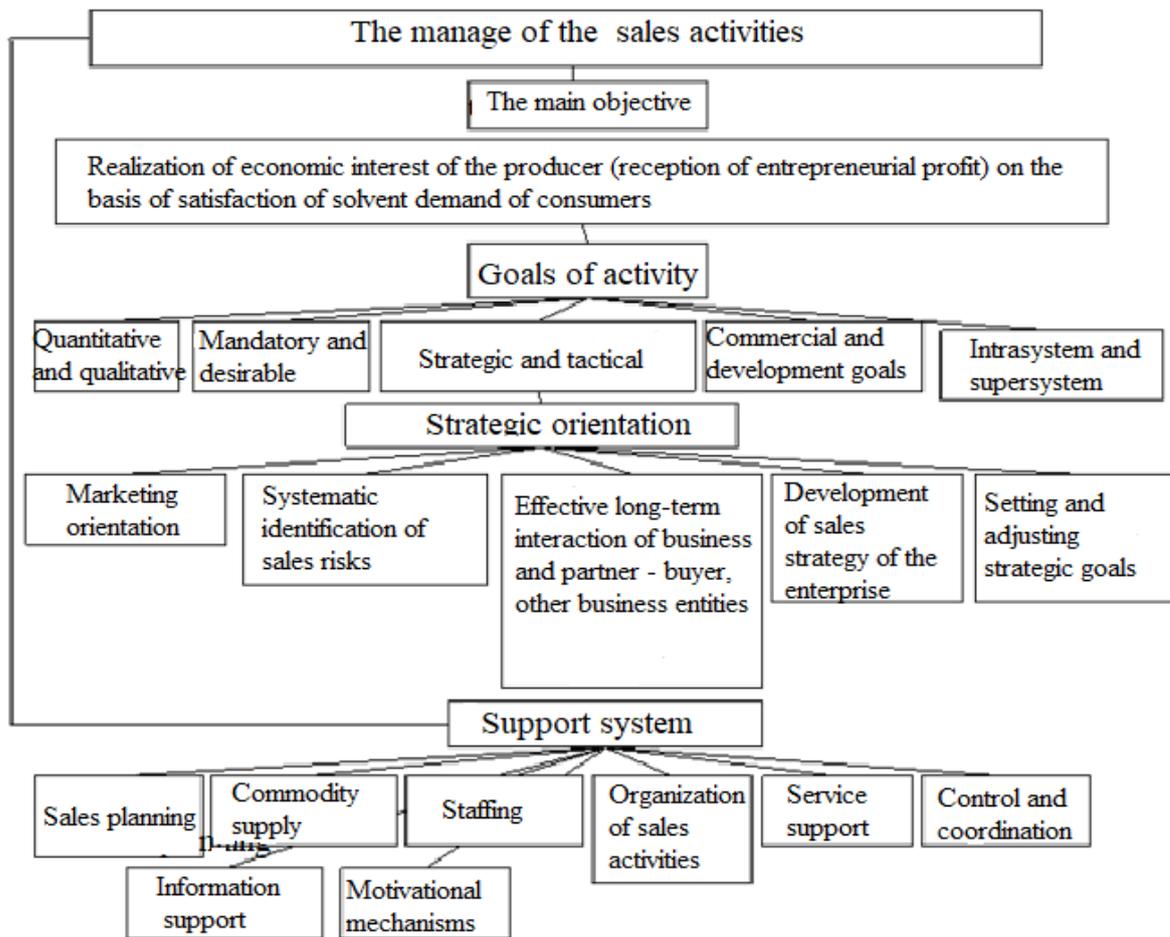


Figure 1. Management system of sales activities of an industrial enterprise [2].

Thus, at the present stage, the company faces tasks of finding markets, choosing the most profitable channels for goods movement. Proper formation of consumer-oriented sales activities is one of the most important priorities in the field of strategic planning of enterprise development. After all, with high-quality work of all its departments, the enterprise will receive not only products of high quality, but also the maximum profit at the minimum costs.

### References

1. Brown K. (2003) Practical guide to sales promotion. - 382 p.
2. N. V. Terentyeva SALES ACTIVITIES MANAGEMENT IN THE ENTERPRISE MANAGEMENT SYSTEM / graduate student, assistant of the department of personnel management and marketing, Zaporizhia National University, Zaporizhia
3. Professor Yaroslav Frolov CLIENT ORIENTED QUALITY / National Metallurgical Academy of Ukraine Metal Forming Department
4. Ogienko S.O., Myzhyrytska A.A. IMPROVEMENT OF EFFICIENCY OF SALES ACTIVITY OF TRADE ENTERPRISE

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### **Risk assessment and hazard identification at Ukrainian enterprises**

The study and solution of labor protection issues is a priority for every enterprise. And the problem of industrial injuries, deaths and occupational diseases is a global problem, its solution is being worked on by leading experts and scientists in the field of security for a long time. New standards are constantly being introduced, new laws and regulations are being approved, but the statistics of the International Labor Organization show that the number of accidents is growing and is about 250 million annually.

The situation in Ukraine has stabilized over the past 15 years, and the number of accidents is declining, but remains critical. In recent years, the number of workers in conditions that do not meet the established standards of labor protection has increased from 15 to 30 percent of the total number of employees and is almost 3 million people. Every day about 150-180 workers are injured, about 3-4 deaths are registered. The coal industry is the most dangerous, with about 5 workers per 1 million tons of coal. The statistics of occupational injuries are affected by many indicators - unsatisfactory level of work culture, efficiency of means of production, low level of qualification and training in occupational safety, lack of adequate funding and development of safety systems.

Thus, the problem of labor protection is very serious and complex. It should be noted that one of the most important ways to solve it is to unite efforts in this direction of all stakeholders - employers, public authorities, local governments and, above all, employees. An effective mechanism needs to be put in place to implement a set of measures to create working conditions that meet the requirements of preserving the lives and health of workers, and to strengthen the role and importance of safety systems in creating appropriate, safe and healthy working conditions.

In order to create safe and harmless working conditions in each structural unit and at each workplace, the head of the enterprise must create a management system for labor protection and ensure its effective functioning.

The labor protection management system (OSMS) is an integral part of enterprise management, which includes forecasting and planning, work organization, coordination and regulation, activation and incentives, control, accounting and analysis.

A clear and objective approach to occupational safety management in the enterprise is to develop a system of safe work, which is a set of carefully selected, based on the production task, safe procedures, which are determined taking into account the competence of employees and equipment characteristics. An important step is the identification of hazards and assessment of occupational risks, which is carried out not only individually but in combination when making decisions to minimize inadvertent effects on employees, especially due to common mistakes, which is the main difference of the proposed system.

Risk assessment is a fundamental process that is the basis of successful occupational safety management. It is a written procedure that helps to develop a system of safe work.

Risk assessment is performed in the following sequence (Table 1)

1. Identify the task or operation and describe the hazards (column 1).
2. Identify and record the relevant effects of the hazard on the person (column 2).
3. Identify persons who are at risk (column 3).
4. Identify existing risk control measures for each case (column 4).
5. Take into account the severity (column 5) and probability (column 6) of the hazard, as well as using the risk level indicator to determine the risk rating, write it down (column 7).
6. If additional controls are required to control or reduce the risk, this should be recorded (column 8).

Table 1. Risk assessment template

Description of the danger to Pitches	The consequences of the danger to Pitches	Profession	Means of control	Serious consequences	Probability	Risk	Reduction measures
1	2	3	4	5	6	7	8

There are a large number of methods for risk assessment - graphical risk assessment, Risk score, Risk assessment code, mathematical equations, etc.

The classical method of occupational risk assessment is carried out according to the formula

$$R = P \cdot S \text{ (British standard BC-8800),}$$

where R - occupational risk;

P - probability of the event;

S - severity of consequences.

The level of risk depends on the probability of the event and the severity of the consequences, which can be determined from Table 2.3.

Table 2. Scale for risk assessment

Probability		Almost impossible	Small speech	Perhaps	Probably	Safe river
		1	2	3	4	5
Heaviness		1	2	3	4	5
Trivial injury or pain from a blow	1	1	2	3	4	5
Minor injuries or dislocations	2	2	4	6	8	10

Injury that requires medical treatment	3	3	6	9	12	15
Injury causes long-term treatment and loss of certain functions	4	4	8	12	16	20
Injuries lead to disability or death	5	5	10	15	20	25

Table 3. Description of results

Risk	Actions
High 15 - 25	Should be immediately stopped. Inform senior management
Moderate 6 - 14	The awakening cannot begin or be stopped immediately. Consult management for permission
Low to 1 - 5	The task can be performed or continued by developing information on safe working methods. Mandatory work control

Identifying potential victims and their health consequences is an important step. The problem of assessment, analysis of risks in labor protection and their management is relevant for the implementation of the main tasks of labor protection. Such information will provide an opportunity to develop measures to prevent unwanted risk situations. The problems of assessment, analysis of risks in labor protection and their management are relevant for the implementation of the main tasks of labor protection.

**References:**

1. ISO 31000 Risk Management (2020). Retrieved from: <https://www.iso.org/iso-31000-risk-management.html> (available on 1.02.2020).
2. ISO 31000 Risk Management (2020). Retrieved from: <https://www.iso.org/iso-31000-risk-management.html> (available on 1.02.2020).
3. OHSAS 18001: 2007 Occupational health and safety management systems - Requirement. Retrieved from: <http://isomanagement.com/wpcontent/uploads/2013/12/OHSAS-18001-2007-.pdf>
4. Karkoshka T. (2017), Operational monitoring in the technological process in terms of occupational risk. Proceedings Manufacturing, 13, 1463-1469. DOI: <https://doi.org/10.1016/j.promfg.2017.09.192>
5. Rosa Anaya-Aguilar, Manuel Suarez-Chebador, Juan Carlos Rubio-Romero, Fuensanta Galindo-Reyes (2018), Delphi assessment of occupational hazards in Andalusian wineries in southern Spain. Journal of Pure Production, 196, 297-303. DOI: <https://doi.org/10.1016/j.jclepro.2018.06.008>
6. Philip P. Purple (2019). Workplace safety. Security and Loss Prevention (seventh edition), 435-455. DOI: <https://doi.org/10.1016/B978-0-12-811795-8.00014-X>

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### **Development of technology for obtaining three-layer joints by rolling**

An urgent problem of modern mechanical engineering is to reduce the metal content of structures while reducing the service characteristics, reliability and operational durability of the corresponding equipment.

The solution of this problem is facilitated by the development and introduction of new structural and functional materials - layered metal composites with increased, and in some cases, unique heat-resistant, thermophysical, anticorrosive and other properties. Complex technological processes have been developed, including blast welding, rolling, and special heat treatment, which make it possible to obtain multi-purpose layered composites based on Ti, Fe, Al, Cu, Mg, and their alloys [1].

The main advantages of magnesium are its relatively low density ( $1.74 \text{ g /cm}^3$ ), satisfactory stability in air and other media, high activity as a reducing agent in chemical processes, as well as good ability to fuse with other metals.

The disadvantage that limits the use of magnesium is its low corrosion resistance. The corrosion-resistant properties of magnesium can be improved by doping it with rare-earth metals [2, 3]. However, this method requires the use of rather expensive materials and does not significantly improve corrosion resistance. Another method of increasing the corrosion resistance of magnesium is aluminum cladding, because the latter has a high resistance to corrosion. This enables to use such a multi-layered material in structures prone to vibrations and aggressive environments.

The combination of the main advantages of magnesium and aluminum alloys is possible in their bimetallic compositions. Because aluminum is highly resistant to corrosion, and magnesium and its alloys have high damping properties. This enables to use such a multi-layered material in structures prone to vibrations and aggressive environments.

The use of bimetallic compositions based on aluminum has become widespread in the construction of modern transport and aircraft, in shipbuilding and chemical engineering.

Bimetal is a double- or multi-layered material consisting of several different metals or alloys that are firmly connected to each other along the entire contact area. In most cases, a bimetal is a combination of two metals or alloys; less likely it consists of three or more. At the same time, bimetal has specific properties that differ from the properties of its components [4].

According to their purpose, existent bimetals are divided into the following types: corrosion-resistant, antifrictional, electrical (conductors and contacts), wear-resistant, thermo-bimetallic, compositions for consumer products. The range of bimetallic products includes sheets, strips, rods, pipes and profiles [5].

The multi-layered products are proposed to divide into two large groups:

1) obtaining a welded joint using plastic deformation (of at least one of the components);

2) obtaining a compound without plastic deformation.

There are also other ways to produce multi-layered products that do not require plastic deformation to form metal binding.

These methods include: welding by surfacing, soldering, casting and immersion into the melt. These methods are widely used in industry both for manufacturing of billets for further joint plastic deformation, and for obtaining fabricated multi-layered products.

Explosion welding gives the widest range of opportunities, which enables to connect metals, including those that cannot be connected by other methods. For example, steel + silver, steel + lead, copper + molybdenum, and so on. Explosion welding makes it possible to produce complex bimetallic products, such as turbine blades .

Joint plastic deformation of metals provides the opportunity to obtain different ratios of layer thickness in a multi-layered product [6].

The thickness of the layers is determined by the position of the metal at the time of its plastic deformation (physical and chemical properties and stress state), the shape of the workpiece and the horsepower of the equipment.

One of the main difficulties in manufacturing and operating of multi-layered joints made of dissimilar metals, such as magnesium and aluminum, is to reduce the resistance to separation of layers after heat treatment of the composite or its welding. Interjacent layers that are formed on the joint line usually consist of one or more intermetallic phases, the structure and thickness of which determine the properties of composites [7].

There are many methods for calculating the energy-power parameters during cold rolling, including non-ferrous metals and alloys rolling, but it is needed to adapt them to the features of bimetallic sheets (made of non-ferrous metals and alloys) rolling [8].

Experimental studies of three-layered pipes rolling process were carried out in the laboratory of NMetAU's Pressure Metal Processing Department. A laboratory rolling mill Duo 180 with a smooth roll barrel had been used for their execution. Among the attendant equipment there were: a chamber furnace with 50-800 °C heating range, thermocouples, a six-channel temperature measuring device, dynamometer (Mesdozi), a laptop, an analogue-digital converter (ADC), a caliper, a ruler, a sheet of textolite, heat-resistant gloves, working gloves, metal pliers.

A chamber furnace was used to heat the samples to 425-430°C max temperature. Heating in the furnace several degrees above the temperature of the beginning of deformation was carried out to compensate the cooling of the workpiece during its transfer to the receiving table of the rolling mill. In order to reduce the temperature consumption, a chamber furnace was installed in close proximity to the mill.

The workpiece heating temperature was controlled by a six-channel temperature measuring device USB TC-08 temperature measuring device manufactured by Pico Technology.

The bimetallic bags were 200 mm long and 25 mm wide. Before being put into bags, the magnesium and aluminum staffs had been degreased. This is necessary to clean the surface of oxide films for better adhesion of the composite layers. Mesdozi force measuring devices were used to measure the rolling force.

After heating to the required temperature, the samples were fed to the rolling mill in the shortest possible time, where they were rolled with the fixed rolling force. The temperature of the air and rolls equaled 15 °C.

The thickness and width of the samples before and after rolling were measured using a caliper with an accuracy of  $\pm 0.01$  mm. The length of the samples was measured with a ruler with an accuracy of  $\pm 0.5$  mm.

To facilitate proper metal feeding to the deformation zone, guide rails were installed in front of the rolls. Their distance from each other was conditioned by the need of a small gap for free feeding of the workpiece into the rolls, taking into account the temperature expansion of the metal after heating. To reduce heat consumption, a heat-insulating material textolite was placed on the receiving table of the rolling stand.

Before starting rolling, the surfaces of the lower and upper rollers had been sanded with sandpaper and degreased with ethyl alcohol. Measuring the required small gap between the rolls was carried out by using a manual pressure device.

The rolling speed equaled 0.26 m/s.

The results of the theoretical studies have shown the possibility of using the *QForm program* for the investigation of the rolling process of three-layer structures made of non-ferrous metals and alloys.

The results of experimental studies have shown that aluminum serves as a thermal "jacket" for magnesium during deformation. This enables us to obtain large deformations of magnesium, which are not possible when rolling a magnesium alloy as a monomaterial because of its rapid cooling. Analysis of the energy-force parameters of rolling confirmed that the rolling force and rolling moment increase with increasing of deformation degree. With an increase in deformation (of relative compression) degree from 30 to 70%, the rolling force nearly duplicated. This is observed at both 360 and 420 °C temperatures.

Analysis of the rolling force value showed that an increase in the deformation temperature reduces the energy-power parameters of the process. Increasing the deformation temperature from 360 °C to 420 °C (according to the calculation data in the *QForm's* software package) causes a decrease in the rolling force by 6-12% .

Experimental value of the rolling force, with an increase in the deformation temperature from 360 °C to 420 °C, and in the impression range from 31 to 64% resulted in a 9-16% reduction of the rolling force.

Experimental study of the effect of temperature and pressure on the rolling force of three-layer al-Mg-Al staffs revealed that a reduction of 30% is not sufficient to obtain a compound of metal layers. A 70% impression is quite difficult to achieve

due to the destruction of magnesium layers in the deformation zone. At the same time, the more package-billet is heated, the lower is the probability of staff destruction in the process of deformation.

**References:**

1. Ryabov V. R. Welding of Bimetals / V. R. Ryabov, L. D. Dobrushin, Jung-Gi Moon. Kiev: Paton Electric Welding Institute of the National Academy of sciences of Ukraine, 2003. 130 pp.
2. Shchegolev V. Y. Electrolytic production of magnesium / U. Y. Shchegolev, A. A. Lebedev, Moscow: Ruda I metally publ., 2002, 368 p.
3. Trykov Yu. P. Layered composites based on aluminum and its alloys КОМПОЗИТЫ НА ОСНОВЕ АЛЮМИНИЯ И ЕГО СПЛАВОВ / Ю.П. Trykov, L. M. Gurevich, And V. G. Shmorgunov. Moscow : Metallurgizdatpubl., 2004, 230 p.
4. Golovanenko S. A., Meandrov L. V. Production of bimetals. Moscow: Metallurgy, 1966. 304 p.
5. Kuznetsov E. V. Methodology for creating layered metal compositions. *Metallurgicheskaya I gornorudnaya promyshlennost'* [metallurgical and mining industry], 2002, no. 8-9, Pp. 42-46.
6. Belyaev S. M. Theoretical substantiation and development of technology for pressing bimetallic aluminum-magnesium products with a predictable распределением layer distribution: dis... candidate tech. date of birth: 05.03.05 / National metallurgical Academy Ukraine. Dnepropetrovsk: Nmetau, 2012. 173 p.
7. Diffusion in layered composites: monograph / Yu. P. Trykov, L. M. Gurevich, V. N. Arisova. Volgograd: PKK "Polytechnic", 2006. 403 p.
8. Zagoryansky V. G. The basis for choosing a method for calculating the average contact pressure when rolling copper-aluminum sheets / Zagoryansky V. G. // Visnik krnu named after Mikhail Ostrogradsky. Issue 6(89) - 2014. Part 1 Modern technologies in mechanical engineering, transport and mining, Pp. 107-110.

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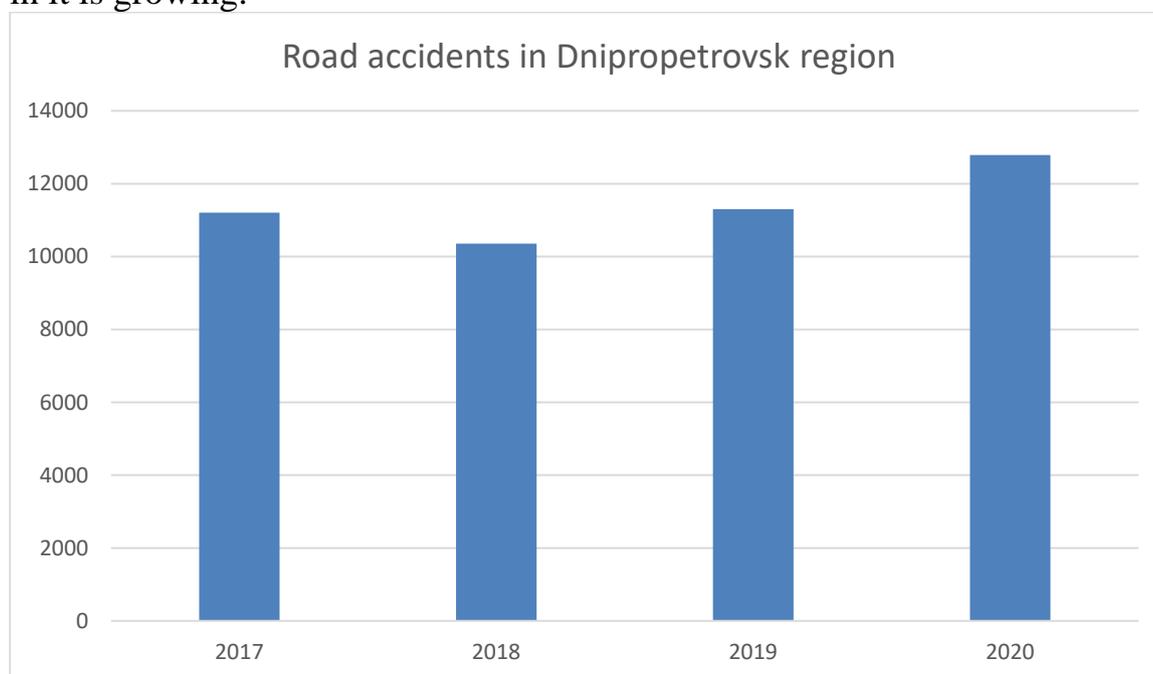
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### Road traffic safety: best practices and challenges for Ukraine

According to the Ministry of Health of Ukraine, more than 150,000 road accidents occurred in Ukraine last year alone. About 3.5 thousand Ukrainians died and 31 thousand were injured. The death rate from road accidents in the world is growing every year. According to the World Health Organization, it currently stands at about 1.35 million people a year. This means that 3.7 thousand people in road accidents die every day in the world. The WHO notes that children and young people under the age of 29 die most often in road accidents [2].

Take at least the region in which we live, over the years the number of accidents in it is growing.



The histogram shows the number of accidents in the last 4 years. In 2018, the number of accidents declined, and in 2020, on the contrary, increased. This is due to the fact that in 2020 a strict quarantine was introduced, due to which people stopped using public transport and bought their own cars.

<b>Road accidents by causes in Ukraine</b>				
	<b>The total number of accidents</b>			
	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>
Violation of maneuvering rules	1819	968	1216	69252
Exceeding the set speed	608	575	576	38768
Exceeding the safe speed	7568	8279	8761	28259
Failure to comply with the	392	306	338	11390

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requirements of control signals				
Violation of the rules of passenger transportation	106	110	86	4522
Violation of maneuvering rules	5201	5252	5676	2101
Violation of the rules of pedestrian crossings	1683	1602	1673	2075
Violation of the rules of public transport stops	14	7	11	1739
Violation of the rules of use of lighting fixtures	37	21	22	1620
Violation of the rules of providing unimpeded passage	469	261	264	1548
Violation of the rules of stopping and parking the vehicle	58	54	52	1489
Violation of the rules of travel of railway crossings	74	51	54	1291
Violation of the rules of transportation of goods	29	19	16	1086
Violation of towing rules	11	6	15	632
Violation of overtaking rules	458	289	317	535
Departure to the oncoming lane	1024	830	778	497
Violation of traffic rules at intersections	2959	1911	2132	341
Driving a faulty vehicle	61	82	67	225
Failure to keep distance	2420	1716	1967	149
Fatigue, sleep behind the wheel	107	79	90	116
Violation of the rules of travel of large and heavy vehicles	3	6	9	104
Go to an unspecified location	1095	1057	1102	96
Pedestrians Failure to comply with control signals	104	82	93	70
Unexpected exit to the roadway	640	510	511	65
Pedestrian in a state of intoxication	211	110	120	62

Violation of passenger safety	45	92	79	31
Violation of the rules of maintenance of roads and streets	21	14	21	28

This table shows the data for the last 4 years on the number of accidents for various reasons. The first thing that can be said is that in 2020 there was an abnormal increase in accidents. The largest number of them occurred due to violations of the rules of maneuvering, exceeding the set speed, exceeding the safe speed, non-compliance with the requirements of control signals, and the smallest number due to violations of passenger safety, violation of rules of roads and streets.

To remedy the situation, there are programs to improve road safety.

In 2017-2018, the Cabinet of Ministers of Ukraine approved the National Transport Strategy of Ukraine for the period up to 2030. The strategy aims to develop safe, environmentally friendly and energy efficient transport.

This strategy aims to reduce road deaths by 30% and socio-economic losses from road traffic injuries by 2020. It also aims at introducing an effective road safety management system to protect the lives and health of the population [4].

According to the organizer and coordinator of the Road Safety Week Yuri Chorny "Road traffic injuries and deaths are one of the five most common causes of death and injuries in the world" [3].

According to the statistical data there were 1 million 350 thousand deaths on the roads worldwide in 2020. More than 180 thousand people died and 1.3 million people got injured on the roads of Ukraine since 1991. All of the above has lead to economic losses. Therefore, it is extremely important to organize preventive measures, especially among children and young people uniting the efforts of ministries and departments. To prevent road traffic injuries and reduce mortality and injuries people can adjust their behavior. When driving on the road, it is necessary to strictly follow the rules of the road and respect other participants.

#### References:

1. A map of the countries with the most dangerous roads [online]. Available from:  
[http://rsrussia.org/opinions/read/a\\_map\\_of\\_the\\_countries\\_with\\_the\\_most\\_dangerous\\_roads\\_\\_by\\_max\\_fisher\\_-106/](http://rsrussia.org/opinions/read/a_map_of_the_countries_with_the_most_dangerous_roads__by_max_fisher_-106/) Accessed 23 March 2021
2. Accident statistics in Ukraine [online]. Available from:  
<http://patrol.police.gov.ua/statystyka/> Accessed 23 March 2021
3. Observance of traffic rules [online]. Available from:  
<https://su.ukravtodor.gov.ua/press/news/49458.html> Accessed 23 March 2021
4. Road safety program [online]. Available from:  
<https://mtu.gov.ua/content/programi-z-pidvishchennya-bezpeki-na-transporti.html> Accessed 23 March 2021

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### **Features of molybdenum disulfide friction**

In the general problem of reliability, accuracy and durability of machines, mechanisms and devices the basic place belongs to questions of friction, lubricating action, wear of surfaces of details and working bodies which are among themselves in very difficult correlation dependences.

One of the current problems of modern science is the rational use of lubricants, which in many cases determines the efficiency and durability of machines and mechanisms. Difficult operating conditions of modern machines have dramatically increased the requirements for lubricants. As a result, the theory of lubricating action was further developed, especially at extreme friction. There is a need for in-depth study of the mechanisms and patterns of mechanical and physicochemical effects of lubricants with different composition under different friction conditions.

An effective way to reduce friction and wear rate of machine parts is to use lubricants of different types and nature. Among the lubricants a special place is occupied by materials containing molybdenum disulfide.

The work aims to analyse of the structure, tribological properties and rational applications of lubricants containing molybdenum disulfide.

Lubrication between two surfaces in conditions of dry or extreme friction is provided by solid lubricants [1-2].

The main types of solid lubricants are graphite, molybdenum and tungsten disulfides, hexagonal boron nitride, tin and cadmium bromides, silver sulfate, bismuth iodides, nickel and cadmium, selenides and tellurides of tungsten, titanium, polytetrafluoroethylene (teflon). The most widely used among solid lubricants are graphite, molybdenum disulfide, polytetrafluoroethylene.

The antifriction properties of molybdenum disulfide ( $\text{MoS}_2$ ) were discovered in 1744. However, for a long time this discovery was unnecessary. And only in 1940 the development of lubricants based on  $\text{MoS}_2$  began, and the production of lubricants based on  $\text{MoS}_2$  was organized in 1948 by Alpha Molykote (USA).

The chemical, molybdenum disulfide, used in industry has the number CAS-1317-33-5 according to the international classification.

Molybdenum disulfide ( $\text{MoS}_2$ ) is a soft bluish-gray powder with a metallic luster of natural or synthetic origin.

According to the classification proposed by Campbell, molybdenum disulfide as well as graphite, mica, talc, boron nitride, zinc stearate belongs to the group of solid lubricants, the crystal lattice of which has a layered structure.

Molybdenum disulfide  $\text{MoS}_2$  has a layered molecular structure that is similar to the structure of graphite. Molybdenum atoms are covalently joined into regular hexagons, and sulfur atoms, when combined with molybdenum atoms, form a





For  $\text{MoO}_3$  the friction coefficient is 0.6, it is much harder than  $\text{MoS}_2$ . Thus, intense abrasive wear of the friction surface in the presence of sulfuric acid begins. With this in mind, when in contact with air, the maximum allowable temperature is not more than 450 °C.

2. At temperatures above 500 °C it is oxidized with the release of sulfur dioxide ( $\text{SO}_2$ ).

3. At temperatures above 800 °C, molybdenum disulfide almost decomposes.

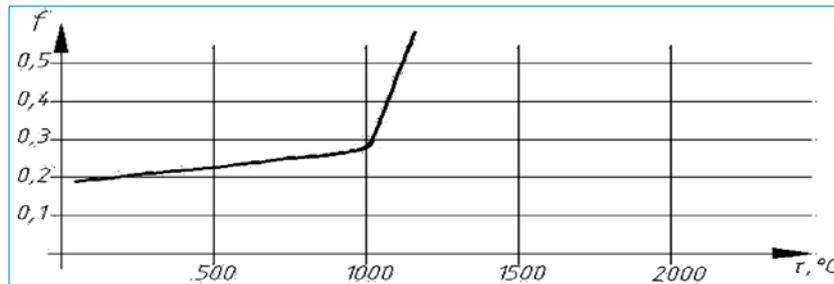


Figure 2 – Dependence of the friction coefficient of molybdenum disulfide on the temperature in vacuum

Molybdenum disulfide is used in the form of a powder, which is added to the carrier material: a plastic mixture consisting of 40...70 %  $\text{MoS}_2$  in a semi-liquid environment, aerosol dispersion sprays.

The second method of use is the introduction of molybdenum disulfide into the composition of sintered metal parts. The brushes of the electric motor, made with  $\text{MoS}_2$  - silver, have the intensity of wear 2...3 times less than the graphite ones.

Comparison of  $\text{MoS}_2$  characteristics (0.5 %  $\text{MoS}_2$ ; 2 %  $\text{MoS}_2$ ; 5 %  $\text{MoS}_2$ ; 10 %  $\text{MoS}_2$ ) and other additives (0.5 % graphite; 5 % graphite; 10 % graphite; Si + 5 %  $\text{MoS}_2$ ; 0.5 %  $\text{ZnO}$ ; 10 %  $\text{ZnO}$ ) in mineral oil at low sliding velocities allows us to conclude that only molybdenum disulfide has the ability to suppress the abrupt increase in friction [1]. In addition, the concentration of graphite above 5 % is less effective in reducing wear than the concentration of 0.5 %  $\text{MoS}_2$  (Fig. 3). Not surprisingly, molybdenum disulfide is now a promising material for friction and slip joints.

In 1992, due to the discovery of fullerene-like particles of molybdenum disulfide (Reshef Tenne), the study of the tribological properties of lubricants with nanostructured  $\text{MoS}_2$  began.

The introduction of nanocrystalline  $\text{MoS}_2$  additives improves tribotechnical characteristics in comparison with similar additives of micron  $\text{MoS}_2$  powder [3-4]. Examples of lubricants containing nanostructured  $\text{MoS}_2$  and being manufactured are Nano Grease UNIVERSAL M-00 Grease Nano Black, Nano Grease UNIVERSAL M-0 Grease Nano Black, Nano Grease UNIVERSAL M-1 Grease Nano Black, Nano Grease UNIVERSAL M Grease Nano Black, low-temperature Nano Grease NOFROST AEP 2 Grease -60 °C.

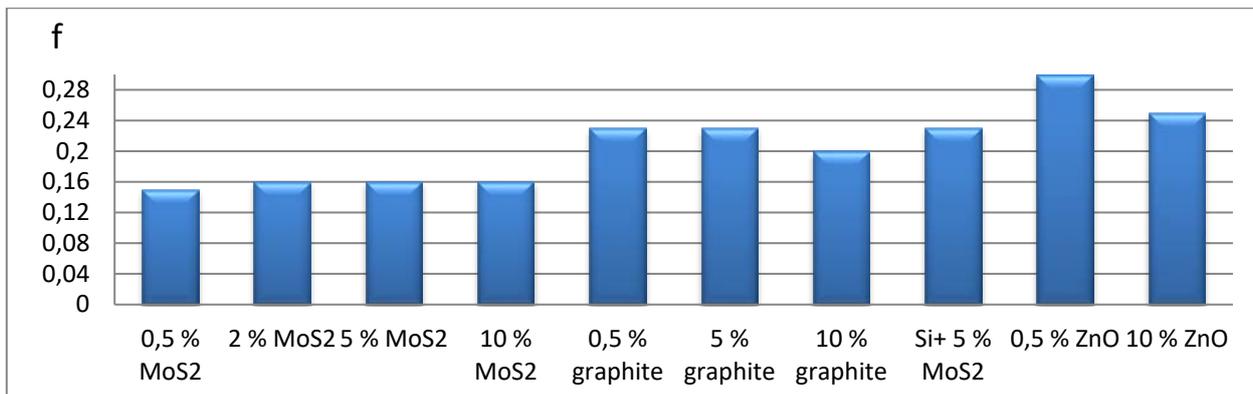


Figure 3 – Comparison of the friction coefficient of molybdenum disulfide and other additives to mineral oil:

0.5 % MoS<sub>2</sub>; 2 % MoS<sub>2</sub>; 5 % MoS<sub>2</sub>; 10 % MoS<sub>2</sub>; 0.5 % graphite; 5 % graphite; 10 % graphite; Si + 5 % MoS<sub>2</sub>; 0.5 % ZnO; 10 % ZnO

As a solid lubricant, molybdenum disulfide is successfully used in internal combustion engines that operate without lubrication, roller chain drives, presses and oil pipelines fans. The characteristics of MoS<sub>2</sub> exceed the characteristics of graphite and fluoroplastic, and, in addition to traditional use (in the form of powder, grease or dispersion), it can also be applied by plasma spraying.

The low friction coefficient of molybdenum disulfide in vacuum allows using it in space technology.

Thus, molybdenum disulfide is a promising material for tribodes.

The analysis of composition, structure, tribological properties and rational areas of application of lubricants containing molybdenum disulfide is made. Specifics of molybdenum disulfide friction are considered. Promising areas of molybdenum disulfide use are shown. The content of the article can be used by students majoring in 274 Automotive engineering in the study of disciplines "Structural and operational materials in the automotive industry", "Fundamentals of technology for the production and repair of cars".

### References

1. Закалов О. В., Закалов І. О. Основи тертя і зношування в машинах: навч. посіб. Тернопіль: Видавництво ТНТУ ім. І.Пулюя, 2011. 322 с.
2. Кондрачук М. В., Хабутель В. Ф., Пашечко М. І., Корбут Є. В. Трибологія. Київ: Вид-во Національного Авіаційного університету «НАУ-друк», 2009. 232 с.
3. Rapoport L., Leshchinsky V., Lvovsky M. et al. Friction and wear of powdered composites impregnated with WS<sub>2</sub> inorganic fullerene-like nanoparticles. *Wear*. 2002. Vol. 252. P. 518–527.35.
4. Rapoport L., Leshchinsky V., Lvovsky M. et al. Superior tribological properties of powder materials with solid lubricant nanoparticles. *Wear*. 2003. Vol. 255. P. 794–800.36.

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### Unconventional modern energy saving projects

The world is in a state of constant change, which leads to the stable development of technologies in all areas of knowledge. So, for example, the human mind continues to improve things that seem to have reached the limit of their development. At the same time, only some ideas are destined to gain a foothold in human life, while the rest, at best, will remain in our memory in the form of bold, but not ergonomic projects for our everyday life. It is beyond our power to predict in advance which idea and which project is destined to become successful, but to look at this possible future is in ours.

It's no secret that the field of energy conservation is an incredibly important component of our time, especially given the scarcity of primary resources and their constant depletion. Now more than ever before, we must use the energy of these resources as efficiently as possible. And if we are clearly unable to consider all possible projects, then going through some of the most promising and innovative projects is a matter of time and desire.

#### **bound4blue. Wingsail**



Fig.1 An example of new sails

Maritime transport is responsible for transporting more than 90% of cargo worldwide by means of a fleet of more than 90,000 vessels, which is renewed every year by more than 2,700 new vessels. These vessels consume from 4 to 110 tons of fuel per day, which is from 25% to 85% of their operating costs, and produce an unstable amount of pollutant emissions.

Bound4blue's wingail technology is needed to maintain the financial viability of the shipping industry while improving its environmental sustainability.

Wind is the cheapest, most powerful and cleanest source of energy in the sea. Now, using the bound4blue system, ships can once again use wind as an energy source to reduce fuel consumption and pollutant emissions.

Advantages of technology:

- 100% autonomous - self-service and self-diagnostics are performed automatically, so no additional crew or training is required for operation.
- Lightweight structure - The system's design allows to lighten its weight, ensuring vessel's stability and minimum heeling.
- Adjustable clear height - The clear height of the wingsail above the vessel's deck can be adjusted to avoid obstacles such as pipes, cranes or the crew.
- Minimum maintenance - Low maintenance tasks, which coincide with the vessel's dry-docking schedule
- Off-the-shelf materials and equipment - They are made with off-the-shelf materials and equipment widely used in the shipping industry.
- Foldable - bound4blue's wingsails are completely foldable (including the mast), ensuring safety during harsh weather and at port operations.
- the technology integration don't reduce the available cargo volume, so it does not have a negative economic impact.

It should be noted that the technology can be installed on both new and existing ships, ensuring a payback period of less than 5 years.

### **Glowee project**

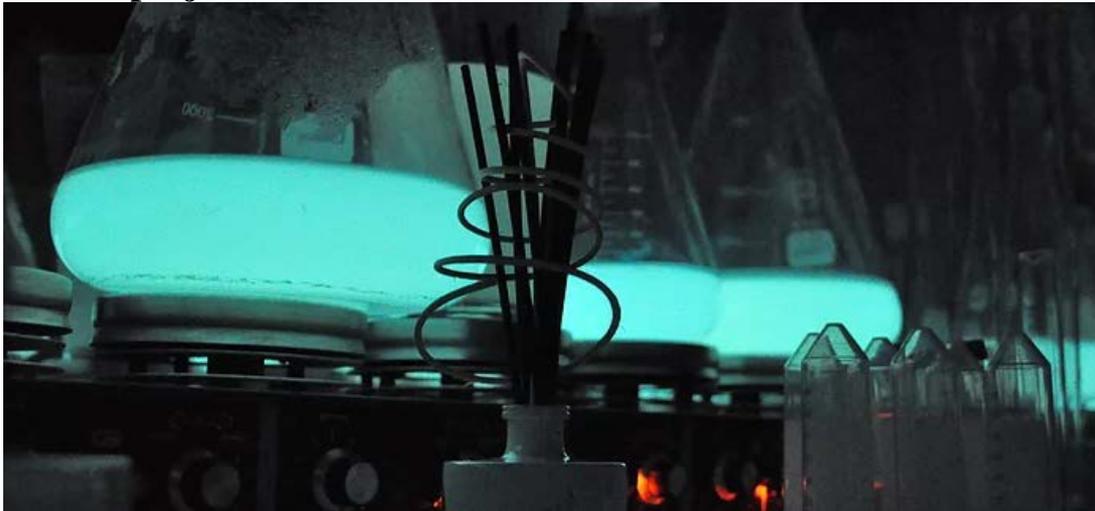


Fig.2 An example of a bioluminescent material that is used as a light source

French company Glowee develops bioluminescent raw materials from microorganisms that can grow indefinitely. It is energy from light that comes directly from nature and, based on biotechnology, is ready to revolutionize our way of production, consumption and lighting, thus reducing the impact of lighting on the environment.

Bioluminescence is the production and emission of light by some living organisms (such as fireflies, some worms and more than 80% of marine organisms). Thus, using living raw materials that produce light, it is possible to illuminate a variety of rooms. At the same time 100% organic by-products are used, which can be easily neutralized at the end of their lifetime.

Using bioluminescent lighting can save limited natural resources, such as rare metals used in LEDs, reduce pollution caused by the production, consumption and end of life of traditional lighting systems, reduce light and visual pollution that affects more than 80% of the world's population and wildlife.

We now use light bulbs as points of light, and to create light surfaces the only solution is to multiply the number of these bulbs (and therefore multiply the amount of pollution and energy consumption), but with raw materials that can take different forms and states there are endless possibilities to adapt to different needs and types of lighting.

The company is currently working on bioluminescent microorganisms to make them more efficient in terms of light production (intensity, stability, power), and for now, light powered by unlimited (or large at least) resources is very promising.

### **MinionLabs – Minion Energy Monitoring System**

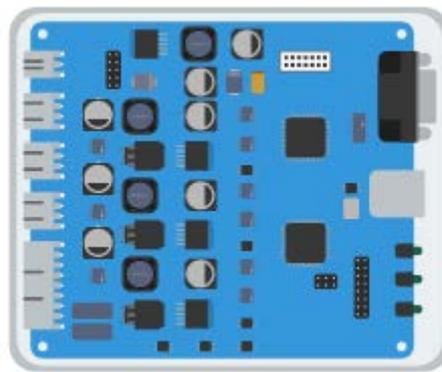


Fig.3 The minion device for single phase usage

An energy audit is an inspection survey and an analysis of energy flows for energy conservation in a building. It may include a process or system to reduce the amount of energy input into the system without negatively affecting the output. In commercial and industrial real estate, an energy audit is the first step in identifying opportunities to reduce energy expense and carbon footprint. Beyond simply identifying the sources of energy use, an energy audit seeks to prioritize the energy uses according to the greatest to least cost effective opportunities for energy savings.

We at MinionLabs have automated the traditional energy audit into an IoT solution which can able to sense device lever energy consumption inside the building and gives a comprehensive report on predictive analytics and maintenance without burning a hole in the pocket.

Minion is a Plug & Play device which doesn't need any device level sensors, plugins or any software installations required. Minion uses single/three split core current transformer sensors which collects more than 4 Million energy consumption parameters per second and fed to our machine learning algorithms which can accurately determine the appliances that are being used inside the building.

Minion Energy Management Platform has already helped many businesses and enterprises to bring down their energy cost and saved a minimum of 10% up to 30% of their annual savings.

## Heliac - Solar Tracker



Fig.4 Heliac's team and their solar thermal panels

To radically change the economics of solar thermal there need to be changes made to conventional solar technology.

With a clean-sheet, first principles approach, Heliac has developed a solar solution that excels in performance, costs and versatility, thereby having the potential to drastically reduce the carbon footprint of global process industries.

Heliac's panels generate heat using lenses that focus sunlight exactly like magnifying glasses. The focused sunlight heats up a liquid running through a series of absorbers. Controlling the flow rate of the liquid allows us to control the temperature level. The generated heat is then transferred to the end-use by directing the liquid through a standard heat exchanger.

Heliac solar fields work from the same principles as CSP (Concentrated Solar Power) which has been proven for decades. What sets Heliac's solution apart from CSP is the use of inexpensive, flat lenses that generate heat instead of the more costly, curved mirrors that are used in traditional CSP. This allows for producing heat at costs so low that Heliac's panels can compete with any other method of producing heat almost anywhere in the world.

We have just got acquainted with only four innovative technologies that may well become one of the directions that humanity will choose on its way to the future. However, already now there are many more projects and ideas that deserve our attention, no less than those that we have already learned about. Someone improves existing things, someone finds new ways to do old work, and there are those who create something completely new. One has only to show curiosity.

### References

1. <https://bound4blue.com/en/wingsail>
2. <https://www.glowee.eu/>
3. <https://www.minionlabs.tech/>
4. <https://www.heliac.dk/>

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### Possibility of strengthening of arched fastening of mining through the use of carbon fiber

Coal mining in Ukraine began more than 100 years ago. This means that the most powerful coal deposits which are the most convenient for large-scale industrial production are almost used. At present, this is not the only problem of Ukraine's coal industry that has led to an overall reduction in coal production and its high cost. This problem was significantly exacerbated by hostilities in the Donbass, when a number of mines were lost, which can no longer be restored [1].

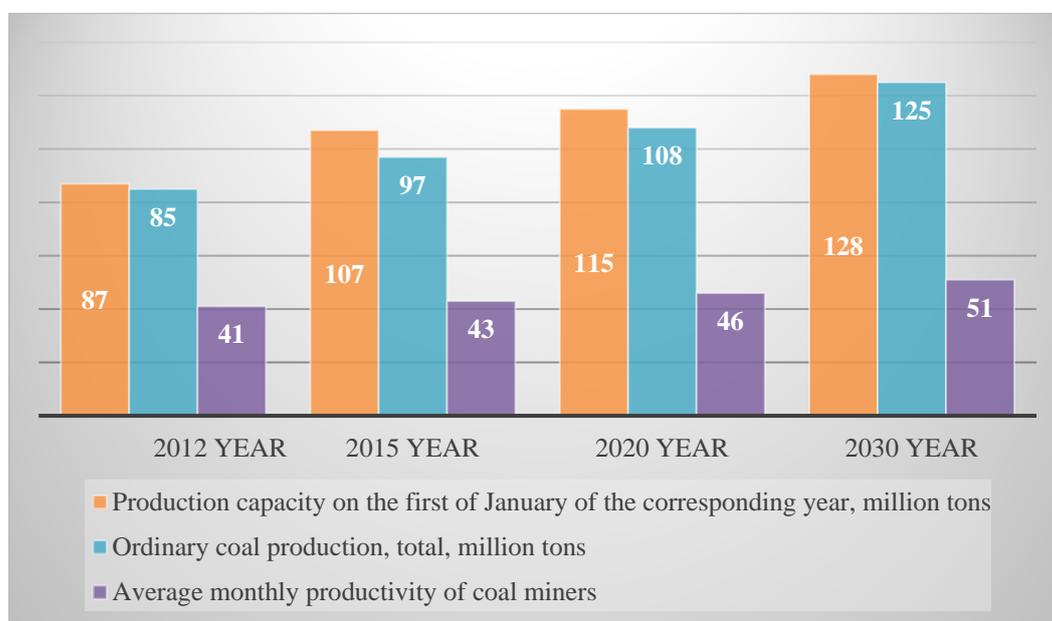


Figure 1. The main indicators of the coal industry until 2030

The problem of supporting underground mining [2-3] with resource-saving technologies is becoming increasingly important for the mining industry of Ukraine for several main reasons: the steady tendency to complicate mining and geological conditions of development; constantly growing material and labor costs for fastening workings; the need to strengthen the requirements for safe underground work.

The most promising direction is to increase the stability of mine workings by strengthening the structure with composite materials to prevent uneven pressure distribution around the contour section of the workings [4-5].

In recent decades, the need to strengthen the structure [6] with the help of innovative materials in major industries has increased, ie now there is a smooth transition from metal to plastic. The 21st century is the age of plastic. Almost

everything in the world is made of this light and soft material, but plastic has a disadvantage - fragility. In order to make it stronger and more durable, the technologists decided to reinforce the plastic by analogy with reinforced concrete. Thus appeared carbon and fiberglass [7], which are increasingly used in industry.

The main types of composite materials are: fiberglass and carbon fiber.

All innovative materials are used in major industries and have high physical and mechanical properties. Studies show that the physical and mechanical properties in the coal industry [8] is better to use carbon fiber as a fastener, because it has a higher specific strength, high heat resistance and long-term resistance to mechanical stress, which is just necessary for coal mine.

The evidence that carbon fiber can increase the load-bearing capacity of the structure and make it easier is the application for a utility model and invention (№ a2020 08057 from 16.12.2020).



Figure 2. Fastening design from composite materials

This fastening in Fig.2 includes a top connected by pliable units with racks and characterized in that the pillars and the top have a variable profile of composite material, and the pliable units are made in the form of a cylinder filled with a rod-shaped plastic material.

The obtained results allow us to conclude that carbon plastics as new innovative materials can be used in the construction of coal mine workings, which can increase the rate of workings, reduce the complexity of work performed and increase the safety of miners in the mining of super-deep horizons.

#### References:

1. Тенденції та проблеми розвитку вугільної промисловості України - [електроний ресурс]-

URL:[http://ird.gov.ua/sep/sep20191\(135\)/sep20191\(135\)\\_003\\_OleksyukH,SamotyN.pdf](http://ird.gov.ua/sep/sep20191(135)/sep20191(135)_003_OleksyukH,SamotyN.pdf)

2. Баклашов И.В., Картозия Б.А. Механика подземных сооружений и конструкций крепей. – М.: Недра, 1984.-415.
3. Баклашов И.В., Тимофеев О.В. Конструкции и расчет крепей и обделок. – М.:Недра,1979. - 263с.
4. Ковалевська, І.А. (2004). Геомеханіка управління стійкістю просторової системи «масив – зміцнені породи кріплення підземних виробок». – автореферат на здобуття наук.ступеня доктора техн.наук. Спец.:05.15.11.Дніпро,Україна: НГУ.
5. Цікра, О.А. (2010). Розробка способів підвищення несучої здатності анкерного кріплення при рамно-анкерному підтриманні виробок у нестійких породах. Дис. на здобуття наук. ступеня кандидата техн. наук. Спец.: 05.15.02. Дніпропетровськ, Україна: ІГТМ НАН України, 130 с.
6. Sakhno, I., Sakhno, S., Isaienkov, O., & Kurdiumow, D. (2019). Laboratory studies of a high-strength roof bolting by means of self-extending mixtures. Mining of Mineral Deposits, 13(2), 17-26. <https://doi.org/10.33271/mining13.02.017>
7. Introduction to Composite Materials by Tri – Dung Ngo[електроний ресурс]–URL: <https://www.intechopen.com/books/composite-and-nanocomposite-materials-from-knowledge-to-industrial-applications/introduction-to-composite-materials>
8. Бондаренко В.І., Салєєв І.А., Шека І.В., Цівка Є.С. Обґрунтування використання композитних матеріалів для підвищення стійкості гірничих виробок // Українська школа гірничої інженерії: міжнар. наук.-практ. конф., 7-11 вересня 2020 р.: тези доп. – Бердянськ, 2020. – С. 25-26

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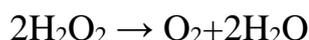
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### **Catalyst of hydrogen peroxide decomposition**

The reaction of the binary compound with hydrogen and oxygen is widely used in such industries as rocket science, textile industry, medicine, food processing etc. The reaction looks like this:



Usually, the oxygen discharged as a product of this reaction is applied as an oxidation agent in the previously mentioned industries. Burning or incomplete oxidation of organic fuels, metal oxidation and other types of oxidation. are the reactions with oxygen which is a product of this reaction, for example, oxygen received from this reaction in the submarines provides the ability to breath there.

However, obtaining oxygen in non-defined amount is extremely irrational, because the rate of the reaction should be controlled, as in the normal conditions decomposition rate of hydrogen peroxide is very low. According to kinetic theory there are several factors (temperature, pressure, concentration, catalyst presence etc.) that influence the rate of reaction. Catalysts are the most efficient because of their variety thus providing the ability to affect the reaction rate in different ways. Their principle is based on the changes in activation energy.

While conducting our research we have managed to test the proposed catalyst and compare it with catalase, which is an enzyme and helps living cells to decompose hydrogen peroxide. This catalyst is an electrolytic alloy. A tinning electrolyte is made of stannum (II) chloride (40 g/l) and potassium hydroxide (84 g/l). A lead electrolyte is made of plumbum (80 g/l), potassium hydroxide (150 g/l) and glycerin (60 g/l). The proportion between electrolytes is equal to the ratio 3:2. Such combination provides streamlined structure.

Permanganometry and a gas-volume method have been chosen as the methods to conduct the research. The first one was used to measure the concentration of hydrogen peroxide during its decomposition and helped to detect catalytic ability of material  $\text{SnO}_z\text{-PbO}_y\text{-TiO}_x$ . Gas-volume method determined the value of oxygen which was received as a product of reaction under the influence of material  $\text{SnO}_z\text{-PbO}_y\text{-TiO}_x$  and catalase.

All the results are presented on kinetic graphs:

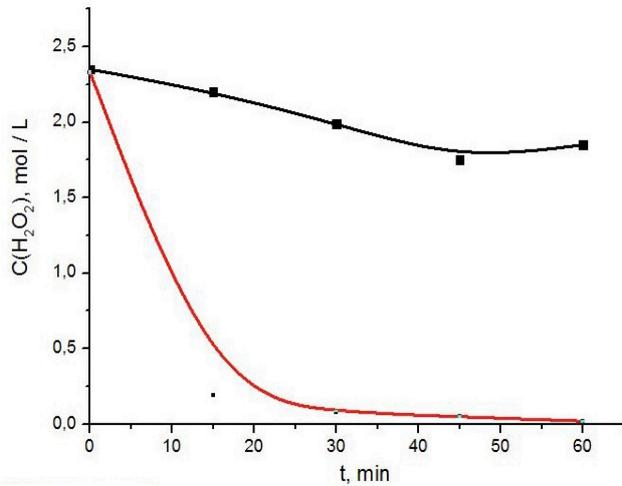


Fig.1 Concentration function of H<sub>2</sub>O<sub>2</sub> (initial concentration 2,35M)

Figure1 shows the concentration function of H<sub>2</sub>O<sub>2</sub> (initial concentration of H<sub>2</sub>O<sub>2</sub> is 2,35M) during the time under the influence of UV-rays (a black curve) and of UV-rays on the surface of catalyst material SnO<sub>z</sub>-PbO<sub>y</sub>-TiO<sub>x</sub> (a red curve).

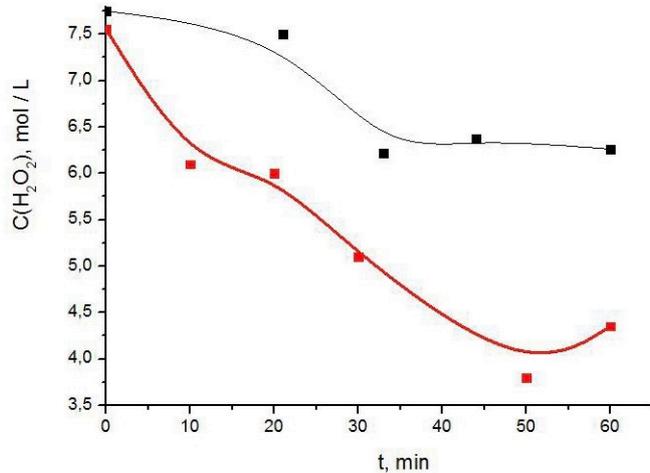


Fig. 2 Concentration function of H<sub>2</sub>O<sub>2</sub> (initial concentration 7,75M)

Figure 2 shows the concentration function of H<sub>2</sub>O<sub>2</sub> (initial concentration of H<sub>2</sub>O<sub>2</sub> is 7,75M) during the time under the influence of UV-rays (a black curve) and UV-rays on the surface of catalyst material SnO<sub>z</sub>-PbO<sub>y</sub>-TiO<sub>x</sub> (a red curve).

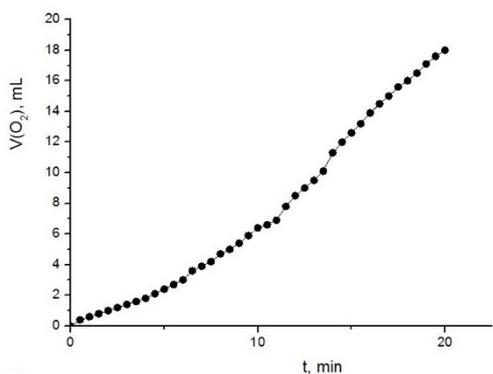


Fig. 3 Value function of O<sub>2</sub> (catalyst material SnO<sub>z</sub>-PbO<sub>y</sub>-TiO<sub>x</sub>)

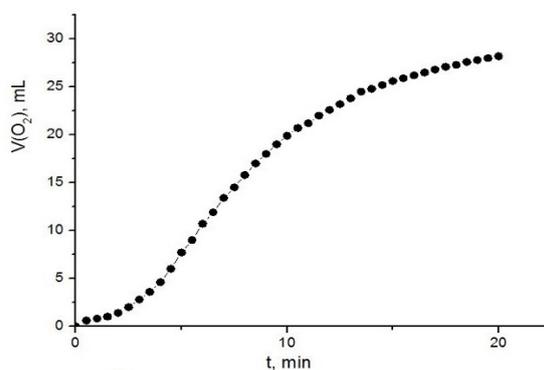


Fig. 4 Value function of O<sub>2</sub> (catalase)

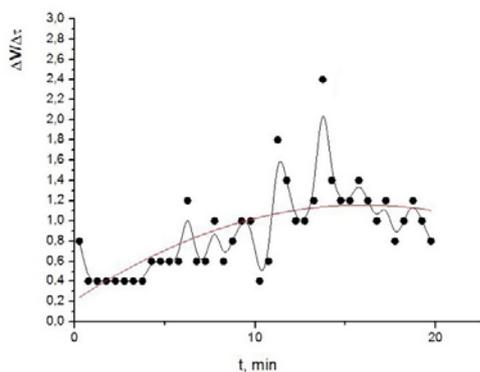


Fig. 5 Speed function of H<sub>2</sub>O<sub>2</sub> (catalyst material SnO<sub>z</sub>-PbO<sub>y</sub>-TiO<sub>x</sub>)

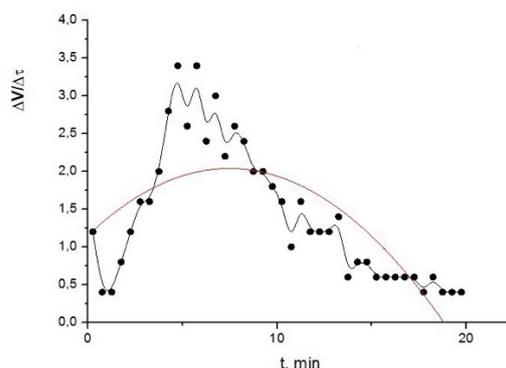


Fig. 6 Speed function of H<sub>2</sub>O<sub>2</sub> (catalase)

Figure 3 shows the value function of O<sub>2</sub> which is a product from H<sub>2</sub>O<sub>2</sub> decomposition (with the initial concentration 1,37M) during the time under the influence of catalyst material SnO<sub>z</sub>-PbO<sub>y</sub>-TiO<sub>x</sub>.

Figure 4 shows the Value function of O<sub>2</sub> which is a product from H<sub>2</sub>O<sub>2</sub> decomposition (with the initial concentration 1,37M) during the time under the influence of catalase.

Figure 5 shows the speed function of H<sub>2</sub>O<sub>2</sub> decomposition (which initial concentration is 1,37M) during the time under the influence of catalyst material SnO<sub>z</sub>-PbO<sub>y</sub>-TiO<sub>x</sub>.

Figure 6 shows the speed function of H<sub>2</sub>O<sub>2</sub> decomposition (which initial concentration is 1,37M) during the time under the influence of catalase.

Thus, we can conclude the following:

The catalyst material SnO<sub>z</sub>-PbO<sub>y</sub>-TiO<sub>x</sub> increases the reaction rate up to 1,5 - 8 times and depends on H<sub>2</sub>O<sub>2</sub> concentration.

H<sub>2</sub>O<sub>2</sub> decomposition under the influence of catalyst material SnO<sub>z</sub>-PbO<sub>y</sub>-TiO<sub>x</sub> and catalase has a different kinetic pattern. Catalase is estimated to be faster than catalyst material SnO<sub>z</sub>-PbO<sub>y</sub>-TiO<sub>x</sub>, but material influence is gradual, and as a result, oxygen is released rather gradually than instantly.

Using H<sub>2</sub>O<sub>2</sub> as a source of energy or as a producer of oxygen is an ecological alternative thanks to its products.

The proposed material ( $\text{SnO}_z\text{-PbO}_y\text{-TiO}_x$ ) is an ecologically and economically beneficial type of catalyst; it could be used several times without enormous flow rate.

**References:**

1. Алексеев В. Н. Количесраенный анализ. Под ред. д-ра хим. наук П. К. Ага- сян. Издание 4-е, перераб. М, "Химия". 1972.
2. Ильин В. А. Лужение и свинцевание / В.А. Ильин – М.: Машгиз. –1971.
3. Кожина Л.Ф., Захарова Т.В., Макушова Г.Н., Чернозубова Е.В. Скорость химических реакций. Химическое равновесие: учебно-методическое пособие. - Саратов: 2014 г.

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### **Raising energy efficiency of metallurgical production: challenges and perspectives**

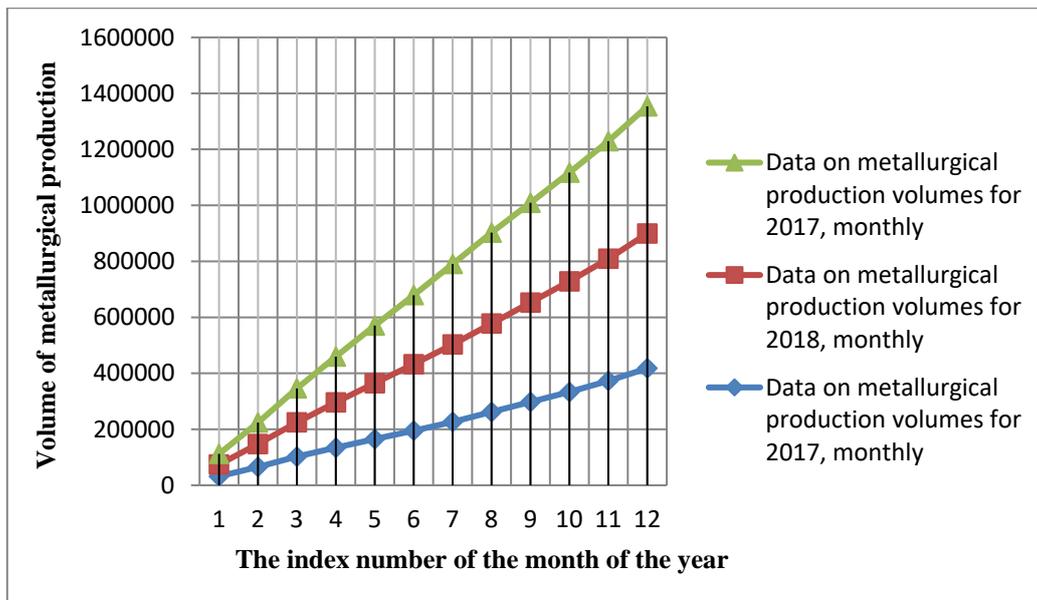
The problem of energy efficiency level increase of metallurgical production in Dnipropetrovsk region is not new for Ukraine. To a large extent it depends on the implementation of specific programs on energy efficiency at specific enterprises of the Dnipropetrovsk region [1].

To solve this problem, it is necessary to periodically analyze detailed statistical data on the volume of metallurgical production on a monthly basis for the period of 2017-2019. These data are summarized in Table 1. Based on this table, we have built a chart with statistical data on the volume of metallurgical production on a monthly basis for the period of 2017-2019 years [2].

Table 1 "Metallurgical production volumes for 2017 - 2019".

Data on metallurgical production volumes for 2017, monthly												
Dnipr. region	3200 0	6550 5	1022 60	1342 86	1650 44	1951 53	2264 50	2621 63	2976 44	3333 43	3728 79	4179 04
Data on metallurgical production volumes for 2018, monthly												
Dnipr. region	4211 4	8186 3	1225 00	1618 65	1997 40	2374 89	2766 75	3155 79	3549 98	3950 76	4362 48	4814 81
Data on metallurgical production volumes for 2019, monthly												
Dnipr. region	3806 7	7667 9	1212 95	1633 87	2056 59	2464 62	2872 35	3248 57	3565 00	3883 23	4200 79	4541 24

As we can see from this chart the production volumes of metallurgical products in certain months fell and rose, ideally, we should try to make these graphs in a straight line with the same volumes in the monthly range for the period of 2017-2019.



The solution to this problem can be the implementation of the following measures to improve energy efficiency [1, 2]:

1) Normative-legal acts fixing on the state level directed on modernization and increasing of power generation sector, due to which the efficiency of present power facilities for metallurgical production, will increase by 20%;

2) Financial incentives for modernization of obsolete components of industrial energy systems for steelmaking;

3) Increasing the share of green energy in the production of metallurgical products.

The mechanism for the implementation of measures on energy efficiency in the production of metallurgical products, usually is formed by the administration of the Dnipropetrovsk region with the attraction of funds through direct investment to the metallurgical industry. These funds should be directed to the need of Dnipropetrovsk region to improve its state of energy efficiency. It is also necessary to increase the percentage when using electricity from renewable sources and alternative fuels.

**References:**

1. E.M. Inshekov, E.E. Nikitin, M.V. Tarnovsky, A.V. Cherniavsky: "Handbook with Municipal Energy Management". - K.: Polygraph Plus, 2014. - 238 c.
2. <http://www.ukrstat.gov.ua/> - State Statistics Service of Ukraine [Date of reference 14.03.2021].

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## **Pipe Rolling Industry, General Analysis and Ways of Development**

Metal forming engineering is one of the most important industries in modern Ukraine and the integral part of it is pipe production. In our country, the intensive development of rolling production, including pipe rolling, began in the late XIX century in the southern regions.

Currently, the pipe industry of Ukraine uses pipe rolling machine that allows the manufacture of pipes with a diameter of 0.3 to 2520 mm with a wall thickness of 0.1 to 100 mm (or more) of various steels and alloys according to Ukrainian and international standards. [1]

Wide range of pipes determines the different methods and tube-rolling machines. In addition, each of the methods are characterized by the most effective range of pipes obtained as a result of the technological operation. And it is also necessary to mind the specific requirements for pipes, which determines the method of their production. For example, only seamless pipes are used to make the track of rolling bearings, as in the process of operation of the rolling body (balls, rollers) very strongly affect the rolling tracks of the rings with variable load. Each point of these surfaces must have the same physical and mechanical properties. So, when choosing a method of production, it is necessary to keep in mind that the pipes must be seamless and made of high-strength alloy steels with rigid dimensional tolerances. [2]

Boiler pipes that are used in thermal power plants must have high thermal conductivity, withstand for a long time the influence of high temperatures and pressures and do not corrode in the atmosphere of flue gases. Therefore, these pipes are seamless and made of special low-carbon alloy, so called “boilers” steels.

The above requirements are not imposed on installation pipes, including water and gas pipes, used in construction, but the price level is important for them. Relatively cheap welded pipes from steels of usual quality with good weldability are most often used in construction. These examples show us that pipes are used to solve various technical tasks and are manufactured in accordance with both, the special requirements set out in the standards, and in the technical conditions, developed in conjunction with consumers of pipes, considering the conditions of their operation. [3]

Analysis shows that pipe production is constantly improved and developed, it shows not only qualitative grow, but also significant changes in accordance with customers' needs.

The range of pipes by sizes and materials is expanding. A production of pipes with specially- treated surface (pipes for nuclear energy, crafting of instruments), with protective and smooth coatings for gas and oil pipelines, etc. is growing.

At the same time, in the last two decades there has been a tendency to reduce a production and consumption of metal pipes. More often we use to solve various technical problems and use pipes made of non-metallic materials (polymers, ceramics, glass, asbestos cement, basalt, etc.) [ 3].

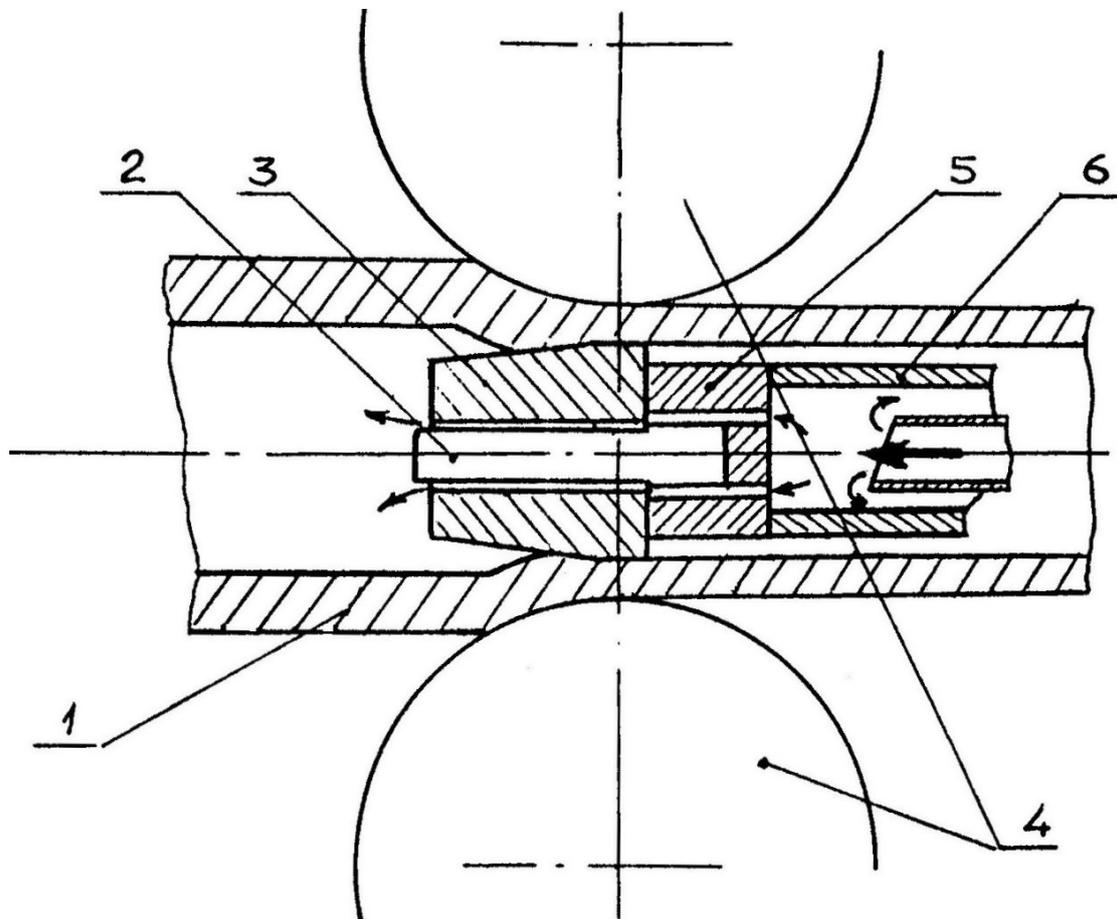


Figure 1. 1 - sleeve; 2 - stud; 3 - mandrel; 4 - rolls; 5 - tip; 6 – rod [4]

Pipe-rolling units with automatic and tandem pipe-rolling mills are the most common among the production of seamless hot-rolled pipes. Such units produce more than 30% of all hot-rolled pipes. Conditions of this type or their various modifications have become widespread in international practice, mainly in the United States, Western Europe, Japan and China. [5];

The correct choice of the heating mode of the metal determines the quality of the finished pipes and, at the same time, allows to operation for all equipment at the lowest loads and with lower energy consumption.

Duration of heating of the workpiece (ingot) is determined by a physical and mechanical properties of the heated metal and heat transfer conditions, depending on the properties of this metal, the design of the furnace and the location of the workpiece in the working space of the furnace. In the second half of the last century, ring heating furnaces with a rotating hearth became widespread. Gas serves as fuel in

ring furnaces. Burners (nozzles) are located on the inner and outer walls of the furnace. The furnace is usually divided into four or five zones.

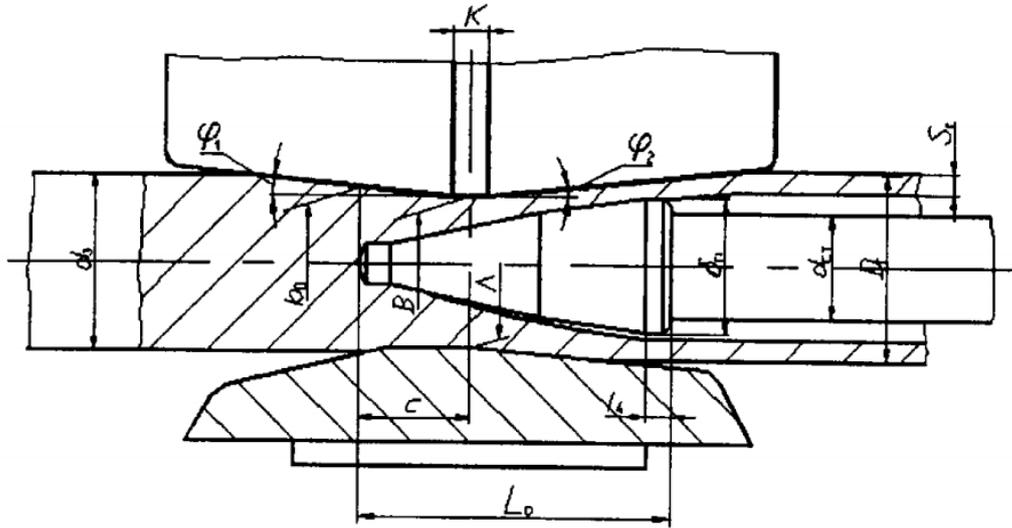


Figure. 2. Scheme of a middle deformation of the piercing mill [4]

Tables of the entrance party of all mills are stationary and only for automatic mills with multi-stream rolls tables carry out mobile. Their movement is carried out in preparation for rolling in a new caliber on the rail mechanism in a way that the gutter of the entrance table must be on the axis of the caliber in which the rolling is provided. Since the sleeves are put on a table of automatic state from a side, a lever delay is installed in front of the gutter, which works from the pneumatic cylinder. For lateral delivery of rolled pipes a circular dumper working on an electric motor. [5]

Modern mills are equipped with mechanisms for reloading rolls. With these mechanisms, rolls are removed from a frame, for which they are lifted by the lower pressure screws and under the cushions inserted bars, which connected to the drive rails through a chain drive and rail gears. After detaching the cushions from the load balancing rods, rolls together with the cushions pulled out through frame's windows.

After each passing, the mandrel is removed from the rod, and the pipe is returned to the front side of the mill which means of return feed rollers located behind the work rolls and rotate in the direction opposite to the rotation of the work rolls. The presence of reverse feed rollers is a characteristic feature of automatic states. To return the pipe, the upper roller lifts slightly, forming an enlarged idle caliber, and the lower reverse feed roller, rising, presses the pipe to the upper roller. As a result, the pipe (due to the friction of the rollers on the pipe) is transmitted through the increased height of the caliber of the working rolls to the front of the camp. The drive of both rollers is carried out through universal spindles and a cylindrical gear reducer from the electric motor of a direct current with adjustable number of turns.[6]

The upper reverse feed roller to avoid friction against the pipe during the working passage is set slightly above the outgoing pipe and in the process of working on the height is not adjustable. The lower roller is on the rocker arm and lowered

during rolling of the pipe. When transferring the pipe to the front side of the state, the lower roller by means of a pneumatic cylinder rises, presses the pipe to the upper roller and together with it informs the pipe back movement.

Star feed rollers, which are direct wiring of the rear table, are selected individually and in groups. Group rollers consist of two halves, but unlike individual their length corresponds to the length of the barrel of the working rolls, and the caliber - the caliber on the rolls. In device, external insulation or rearrangement of the rollers in the tube is not necessary when switching to pipe rolling. Therefore, in modern conditions I use only group videos. Naturally, single-caliber rollers also have one caliber [7].

Summing up, we can say that the pipe industry makes a major contribution to the global metallurgy. Pipes perform a wide variety of functions, they have different requirements regarding their properties, materials of manufacture and the technological process of their manufacture. The development of the industry is moving towards the automation of production processes and in increasing of production, as well as the manufacture of pipes with non-metallic materials.

#### **References:**

1. Kolikov, AP, Machines and units of pipe production. Kolikov, VP Романенко, С.В. Samusev.// Moscow, 1998. - 536 p.
2. Romantsev, B.A. Processing of metals by pressure. / BA, Romantsev, A.B. Гончарук, Н.М. Вавилкин, С.В. Samusev // Moscow, 2008. - 960 p.
3. Danchenko, VN Technology of pipe production. / VN Danchenko, AP Коликов, Б.А. Romantsev, S.V. Samusev // Moscow, 2008. - 960 p
4. Automatic machine [Electronic resource]: Mash-xxl.info. Encyclopedia of Mechanical Engineering. Units with automatic machine. - Link: <https://mash-xxl.info>
5. Pipe production [Electronic resource]: International edition "Metallurgical and Mining Industry". - Link: <https://www.metaljournal.com.ua>
6. Equipment and complete set for rolling mills [Electronic resource]: Production and engineering company ENCE GmbH (ENCE GmbH) - Link: <https://rolling-mills.ru/>
7. Machines and units of pipe production [Electronic resource]: Electronic library - Link: <http://www.bibliotekar.ru/>

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### **Investigation of the drive mechanism of the sewing machine Bielefeld Nähmaschinen & Fahrrad Fabrik Hengstenberg**

One of the problems that the science "Theory of Machines and Mechanisms" solves is the analysis of mechanisms or the determination of kinematic and dynamic characteristics of existing mechanisms [1]. In this regard, the current scientific task has been solved in this work - the study of the mechanism of driving a sewing machine Bielefeld Nähmaschinen & Fahrrad Fabrik Hengstenberg (image 1).

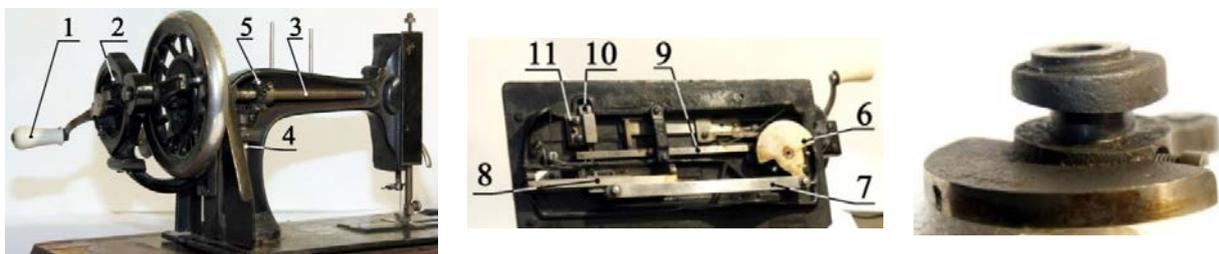


Figure 1 – The design of mechanisms for moving the shuttle and fabric of the sewing machine Bielefeld Nähmaschinen & Fahrrad Fabrik Hengstenberg: 1 – handle; 2– multiplier; 3 – main shaft; 4 – vertical shaft; 5 – two bevel gearwheels; 6 – crank; 7 – connecting rod; 8 – shuttle holder; 9 – connecting rod; 10 – quotion mark; 11 – guide

The purpose of the work: obtaining mathematical motion dependencies of the actuator of the sewing machine Bielefeld Nähmaschinen & Fahrrad Fabrik Hengstenberg.

To achieve the goal, the following tasks were set:

1. Analysis of the structure of the shuttle and fabric movement mechanism in the context of the sewing machine drive mechanism Bielefeld Nähmaschinen & Fahrrad Fabrik Hengstenberg.

2. Development of a computer model of parts and assemblies of the executive mechanism of the sewing machine Bielefeld Nähmaschinen & Fahrrad Fabrik Hengstenberg (image 2) [2].

3. Investigation of kinematic characteristics of drive actuator elements movement [3].

Research methods: physical modeling; solid state computer simulation in Solidworks; numerical simulation of kinematics in Solidworks Motion; measuring and instrumental methods.

During the research the following results were obtained:

– For the first time it is shown that, when turning the flywheel enters the sewing machine drive of company Anker-Werke, a needle fixed in the needle holder, dropping vertically down, supplies the thread, forming a loop under the fabric; into which, moving progressively, the shuttle, receiving movement from the vertical shaft of the drive, associated with the fly. When the needle holder with the needle rises vertically upwards, the shuttle returns to its original position, and the tab of the tissue transfer mechanism moves the tissue by the value of the line pitch.

– A computerized model of the executive mechanism of the Bielefeld Nähmaschinen & Fahrrad Fabrik Hengstenberg sewing machine, which consists of 38 components, has been developed. The model is tested for assembly by detecting the absence of interference, this shows the necessary gaps between the parts. Therefore, it is operational and can be used for investigating the kinematics of the mechanism.

– Equation of shuttle motion and quotation marks of fabric movement mechanism in function of flywheel rotation angle respectively have form  $x(\alpha) = k_1 \cdot \alpha^4 + k_2 \cdot \alpha^3 + k_3 \cdot \alpha^2 + k_4 \cdot \alpha + k_5$ ;  $r(\alpha) = n_1 / \sqrt{n_2^2 \cdot \sin(\alpha)^2 + n_3^2 \cdot \cos(\alpha)^2}$  (image 3), and values of coefficients are determined by means of calculative experiment with an inaccuracy of up to 8 % [4].



Figure 2 – Solid model of the executive mechanism of the sewing machine

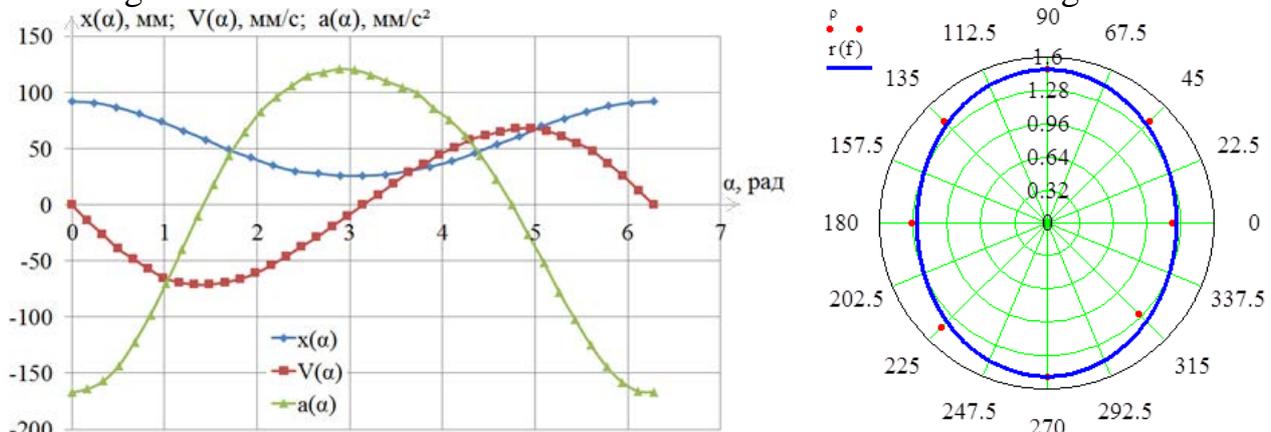


Figure 3 - Comparative analysis of shuttle movement law and lower quotation mark from crank turn angle:  $x(\alpha)$  – translatory motion of the shuttle;  $V(\alpha)$  – shuttle speed;  $a(\alpha)$  – acceleration of the shuttle;  $r(\alpha)$  - moving the lower quotation mark

The practical significance is that copying the mechanism of the sewing machine Bielefeld Nähmaschinen & Fahrrad Fabrik Hengstenberg allows you to create domestic sewing machines with a strong and highly reliable drive.

**References:**

1. Теория механизмов и машин: курс лекций / Г.А. Тимофеев. – М.: ИД Юрайт, 2010.–351 с.
2. Захарова Д.Р. Зворотний інжиніринг механізму подачі голки швейної машинки Nähmaschinen & Fahrrad Fabrik Hengstenberg / Д.Р. Захарова, О.В. Панченко // Матеріали VI Всеукр. наук.-техн. конф. студентів, аспірантів і молодих вчених (Дніпро, 15–16 листопада 2018 року). – Д.: НТУ «ДП», 2018 – С. 4–5.
3. Алямовский А.А. SolidWorks Компьютерное моделирование в инженерной практике: / Алямовский А.А., Собачкин А.А., – СПб.: БХВПетербург, 2005. – 800 с
4. Гмурман В.Е. Теория вероятностей и математическая статистика: учеб. пособие для вузов / В.Е. Гмурман. – 7-е изд., стер. – М.: Высш. шк., 1999.– 479 с.

## **Section 04 Computer Science and Solutions in IT**

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### **The application of blockchain technology**

Nowadays technologies are advancing at such a rapid pace that it allows for faster change and progress, and accelerates the pace of change until it becomes exponential over time. Not just technological trends and cutting edge technology, but many other things have changed this year due to the COVID-19 outbreak. IT professionals realized that their role in the contactless world will not remain the same. And IT specialists in 2020-2021 will constantly learn and upgrade their skills.

This publication briefly describes the blockchain technology and describes digital ledger methods in various fields, as well as its application in cryptocurrency. As blockchain is a relatively new technology, this article presents a sample of research over the past decade, starting with the first steps in this area.

Blockchain is a secure system for recording and storing information, so it is difficult or impossible to change, break or deceive it. It is actually a digital ledger of transactions that are replicated and distributed in the blockchain through a network of computer systems. Every block in the chain contains a certain number of transactions, and every time a new transaction occurs in the blockchain, the description of that transaction is added to the general ledger of each participant.

A decentralized database managed by many participants is called Distributed General Ledger Technology (DLT). This means that if a block in the chain has been changed, it is immediately obvious that it is a fake. If hackers wanted to damage the blockchain system, they would have to change every block in the chain across all distributed versions of the chain.

Blockchain, the technology behind the Bitcoin cryptocurrency system, is seen as attractive and important for enhancing security and (in some implementations) privacy for various purposes in many other areas, including the Internet of Things (IoT) ecosystem. For example, blockchains of Bitcoin and Ethereum are constantly growing as blocks are added to the chain, which greatly enhances the safety of the ledger. There is an intense research going on in academia and industry alike, with blockchain technology being used in a variety of applications. The Proof-of-Work (PoW) cryptographic puzzle plays an important role in securing the blockchain by maintaining a ledger of digital transactions that is considered incorruptible.

In addition, the blockchain uses a variable public key (PK) to record a user identification, which provides an additional level of data protection. Bitcoin is successfully used not only in cryptocurrency, but also in various non-monetary systems, such as distributed storage systems, location confirmation, health care, decentralized voting, etc. According to the latest researches, implementation of

blockchain can increase security, identify problems and offer solutions for advanced blockchain security systems.

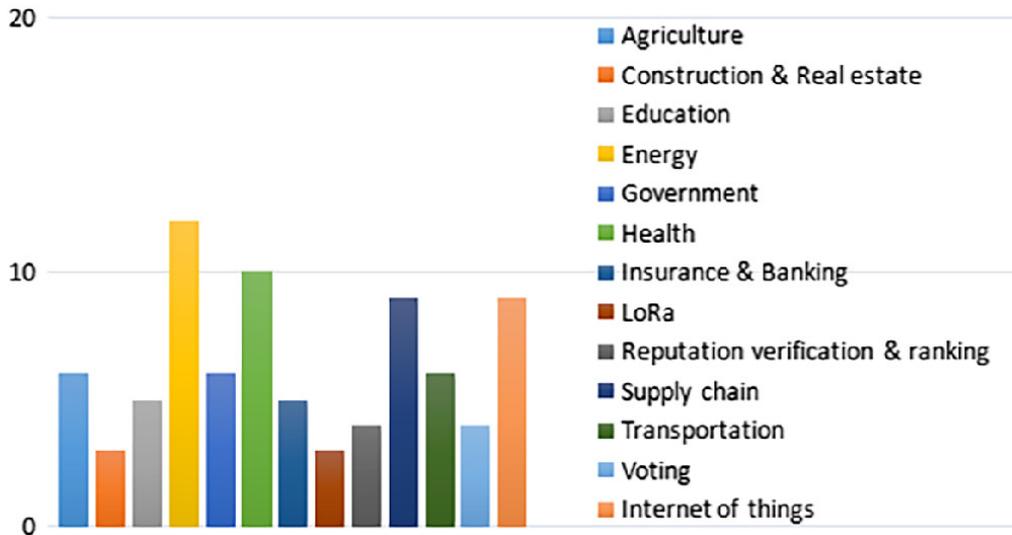


Fig. 1. The use of blockchain technology in various areas

After all, the application of the concept and technology of blockchain has surpassed its use for bitcoin generation and transactions. Its security, privacy, traceability, non-negative data sources and timestamps took it beyond its original scope. The blockchain itself and its variants are now used to protect all types of transactions, whether human-to-human or machine-to-machine. Its adoption seems safe, especially with the advent of the Internet of Things in the world. A decentralized application in the already established global Internet is also very attractive in terms of data redundancy. In particular, it is noted that the blockchain is suitable for developing countries, where trust is an important issue. Thus, the invention of blockchain can be considered a vital and indispensable additional component of the Internet, which previously lacked security and trust. Blockchain technology has not yet reached its maturity, predicting five years, as new programs continue to be implemented worldwide.

### References:

1. Mahdi H. Miraz, Maaruf Ali. Applications of Blockchain Technology beyond Cryptocurrency. [Online]. Available at: <https://arxiv.org/ftp/arxiv/papers/1801/1801.03528.pdf>. Accessed on: March 15, 2021.
2. Johan Adam. Blockchain Technology Applications where and how to use? [Online]. Available at: <https://thefrontmail.com/tech/blockchain-technology-applications-where-and-how-to-use/>. Accessed on: March 15, 2021.
3. Maria Redka. "Future of the Blockchain Technology: Use Cases, Risks and Challenges". [Online]. Available at: <https://mlsdev.com/blog/the-future-of-the-blockchain-technology-use-cases-geographical-expansion-potential-risks-and-challenges>. Accessed on: March 15, 2021.

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## Cloud migration

In the second quarter of 2020, according to IDC, sales of infrastructure equipment for cloud systems increased by 34.4% compared to the previous year [1]. More and more companies are trying cloud infrastructure, as cloud migration is now manageable and possible for any IT system. So, what is cloud migration and why it is getting more popular?

Migration to the cloud is the process of transferring data, applications, and even the entire infrastructure from a local site to a virtual environment that is used by multiple clients on demand [3]. This public cloud is responsible for computing, storing and delivering network services on a full scale. It gives you more control over the resources used and their better utilization, opens up flexible options for backing up and connecting other features that make applications more reliable. In addition, infrastructure that is already in the cloud can be further enhanced to leverage the power of the cloud.

Before, it was not easy to decide on such a move. After all, each IT system is unique, so the move was a piecemeal task with many unknowns and with risks that something would not work in the cloud. Now migration has become a predictable process with a controlled, minimal service unavailability time (the so-called "downtime"), which can be almost equal to zero [1].

Migration to the cloud, in general, can be of three types: *“lift & shift”*, *rebuilding*, *hybrid*.

*“Lift & shift”*, or *“as it is”* is when the IT infrastructure is moved to the provider's cloud in exactly the same form as it worked at the previous site - on the customer's premises or in another cloud. Operating systems with all settings and one-to-one software are moved to another environment and there, on new virtual machines, the system works almost exactly the same as before.

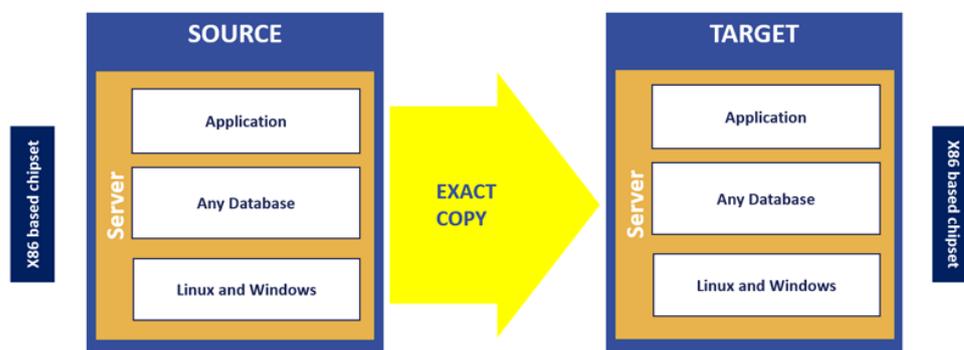


Figure 1. Lift and Shift migration [4].

*Rebuilding* is a more complex and subtle type of migration. In particular, it is planned to reconstruct monolithic applications, ideal for working in a traditional IT system, into a micro service, cloud-native architecture that takes the maximum of its capabilities from the cloud. In addition, some applications can be replaced with platform cloud services.

*The hybrid* type of migration occurs when the first “lift and shift” move is done and then rebuilding is performed, in result, the infrastructure is gradually becoming more compatible with the cloud (cloud native). This approach allows businesses to reassemble their systems in two stages. It is especially convenient when moving complex systems, as it helps to deal with the difficulties of actually moving to the cloud and then reassembling the entire system in turn, rather than simultaneously [1].

There are three main reasons why businesses are starting to migrate to the cloud.

*Speed and cost savings.* With cloud computing, you can scale your business to fit your needs, and with the right management, you can handle any spike in workload and save money with a low level of consumption.

*Disaster recovery.* If the business is global, the cost and complexity of managing end-to-end disaster recovery for on-premises data centers is exponential. It is possible to reduce costs by using high-quality cloud infrastructures in a centralized manner.

*Continuously updated new technologies and services.* Major cloud providers are constantly developing new technologies and services to help customers deliver services. The offerings include the most trending solutions, from faster servers to machine learning systems in the cloud [2].

What specific issues should businesses think over while making a decision to migrate to a cloud? The first is the need for data privacy and regulatory compliance: how to maintain confidentiality as it is required by government or health organizations. The second is supplier dependency: “to put or not to put all your eggs in one basket”. The third is cost of time and money: how long it will actually take to migrate data taking into account the need to upgrade employee skills and peculiarities of a company culture.

However, despite all the challenges, moving to the cloud can solve many problems and allow the companies to benefit. The first problem is a big traffic required for the applications, as it becomes difficult to scale resources on the fly to meet growing demands. The second is a need to reduce operating costs while improving the efficiency of IT processes. As companies need rapid implementation and deployment of applications, they want to focus more on development while reducing infrastructure overhead costs. Also, keeping pace with growing storage needs is getting harder and more expensive. Many companies are looking for expanding their business geographically, that is why building a multi-regional infrastructure with service, time, human resources and error control efforts will be challenging.

Also there is a need to create a widely distributed development team. Cloud computing enables remote workers to access applications and work over the Internet.

Likewise, keeping track of and updating the underlying server software is a time consuming but important process that requires periodic and sometimes immediate updates.

Of course, a lot of big and reliable cloud providers are ready to take care of all these issues. Many other administrative tasks, such as database backups, software updates, and periodic maintenance, are handled similarly within the cloud. And finally CapEx and OpEx: Cloud computing is shifting IT spending to a pay-as-you-go model, which is an attractive benefit, especially for startups [2,3].

**References:**

1. Миграция в облако — теперь управляема и возможна для любой ИТ-системы. [Электронный ресурс]. Режим доступа: <https://www.tadviser.ru/plus/mcs/article.php?id=14>. Дата звернення: Берез. 01, 2021.
2. Исчерпывающая информация о миграции в облако инфраструктуры и бизнес-сервисов: все о причинах, преимуществах и рисках. [Электронный ресурс]. Режим доступа: <https://cloud.croc.ru/blog/byt-v-teme/wcn-migratsiys-korporativnyh-dannih/>. Дата звернення: Берез. 01, 2021.
3. What is cloud migration? An introduction to moving to the cloud. [Online]. Available: <https://searchcloudcomputing.techtarget.com/definition/cloud-migration>. Accessed on: March 01, 2021.
4. 3 types of cloud migration strategies. [Online]. Available: <https://www.protera.com/sap-blog/cloud-migration-strategies/>. Accessed on: March 03, 2021.

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### **Smart contracts: potential breakthroughs and application cases**

Relationship between individuals relies on trust. However, sometimes that trust is broken, and that is where contracts come into play, and define a set of rules and conditions to follow in order to maintain consensus between parties and also state the consequences of failing to complete discussed conditions. Modern world is to a certain extent defined by contracts, as they provide clear instructions and conditions to follow among the participants involved.

However, sometimes troublesome situations are unavoidable. For example, if a customer claims one thing occurred and the business claims another one, it can lead to a myriad of misunderstandings with no benefit for anyone. Smart contracts provide a solution to such uncertainty.

A smart contract is a computerized protocol/application set to execute the terms of a particular transaction. It is stored on blockchain, so called a continuous sequential chain of blocks built according to certain rules, containing information about transactions, their registration and communication between them in a digital form.

Smart contracts may assist in exchanging anything of value (property, money, shares etc.) in a secure and completely conflict-free way. The purpose of smart contracts is to reduce the need for third parties, potential malicious exceptions, and to automate the whole process of creating the contract.

The term "smart contract" was first invented by a computer specialist Nick Szabo in 1997. He said that smart contracts could be presented as a set of promises, specified in digital form, including protocols within which the parties perform on these promises and could be deployed on a ledger that would be controlled by machines running on the network.

A classic example of a smart contract proposed by Nick Szabo is a vending machine. Once the client fulfills the machine's conditions (puts the token inside), the machine will execute its own part of their "agreement" and deliver the snack.

Smart contracts also originated in a concept published by Gary Howland and Ian Grigg in 1996. They described those contracts as a part of their work on a payment system for transferring assets. Further the concept was given a name "Ricardo contracts". Nevertheless, the protocol gained a real recognition only in 2014 when Ethereum (cryptocurrency and a platform for developing decentralized applications) was launched. Since that year anyone with a good software programming skill could write their own smart contracts on Solidity (a special contract-oriented programming language backed by Ethereum).

Nowadays, smart contracts have already been adopted on several other problems apart from Ethereum and even Bitcoin has its own version of smart contract

interpreters, thus providing developers the chance to choose any required platform to build their future applications.

One of the common features of smart contracts is their immutability, which means that after deployment they cannot be changed or be tampered with in any way, guaranteeing the performance of the protocol. Therefore, the terms of the agreement have to be written in a precise and specific manner to avoid bugs and errors as much as possible. Smart contracts are currently efficient for performing two types of "transactions" that are present in many contracts:

- securing the payment of funds
- imposition of financial penalties for failure to comply with conditions.

Overall, smart contracts offer a variety of advantages over traditional contract system including the following aspects:

- absence of intermediary, or any third party involved significantly reduces the cost of creating and maintaining the smart contract;
- blockchain encryption methods allow a maximum level of data privacy and security for smart contracts;
- electronic signature used to sign the smart contract eliminates the need for physical presence of the parties.

The time needed for creating a traditional contract could range from one to several days, depending on the quality of legal services, while smart contracts can be created in a few minutes if using the ready-made smart contract platform, such as Hyperledger, Fabric, Ethereum etc.

With such crucial potential, smart contracts could make an impact in many fields. For instance, in government services this technology could provide a much more secure voting system less vulnerable to fraud or manipulation. Moreover, voting transferred digitally would increase the number voters due to higher accessibility.

Finance is the area where smart contracts would most likely excel the most. Several cryptocurrency payments systems and exchanges based on this technology (Uniswap, Airswap, Kyber) are already thriving. Smart contracts may bring more freedom and efficiency to the global market as they do not require an intermediary which in turn optimizes the transaction process and significantly decreases margin costs. Financial instruments such as derivatives, loans, deposits could also be digitized and implemented in similar fashion.

In addition, smart contracts could also be used in real estate field to transfer any kind of property, thus reducing the amount of paper work required as the property registry will be taken online, saving the time and fees for real estate investors.

In healthcare, medical research companies often deal with large amounts of sensitive information (patient records, test results, and new drug formulas which are needed to be kept safe) that could be protected and encrypted through the use of smart contracts.

It should be concluded that smart contracts are only in the early stages of development. It will take some time for their evolvement and adaptation, but they already have the ability to change the current structure of traditional contracts and transform the ways of interacting with sensitive data on the internet.

**References:**

1. [https://en.wikipedia.org/wiki/Smart\\_contract](https://en.wikipedia.org/wiki/Smart_contract)
2. <https://medium.com/coreledger/what-are-smart-contracts-a-breakdown-for-beginners-92ac68ebdbeb>
3. <https://blog.hubspot.com/service/smart-contracts-customer-service>
4. <https://www.ibm.com/blogs/blockchain/2018/07/what-are-smart-contracts-on-blockchain/>
5. <https://www.devteam.space/blog/10-uses-for-smart-contracts/>
6. <https://corpgov.law.harvard.edu/2018/05/26/an-introduction-to-smart-contracts-and-their-potential-and-inherent-limitations/>
7. Savelyev, Alexander (14 December 2016). "Contract Law 2.0: "Smart" Contracts As the Beginning of the End of Classic Contract Law". Social Science Research Network.
8. Filatova, Nataliia (1 September 2020). "Smart contracts from the contract law perspective: outlining new regulative strategies". *International Journal of Law and Information Technology*. **28** (3): 217–242.
9. Nick Szabo (1998). "Secure Property Titles with Owner Authority". Archived from the original on January 15, 2014. Retrieved January 12, 2014.
10. Hal Hodson (20 November 2013). "Bitcoin moves beyond mere money". *New Scientist*. Retrieved 12 January 2014.

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## **Directions in IT and Their Prospects**

By 2022, the World Economic Forum predicts more than 75 million jobs will disappear. In 3 years, it will be more difficult to find a job for banking specialists, accountants and other office employees whose duties can be automated. At the same time, companies will need personnel, competencies are associated with new technologies.

### ***Development and design of software:***

The most popular direction in the field of information technology includes all possible types of software development.

Main types:

1. *Server development* (backend) - development and design of software for servers. The main programming languages are C #, Java, Go, Python, Ruby, C ++, PHP, JavaScript.

2. *Development the client side* of the site in the browser (frontend) - development appearance and functionality of the site, executed in the browser. The dominant programming languages in this area are JavaScript and TypeScript.

3. *System development* - development and design of drivers, system programs, antiviruses, firmware for smart microwaves, security systems, climate control in cars, the kernel of operating systems and other low-level software. The main programming languages are C ++, C, Rust and the Assembler language group.

4. *Desktop development* - development and design of desktop applications for Windows or Linux. The main programming languages are C ++, C #, Python.

5. *Development of mobile applications* for Android or IOS. For android, the main programming languages are Kotlin and Java, for IOS - Swift.

### ***Internet of Things:***

A network of autonomous devices operating in real time, interconnected via the Internet, the main task of which is to collect and analyze information, and then transfer it to each other. A classic example of IoT is a system of smart devices and the cloud to which they transmit data.

### ***Big Data:***

A set of rules, tools and approaches that allow you to collect and analyze huge amounts of data, the analysis of which is almost impossible for humans, to achieve specific goals. In this case, the data can be structured or unstructured.

### ***Information Security:***

A set of rules, methods, tools and approaches aimed at protecting information systems or confidential information, as well as equipment designed to store this information.

***Automated testing:***

It is divided into several sub-items:

1. Quality Assurance - a general set of measures, the purpose of which is the maximum quality of the created IT product.
2. Quality Control - checking the product for relevance and customer satisfaction.
3. Software Testing - organization of software testing for errors and performance.

***DevOps:***

A set of tools responsible for building code, pulling in dependencies, and hosting an application on the cloud.

***Main subsections:***

1. Coding - bringing the software code to a ready-to-deploy form.
2. Release - release approval and release automation;
3. Configuration - infrastructure configuration -Monitoring performance check and monitoring of communication with the user.
4. Testing - business risk assessment;

***Business analysis:***

It includes communication between the client and the developers, analysis of the customer's requirements and the preparation of the necessary documentation.

***Design:***

Design consists of graphic design (ads, marketing etc.), web design (creation templates for sites) and game design (plot creation, game level design), as well as thinking through the user interface.

***System administration:***

The sphere is responsible for the control over the operation of the information system. System administrators work with hardware, upgrade infrastructure, set up networks, maintain software and, sometimes, responsible for informational security in the company.

The rapid development of communication technologies has opened up a new industry - the IT sphere, which today is the most developing in the world. Finding a job for an IT specialist with extensive experience does not present any difficulties, because with the development of the industry, there is a shortage of professional personnel. Working in an IT company without fundamental knowledge and an unconventional view of the situation is impossible - not only will no beginner be taught here from the very beginning, but an experienced specialist will also need to devote a lot of time to self-education.

***References:***

1. <https://trends.rbc.ru/trends/industry/5db96f769a7947561444f1182>.
2. <https://tproger.ru/curriculum/devops/>
3. <https://www.profguide.io/professions/category/it/>
4. <https://www.sviaz-expo.ru/ru/articles/2016/rabota-karera-it-otrasli/>

### **Smart electronic planner with a variety of interfaces**

The digitalization spreads to an increasing number of everyday processes and large number of activities encourages people to use personal diaries for planning. Prompting people to switch to personal gadgets, planners are being transferred to electronic devices. Market analysis showed that today there is no multipurpose planning application that would suit every user in terms of functionality. Therefore, it was decided to develop the planning application with a set of different interfaces and functionality that adapts to the user's needs. The features of the application are flexible functionality, flexible access, easy sharing, quick search, attaching media files.

Flexible functionality. Thanks to the selection algorithm, embedded in the application, the user from the very beginning of work with the scheduler gets exactly the planning method that is most suitable for his needs. The algorithm works on the basis of the sample weights described in the book [1]. This means that when passing the questionnaire, which is available at the beginning of working with the application, depending on the answer chosen by the user, one of the planning methods gains more weight relative to the other methods. Thus, the application offers the user the most convenient method of maintaining the scheduler in terms of functions and compactness. Also, if necessary, the user can change current planning method at any time, and all data will be saved in a new format.

There are currently two planning methods available in the planning tool.

The first and simple one is the Ivy Lee method. As described in the article [2] the method is more than a hundred years old and its essence lies in one elementary, but effectively working principle – concentration on the important and the ability to limit secondary tasks. According to this method, the user should make a list of no more than 6 most important things for the day, ranking them strictly in descending order of the priority level of each. It is also fundamental not to proceed to the next case without completing the previous one, and so on along the list. This method is aimed at increasing human productivity.

The second method is Bullet Journal. According to the book written by the author of this method [3], Bullet Journal is a mixture of a planner and a personal diary: here it is convenient to record a variety of things (from random thoughts that come to mind to urgent work tasks and plans) and quickly find everything needed using special symbols. All the information is stored in one place. In addition, the Bullet Journal is a clear system: with its help, it is convenient to transfer tasks for which there was not enough time, and not to miss anything important. Originally,

using this method people can make plans for several next years. But in the adaptive planner application, planning is implemented only one year ahead, since according to Roger L. Martin's article [4], longer-term planning is more 'impressionistic' than 'strategic'.

**Flexible access.** The responsive planner, like most electronic planners or note-taking applications, can be accessed from anywhere in the world, since electronics users almost always have their gadget at hand. Although many applications of this kind work exclusively with a device connected to the Internet, the adaptive scheduler works even in offline mode. This is done thanks to the mechanism of caching user's data, which is described in [5], in the device's memory. The application works with any gadget that has access to a web browser: smartphone, tablet, laptop, personal computer.

**Easy sharing.** The adaptive planner application has the ability to quickly share notes with team members, family or friends. If they use this application, then shared records will open in this application, and if not, they can open them as a text file. As already mentioned, the application is synced across all users' devices, so user can easily add calendar dates and reminders that can also be shared with others.

**Quick search.** The application has a quick search option, with the help of which it is easy to find important information without flipping through the pages.

**Attaching media files.** In the Bullet Journal interface of the application users have the ability to attach images to their notes, so that in the end it looks like stickers in a real personal diary.

The application is unique in its kind, as it selects the planning method according to the needs of the user. Based on analysis of the planning applications market, it can be said that the listed functions of the adaptive application are its advantages and distinguish it from similar ones. Mostly analogs are not free in whole or in part. Many applications work with a paid subscription, which significantly reduces the number of users who can use it. The application is absolutely free, so the functionality is fully available to all its users. All existing features have been tested and, according to the test results, work properly. Also, new functions (for example, attaching audio files to diary notes) are being developed, tested and implemented into the application. Further development makes sense, as the design and accessibility of the application is mostly geared towards young people, among whom planning is very common these days.

## References

1. Denis Rothman. Artificial Intelligence By Example: Acquire advanced AI, machine learning, and deep learning design skills, 2nd Edition / Denis Rothman. – Birmingham: Packt Publishing, 2020. – 578 p.
2. The Ultimate Guide to the Ivy Lee Method [Electronic resource]. Access mode: <https://tweek.so/calendar/ivy-lee-method> (Last accessed: 29.03.2021).
3. Ryder Carroll. The Bullet Journal Method: Track the Past, Order the Present, Design the Future / Ryder Carroll. – New York City: Random House, 2018. – 320 p.

4. The Big Lie of Strategic Planning [Electronic resource]. Access mode:<https://hbr.org/2014/01/the-big-lie-of-strategic-planning#> (Last accessed: 29.03.2021).
5. HTTP Caching. [Electronic resource]. Access mode: <https://developer.mozilla.org/en-US/docs/Web/HTTP/Caching> (Last accessed: 29.03.2021).

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## Why IT-specialists leave IT sphere

While some people are struggling to enter IT, taking courses, internships, interviews, some of those who have already managed to do this, for some reason, are trying to get out of IT. Why do IT specialists abandon their own galleys and in what unexpected areas do professionals find their vocation?

A lot of people often change their field of activity because of the desire to earn more, but in case of IT, a salary is rarely a reason to leave the workplace in the office and the well-trodden path to a coffee machine. Employees of IT companies such as Facebook, Google, Amazon, Apple quit after having worked in the company for about 4 years on average, and they definitely cannot complain about low earnings, bad coffee and uncomfortable working conditions. Then, what pushes developers to give up everything and become designers, bloggers or something even more interesting?

According to “itpravda.com” statistics:

54.8% of programmers said they sometimes get bored at work

21.9% are bored all the time.

48.8% of IT specialists say that they are bored because of the monotonous activity.

25.7% of IT professionals think about changing jobs [1].

So, let us look at the main reasons in more detail.

*Reason 1: Monotony and routine.* Someone imagines the work of an IT specialist as a big creative activity, but this is not at all the case. Instead of building modern robots and innovative applications, developers are often forced to reinvent the wheel. «Probably, about 80% of a programmer's job consists of inventing what is already there, while not at all better than what already is. Maybe that thing is closed for public access, or it is written in another language, or it was abandoned, or maybe we just don't want to pay for it. Therefore, we start from scratch. It's a photo application, own file extension for a photo, own web browser and, of course, own web protocol. Your own online store, own payment system, and so on», says Eevee, ex-developer of eBay [1].

The «Emolument» website conducted a survey among representatives of various professions to determine the most boring ones. Overtaking lawyers, sales managers and financiers, the job of an IT specialist took the 10th place. 56% of IT respondents said they are bored at work. Going to work becomes an automatic process. Instead of seeing your work as “important” (the word that recruiters like to use to describe the position), they start seeing that they just go to the office, write the code and come home.

*Reason 2: Office work.* Office work has enough drawbacks: a sedentary lifestyle, a schedule from 9 to 5, impaired vision and poor posture. Here is what one

anonymous developer wrote on the Pro-It website: «Sadomasochism of eight-hour slavery. At 35, I work to the limit - my arms and legs become numb, I have less and less strength, constant lack of sleep. I can't leave work, I don't even have a few free minutes. Now I have one goal in life - to leave IT. Once and for all. In order not to see and remember colleagues - clerks, an endless stream of tasks and all this pointless, unnecessary work» [1]. But the schedule from 9 to 5 is still nothing, because sometimes IT people have to sit for 24 hours at work.

*Reason 3: Lack of communication.* If avid introverts are able to sit in front of the screen all day and do without communication, then those who are not among them suffer from a communication deficit. James Maverick (Ex-Programmer): "The more time I spent on giving a command to the computer, the more my communication with people suffered. While I was improving my computer skills, at the same time my communication skills with real living people atrophied" [1].

*Reason 4: Stress.* There are professions in IT where communication cannot be avoided. Engineers, sales managers and project managers do not suffer from a lack of communication. Instead, they suffer from stress. They may be under constant press from hundreds of customers calling you all day long to say their computers are not working. There is a queue of people who cannot do their job because you haven't solved their problems. All day is about disaster relief and sorting of cases, and it never ends.

*Reason 5: Big competition.* Developers who are not afraid of routine, stress, or lack of communication leave because of high competition. Now, even in vacancies for Juniors, more and more new technical terms appear. It is for this reason that IT people are forced to constantly improve their skills, otherwise they will be left on the sidelines.

There are too many IT specialists: now Ukraine ranks first in Europe in the number of IT specialists and their number is inexorably growing. At the end of 2020, the number of IT specialists was about 200,000 [2]. At the present moment demand equals supply. However, competition is growing - demands are growing, and salaries are decreasing.

*Reason 6: Reduced salaries.* Ukrainian IT sphere has the highest salaries in the country and the best specialists, but this is only partly. If we put things into perspective, we can see that, for example, the demand on the Ukrainians are more modest than on their western neighbors. The average salary of an IT developer is \$15,000-35,000, depending on the rank, experience, and place of residence. Americans get about \$100,000 a year. Of course, if we compare the salary of a Ukrainian IT specialist and the national average wage, then IT specialists are not the losers at all.

So, nowadays a lot of IT specialists just leave their work places and decide to try themselves in other professions, but still there are people that are only getting better in IT sphere. But no one knows what the state of affairs will be in the next 5 years, so today it is impossible to draw precise conclusions.

**References:**

1. Если бы не кризис, то разработчики уходили бы из IT по причине скуки, стресса, конкуренции, и отсутствия общения. [Электронный ресурс]. Режим доступа: <http://itpravda.com/2017/10/13/reasons-to-leave-it/>
2. Исследование: За 5 лет количество IT-специалистов в Украине выросло вдвое, а женщин в IT — на 79%. [Электронный ресурс]. Режим доступа: <https://itc.ua/news/issledovanie-za-5-let-kolichestvo-it-spezialistov-v-ukraine-vyroslo-vdvoe-a-zhenshin-v-it-na-79/>

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### **Working from home versus working from office in a pandemic time**

During the pandemic, many employers wondered how to ensure the safety of their workers and decided to transfer them to remote work, which has its pros and cons. Remote work or work from the "home office" is more popular than ever. Working from home is gaining growing public support because the risk of infection or infection by someone during a pandemic disease. Despite its many benefits, teleworking also has a number of challenges. Self-discipline and motivation play an important role when working from home. When there is no need to rush anywhere, we go about our business, which is why time is lost and productivity decreases. When working from home, the role of self-discipline increases as there are many distractions:

- family;
- comfort zone;
  - furnishings in the room;
  - relaxedness;
  - distraction;
- disrupted work schedule.

A remote employee, separated from their team members and team leaders, can easily become a passive observer rather than an active participant.

When the work environment was changed, no one even thought that in addition to maintaining productivity, one should think about health.

Since the beginning of the quarantine, a survey of 7,000 IT specialists in Ukraine was conducted, which showed that 80% of people went to work remotely. Developers left the most, 51% among all companies and cities. Because the work environment is at home, distractions such as family and comfort may prevent you from concentrating on work. 50% live in pairs, 27.6% live in pairs with children. You can see that working from home has become a relevant mode of work for more people, but they have another problem - concentration at work. The transition gave rise to a new problem. It became easier for people to avoid contracting the virus, but on the other hand, it became more difficult for them to concentrate on work. Of the advantages of working in an office, they note:

- a lower risk of infection;
- not wasting time on the way to the office.

Among the main factors of dissatisfaction with work at home are:

- no communication with colleagues;
- the work schedule is disrupted due to overwork caused in turn by family intervention;
- setting up a workplace;

- balance between work and life [1];

In most cases, companies help workers move work home. At the time of March 16, 2020, after after 5 days from the beginning of quarantine, EPAM, having a staff of 8,300 employees, transferred 70% of people to remote work in Lviv and Kiev, and 80% of employees in Kharkov, and the «Ciklum» company, with a staff of 3,000 people, since March 13, it has completely switched to remote mode. In addition to transferring people to remote work, «SoftServe» began to conduct online courses for students, as well as internships afterwards [2]. Almost all employees were provided with "work equipment" at the expense of the company, and 6.5% of those who did not receive support did everything at their own expense. Remarkably, productivity, in most cases (47%), has not changed [1].

Experience has shown that after switching to remote work, many employees began to notice that despite the lower risk of contracting the virus, they began to feel worse. Among the main reasons they distinguish: apathy, drowsiness and fatigue. It's all about the air, or rather ventilation. In most cases of apathy and fatigue when working remotely, carbon dioxide is to blame. In the blood, carbon dioxide, like oxygen, is carried by hemoglobin. The higher the concentration of CO<sub>2</sub> in the air, the more hemoglobin will join it and the less oxygen, and, accordingly, the higher the acidity of the blood will be. The development of respiratory acidosis leads to disruption of the functioning of organs and systems, which in mild cases manifests itself as:

- apathy;
- depressed mood;
- headache;
- instant fatigue;
- desire to sleep.

CO<sub>2</sub> standards - permissible carbon dioxide content in rooms: 400 ppm - street air. 1000 ppm - acceptable level, 5000 ppm - limiting concentration.

- At CO<sub>2</sub> level of 700 ppm - a person feels good.
- At 1000 ppm, the room becomes stuffy and the first symptoms of oxygen starvation appear - a feeling of suffocation.
- At 2000 ppm, it will become stuffy, even trained and unresponsive. [5]

A further increase in concentration leads to a worsening of the condition and even the development of symptoms characteristic of respiratory failure. Each person emits 35 grams of carbon dioxide in one hour. For an average room of 20 square meters and a ceiling height of 2.5 meters, this means an hourly increase in the amount of carbon dioxide by 584 ppm. Thus, 4 hours with standard ventilation is sufficient for the concentration to reach values that not only cause a decrease in productivity, but also harm human health [4].

Working from home requires creating a work environment. ... Most work with a laptop and often in the bedroom, but there are those who work in the kitchen, balcony, office. The company allocates equipment, but the worker himself is in charge of arranging the home office [1]. Interviews taken with specialists provide an opportunity to see different options for using workplaces at home. In order to equip a

place of work at home, specialists need to calculate the following factors: 1) Technical: lighting, air, isolation; 2) Communication: a way to communicate with your family; 3) Financial: buy property and furniture.

All this is solved independently or with the help of companies.

The survey showed how employees arrange their workplaces at home. Sergey Pirogov, Solution Architect, uses the balcony as an office. He chose the balcony because it suits his requirements: a quiet place where no one will disturb, good lighting, fresh air. His chair and desk are tailored for his height, has a Windows laptop and a Linux desktop computer. Anton Artyukh, Lead Developer, equipped his office with a computer and a MAC laptop. MAC stands on a stand, and two monitors are attached to brackets. He made himself a "CALL" button which he unfolds on the screen during meetings so that he would not be distracted by his family. He also uses Large headphones to keep your ears from getting tired during long meetings, as well as timers for breaks and alarms. Vladimir Rozhkov, Software Architect, has a height of 190 cm, so he bought himself a table with a height adjuster. There is a cutout on the table, it makes it possible to work more comfortably while standing, so it removes problems with the spine and there is where to put your elbows, relieving your hands. [3]

Working from home is like working in the office and leisure time like at home. So, we found out that working from home has many disadvantages, distractions like family, setting up a "home office", indoor air and if the family and the arrangement negatively affect productivity, then the lack of fresh air causes negative consequences in the form of apathy, fatigue and drowsiness. The benefits of longer sleep and unnecessary commuting time do not outweigh the disadvantages. But, despite the fact that there are not many benefits, they still affect the continuation of work after quarantine. Given the number of shortcomings, it is difficult to say what the health of people will be like in 10 years. At the same time, statistics show that 57% of people could work both in the office and at home. Creating an optimal working environment (lighting, air, furniture) is a top priority for good health and productivity.

## References

1. Ukrainian IT during quarantine. DOU web-site. URL: <https://dou.ua/lenta/articles/ukrainian-it-during-quarantine-results/>(accessed 17.03.2021)
2. Coronavirus vs Ukrainian. DOU web-site URL: <https://dou.ua/lenta/articles/coronavirus-vs-ukrainian-it/>(accessed 17.03.2021)
3. How to equip home office. DOU web-site URL: <https://dou.ua/lenta/articles/how-to-equip-home-office/>(accessed 17.03.2021)
4. Escape from suffocation in apartment. Habr web-site. URL: <https://habr.com/ru/post/542912/> (accessed 17.03.2021)
5. CO2 standards. Izmerkon web-site. URL: <https://izmerkon.ru/podderzhka/publikaczii/normy-so2.html> (accessed 17.03.2021)

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## **The main fears of society about Artificial Intelligence**

What is the word “future” associated with? New technologies, robotics, anxiety, artificial intelligence, job loss? The number of people from economically developed countries who see AI as a threat, despite its all obvious advantages, is still a considerable 46%. Of these, 23% believe that AI technologies do not carry any positive benefits specifically for humanity in principle. According to McKinsey's forecast, by 2030, about 400 million people on the planet, or 14% of the workforce, will lose their jobs due to the fact that their functions will be performed by programs and robots [2]. However, AI is a means to an end, not an end in itself. Artificial intelligence technologies are just tools for solving specific problems. This means that the symbiosis of a human and artificial intelligence will significantly increase productivity.

So should we be afraid of new technologies and AI? Every new technology brings a degree of fear with it. When we got phones in for the first time, people feared it would destroy conversations face-to-face. Nowadays, we use phones not only for communication, but for many other purposes, and we do not even notice how the using of AI has become common. We use a voice assistant, a camera that recognizes objects and environments and automatically adjusts the settings for taking a photo, automatic translation of a text from a photo, we unlock the phone using a fingerprint. Many other functions make everyday life easier and we do not think that these are all AI technologies.

Artificial intelligence has a positive impact on many areas. AI in medicine and healthcare has become a particularly hot topic in recent years. A good example is the first operation in Ukraine in 2019 performed by a robotic surgeon. The robot successfully removed the tumor from the patient. The robot named DaVinci, was designed by NASA specialists. During the operation, it was remotely controlled by a surgeon [3]. The advantage of this type of operation is that robots perform actions which a surgeon's hand cannot repeat, and they can be located in different parts of the planet, doing a high-quality operation.

A group of experts headed by the Professor Denniston (the University Hospitals Birmingham NHS Foundation Trust in the United Kingdom) made the first systematic review comparing the effectiveness of artificial intelligence with medical professionals in disease diagnosing. The study showed that AI can correctly diagnose the disease in 87% of cases, while detection by healthcare professionals gave an accuracy of 86%. The specificity (determines the probability of the positive result of a diagnostic tool) of deep learning algorithms was 93% compared to human - 91% [5].

An example of this is diagnosing dyslexia, a specific learning disorder. Machine

learning has the ability to process huge datasets much faster and more efficiently than human researchers could do. Research of Spoon et al in 2019 showed that the neural system, using computer vision, was able to determine the presence of dyslexia by a person's handwriting. Their findings were supported by another study [8].

In addition, AI can help solve global problems of humanity. About 13 million tons of plastic waste end up in the ocean every year, according to UN ecologists. They report that by 2050, the mass of rubbish will be higher than the total weight of all fish on the Earth. Garbage recycling is one of the areas where robotic solutions have been actively entering in recent years. Saving the planet from a "plastic catastrophe" will be able with the help of robots capable of snatching bags and cups from garbage and getting hazardous waste out of the ground. The use of AI technology, computer vision and robotics will automate the processes from collecting waste material to sorting it out and processing. The robot named DustCart illustrates this point. He collects garbage bags from city dwellers and takes them for recycling. Robot height is 150 cm, weight - 70 kg, speed - 1 m/s. One battery charge is enough for 16 km [5].

What is the reason for the bias of people towards AI technologies? One of the main reasons is that mass media makes a hype around this topic. This is beneficial because it generates a lot of discussion among people and because of this the media can easily control the thinking and actions of the population.

However, the threats still exist. Research firm OpenAI, the Electronic Frontier Foundation's digital rights management group, and the US Center for Emerging Security Practices have identified the key areas of potential AI abuse. The digital, physical and political spheres are exposed to this threat. Projectile drone is a good example of how attackers can use AI for their own purposes. They can equip an ordinary drone with software that will recognize the faces of people, so in this way they can attack a specific person remotely. In addition, hackers can use AI technologies for speech synthesis to impersonate someone, or they can use a bot that will automatically create fake videos, all of these can create a huge political problem [6]. Leakage of confidential information is a threat that accompanies AI. China's "Orwellian" use of facial recognition technology demonstrates this problem well. In China, face recognition is everywhere, all actions and locations, ID number, address, date of birth of people are recorded in the database. In 2019, company SenseNets failed to protect this database with a password, in result anyone could view this data in the public domain. This allowed the thieves to steal personal data of citizens and their identification numbers [9].

To avoid these threats, Software engineers, policymakers, and scientists must determine exactly what malicious use of AI might be and how to prevent it. They must realize that AI is a very versatile, double-edged technology, so scientists and developers must consider the possible outcomes of using AI.

To sum up, we can say that artificial intelligence can complement the human world, but cannot replace it in any way. People should not forget that we are talking about artificial intelligence, not artificial consciousness. The key point is that people are not afraid of artificial intelligence itself, but they have a dread of the unknown

lying behind this phenomenon. If the essence of AI is explained in more simple terms with more positive connotation, it can be a solution to many problems and concerns. AI will only become what humans want it to be. Stephen Hawking once said: “Unless we learn how to prepare for, and avoid, the potential risks, AI could be the worst event in the history of our civilization”. The main task is to clearly define the line beyond which the AI should not go, and the fear that AI can completely displace human services from the labor market or become a human itself will disappear.

### References:

1. Статистика роста AI в 2019 году, которую вам нужно знать. [Электронный ресурс]. Режим доступа: <https://www.everest.ua/ru/najpotuzhnisha-j-dovgostroкова-ekonomichna-czinnist-ai-sogodni-polyagaye-ne-u-tysyachah-novyh-startapiv-ne-u-globalnomu-vplyvi-na-pererozpodil-robochyh-misz-shho-svit-obyektivno-poky-shhe-ne-pe/>. Дата обращения: 15.02.2021.
2. Что такое индустрия 4.0 и что нужно о ней знать. [Электронный ресурс]. Режим доступа: <https://trends.rbc.ru/trends/industry/5e740c5b9a79470c22dd13e7>. Дата обращения: 15.02.2021.
3. В Виннице робот-хирург выполнил первую в Украине операцию. [Электронный ресурс]. Режим доступа: <https://tsn.ua/ru/ukrayina/v-vinnice-robot-hirurg-vypolnil-pervuyu-v-ukraine-operaciyu-1319292.html>. Дата обращения: 15.02.2021.
4. Эффект пылесоса-убийцы: почему общество боится искусственного интеллекта. [Электронный ресурс]. Режим доступа: [https://www.rbc.ru/spb\\_sz/28/10/2019/5db6f21b9a79476c3bedbf](https://www.rbc.ru/spb_sz/28/10/2019/5db6f21b9a79476c3bedbf). Дата обращения: 15.02.2021.
5. Роботы сделают мир чистым. [Электронный ресурс]. Режим доступа: <https://habr.com/ru/post/402311/>. Дата обращения: 15.02.2021.
6. Три угрозы человечеству, которые несет искусственный интеллект. [Электронный ресурс]. Режим доступа: <https://www.bbc.com/russian/features-43139404>. Дата обращения: 15.02.2021.
7. AI just as good at diagnosing illness as human. [Online]. Available: <https://www.medicalnewstoday.com/articles/326460#AI-on-a-par-with-healthcare-professionals>. Accessed on: 06.12.2020.
8. Machine Learning Might Be The Future of Dyslexia Diagnosis. [Online]. Available: <https://interestingengineering.com/machine-learning-might-be-the-future-of-dyslexia-diagnosis>. Accessed on: 06.12.2020.
9. Chinese facial recognition company left database of people’s locations exposed. [Online]. Available: <https://www.cnet.com/news/chinese-facial-recognition-company-left-database-of-peoples-location-exposed/>. Accessed on: 06.12.2020.
10. Artificial Intelligence and the Fear of the Unknown. [Online]. Available: <https://interestingengineering.com/artificial-intelligence-and-the-fear-of-the-unknown>. Accessed on: 06.12.2020.

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## **Big Data technology problems**

In the realities of the technological development of the digital environment, the role of data and information in them has changed significantly. Before the growth of computer technology, the speed of creation and dissemination of information allowed to define it as a source of necessary information and knowledge, but in today's realities, we confidently assert that the data is gradually acquiring the form of an independent resource with personal value. It should be emphasized that data, by its very nature, is a universal resource. In modern science, it is most often referred to as a kind of economic resource, since information has a direct impact on relationships that can be expressed in monetary terms. Moreover, information affects not only socio-economic relations, but also has tremendous significance for scientific and technological progress, is valuable for military and political tasks. As an intangible resource, data has some advantages. Compared with other resources, it requires minimal storage and transportation costs, and from the very beginning, there are no restrictions on copying and use.

The answer to the question where the roots of big data come from and why this problem has become so urgent in our time, lies in plain sight. Based on statistics, the size of the data that was accumulated by people in 2007 reached 300 exabytes. It is hard to believe but in 2020 the amount of data we create and copy annually has reached 44 zettabytes. This includes, for example, reading various sensors, starting with video surveillance cameras on city streets and ending with Google Analytics services, which can be found on 95% of sites on the Internet. Besides, people do not pay enough attention to the information that they leave on the network, no matter how insignificant it may be. Most of the data can be called information only because it occupies space on various data carriers; big data methods make it possible to highlight important points from this volume and obtain the desired statistical result. Previously, sampling gave us some insight into the whole by examining a small fraction of the collected data. Now we do not need to limit the algorithm to a small part, we can take all the information about something instead of samples and possible errors in the analysis of this sample.

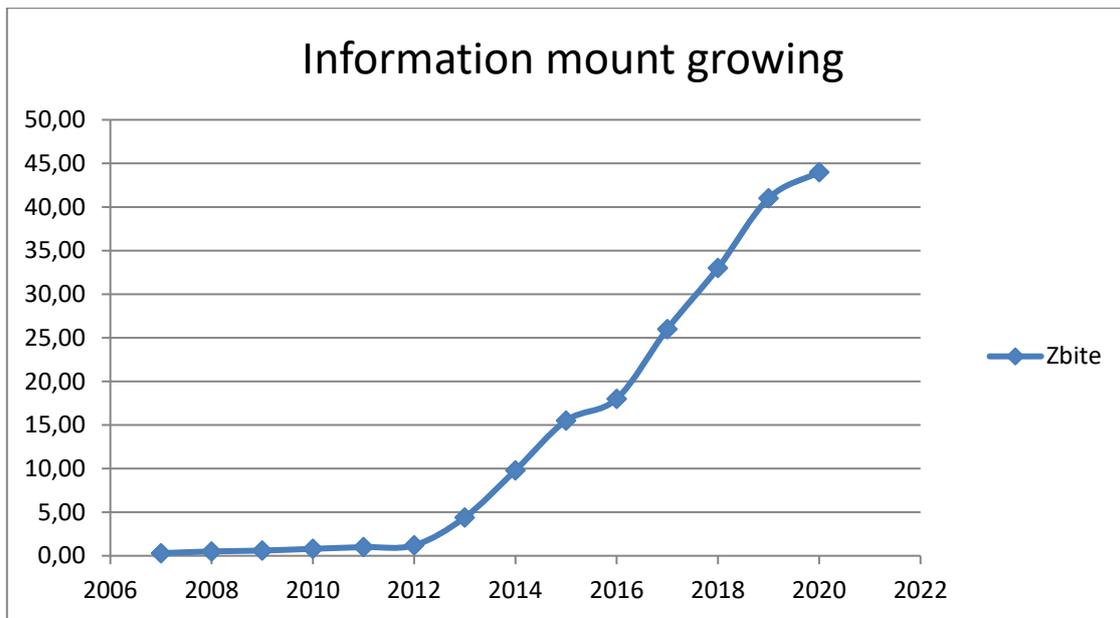


Figure 1 – Information mount growing

Thus, big data technologies have burst into our lives. And, it would seem, everything is fine, people get continuous benefits and convenience with the help of this technology. When you type a question, you are interested in into a search engine, it offers you options similar to your request. It adds many analytical functions to the software, such as: "The best cafes in your city." The browser shows advertisements for the products you were interested in the other day. But all these things have another side with disadvantages:

The first and most significant drawback of this technology is the violation of user privacy. Processing programs analyze huge amounts of data. Accordingly, the more personal the information is, the more worthwhile and interesting results the algorithms get from it.

The unjustified illusion of correctness of program conclusions and its possible ambiguity. Without knowing the mathematical logic inscribed in the algorithm, there is no way to confirm or deny the correctness of the calculations.

The secrecy of algorithms for analyzing big data. And because of this status of a trade secret, independent experts and mathematicians cannot criticize them.

Also, commercial secrets accompany the inaccessibility of the algorithm, it remains unknown what data gets into its processing, and what is not taken into account. Moreover, this is unknown not only to consumers, but also to the administrator who works with the program and acts according to the protocols, depending on its conclusions.

The results of the analysis are also not completely transparent and, with a high probability, can be misinterpreted. Many people will perceive the same results differently. For example, a 20% probability is little or a lot? The answer is different for each person and it depends on many factors that we may not even be aware of.

In case if an organization implements analytical software in its software products, and you do not like it, you cannot simply refuse to provide personal data. The company is not interested in your opinion whether you agree to participate in this

study or not. More often than not, corporations do not consider it necessary to notify their customers about this. And with rare exceptions, you must personally agree to the processing of your data, otherwise, you will have limited access to the functions of the software.

Summing up, the impact of big data analysis technology on society boils down to the fact that in other advanced and key technologies, there are two sides, and this is not a panacea, but just a new tool, and although it is powerful enough, it is still not without its drawbacks and restrictions. The public should be provided with well-protected and open-ended data processing algorithms. It is also important to make public what user data is used in the algorithm. Independent critics and academics should be allowed access to the source code, governments should impose restrictions and erase gray areas in legislation regarding the use of confidential information by companies and tighten punitive measures for its leakage or distribution.

**References:**

1. <https://techland.time.com/2013/10/10/the-argument-for-making-the-misuse-of-your-personal-data-a-felony/>
2. <https://www.ibm.com/software/data/bigdata>.
3. <https://www.osp.ru/iz/bigdata/articles/13048920>
4. <https://pdfs.semanticscholar.org/c145/ac7fff9293da9c57d9a5e4f40dad875abd6.pdf>
5. <https://www.weforum.org/agenda/2019/04/how-much-data-is-generated-each-day-cf4bddf29f/>

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## Artificial Intelligence in University Educational Process

Nowadays, in the age of information, educational organizations more and more often use different kinds of information technologies to automate their working process. However, not all the problems are resolved. In addition, educational process rapidly makes a transition to the online format, so new challenges appear. Some of educational process issues, such as knowledge assessment and prediction of academic performance, are directly connected to tasks of recognition, making decisions, classifying and analyzing a large amount of data. Tasks of this kind are quite difficult to solve with standard programming approaches and this is a problem. However these tasks are typical for artificial intelligence (AI). So using AI in systems for automation some aspects of educational process, including methods of assessment students' knowledge, prediction of students' academic performance, etc., is very actual. There are no such systems implemented in Ukrainian educational platforms, but some experimental systems exist in other countries [1, 2, 4]. Using AI in educational process certainly has its own benefits and future perspectives, but it also may cause some problems. Typical problems in AI use are:

- time for training;
- high cost of development;
- wrong interpretation of results;
- risk of unemployment.

AI can be used for handling examination related activities. Subjective opinion and different marking systems of examiners are main highlights that usually cause a certain level of bias in knowledge assessment. Nowadays the systems for objective type papers evaluation exist and they mostly use OMR technology [3]. There exist the problem of evaluating subjective type papers. For this purpose AI can be used. It is an urgent educational system need. First of all, AI can provide a high level of precision, efficiency and it can save a lot of time because of its possibility to analyze large amounts of data, more than any human. Secondly, AI can guarantee reducing bias in assessment caused by subjective examiner's opinion.

Today some experimental systems exist. For example, in the article [1] authors from Sinhgad Institute of Technology in India described their experimental system for subjective answer evaluation. They tested this algorithm and it showed about 90% of agreement with human performance. Another bright example is Chinese education [4]. By the year 2016 China Ministry of education started a big digital educational experiment. And today 60 000 schools use the system for automatic essay correction with the level of precision matching humans in 92%. The essay grading machine is based on AI neural network and is improving its ability to understand human language by using deep learning algorithms. These examples show that AI can be

trained for grading different kinds of subjective type papers, for example, even code snippets, what is actual issue in IT-education area.

Another possible use of AI in education is prediction students' academic performance. Poor results of students after admission are a big problem for many of educational institutions. Students' progress depends on variety of reasons, such as their socio-economic background, academic performance record, etc. Prediction based on manual analysis of large amount of data is difficult and inefficient. Standard programming algorithms cannot work with such a spread in data sets. According to the article [2], the test version of a neural network was created and integrated in educational system of "Nicolae Titulescu" University of Bucharest. The neural network analyzed profiles of first-year students and classified them into specific academic performance groups. It was successfully used to predict potential candidates for leaving the university with about 86% of the average predictability rate. This helped institution management to take early actions to avoid academic performance regress and even student leaving education. Hence AI can be used for analysis and prediction of different aspects of educational process, such as forecasting different academic characteristics of students. This can make educational process more flexible. Such a system can analyze for example, weaknesses in student's knowledge, so that teacher is able to adjust teaching/learning strategy and provide a student with specific tasks.

Using AI may have some possible problems:

- **Long training.** AI systems mirror human behavior and replicate the best practices of human, but they also need to be pre-fed with relevant information. It can take up to six months to train AI system.
- **High cost of development.** The exact cost is difficult to estimate, because it depends on many aspects. To demonstrate the expenditure scale, authors of the article [5] predict that AI adoption in education is expected to reach global expenditure of \$6b by 2025. Much of the growth will come from China and USA.
- **Wrong interpretation of results.** AI analyzes big amounts of data quite accurately, but the results can be misinterpreted or even deliberately misused. For this reason, results of analysis should be used carefully.
- **Risk of unemployment.** According to the study conducted by McKinsey Global Institute [6], intelligent agents and robots could replace about 30% of the world's current human labor by the year 2030. Consequently, many teachers could lose their jobs and this problem should be resolved in some way, for example by staff retraining.

AI is an efficient solution that can provide opportunities to optimize and improve some aspects of educational process. Despite of some possible the problems such as time for training, high cost of implementation, wrong interpretation of results and risk of unemployment which undoubtedly should be taken into account, AI systems can be successfully used for solving many issues in education. These are above mentioned assessment of student's knowledge, prediction of students' academic performance and some others. High cost of implementation can be

compensated by the process optimization and reducing costs in the near future. To avoid wrong result interpretation data should be used carefully and inaccuracies should be taken into account. In this case advantages outweigh disadvantages. It is brightly illustrated by existing experimental systems, mentioned above in this paper. Unfortunately, today there are no AI systems implemented in Ukrainian education, but AI application in education becomes more and more popular and has great future perspectives, so it is very possible to appear in Ukraine soon.

**References:**

1. Patil, P., Patil, S., Miniyar, V., & Bandal, A. Subjective Answer Evaluation Using Machine Learning. *International Journal of Pure and Applied Mathematic*. 2018. Vol. 118, no. 24. URL: <https://acadpubl.eu/hub/2018-118-24/3/577.pdf> (Last accessed: 08.02.2021).
2. Oancea, B., Dragoescu, R., & Ciucu, S. Predicting students' results in higher education using neural networks. *International Conference on Applied Information and Communication Technologies*, pp. 190-193. 2013. URL: [https://www.researchgate.net/publication/236582370\\_Predicting\\_students'\\_results\\_in\\_higher\\_education\\_using\\_neural\\_networks](https://www.researchgate.net/publication/236582370_Predicting_students'_results_in_higher_education_using_neural_networks) (Last accessed: 08.02.2021).
3. Optical\_mark\_recognition. *Wikipedia* : website. URL: [https://en.wikipedia.org/wiki/Optical\\_mark\\_recognition/](https://en.wikipedia.org/wiki/Optical_mark_recognition/) (Last accessed: 09.02.2021).
4. Pedró, F., Subosa, M., Rivas, A., & Valverde, P. Artificial intelligence in education: challenges and opportunities for sustainable development. *Working papers on education policy*, p.13. 2019. URL: <https://unesdoc.unesco.org/ark:/48223/pf0000366994/> (Last accessed: 10.02.2021).
5. 2019 Artificial Intelligence & Global Education Report. *HolonIQ* : website. URL: <https://www.holoniq.com/notes/2019-artificial-intelligence-global-education-report/> (Last accessed: 09.02.2021).
6. Manyika, J., Lund, S., Chui, M., Bughin, J., Woetzel, J., Batra, P., Ko, R., & Sanghvi S. Jobs lost, jobs gained: What the future of work will mean for jobs, skills, and wages. *McKinsey Global Institute*, p. 2. 2017. URL: [https://www.mckinsey.com/~/\\_media/McKinsey/Industries/Public%20and%20Social%20Sector/Our%20Insights/What%20the%20future%20of%20work%20will%20mean%20for%20jobs%20skills%20and%20wages/MGI-Jobs-Lost-Jobs-Gained-Report-December-6-2017.pdf](https://www.mckinsey.com/~/_media/McKinsey/Industries/Public%20and%20Social%20Sector/Our%20Insights/What%20the%20future%20of%20work%20will%20mean%20for%20jobs%20skills%20and%20wages/MGI-Jobs-Lost-Jobs-Gained-Report-December-6-2017.pdf) (Last accessed: 10.02.2021).

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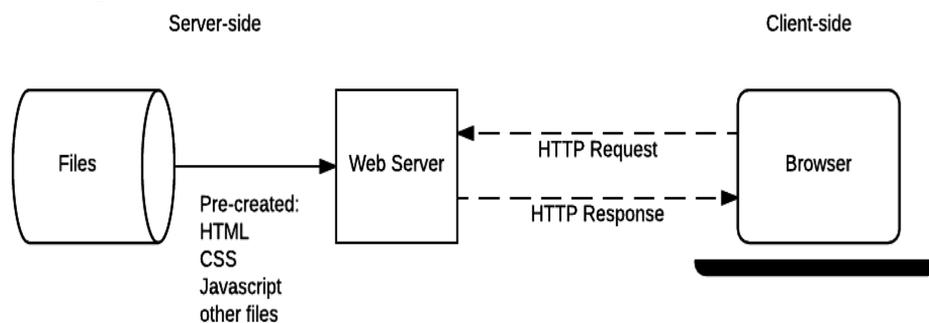
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## Development of a web-application using the Vue.js framework

A web application is a set of software created by a client-server technology which, unlike conventional traditional applications, can be run on any device that has an Internet connection and an interactive user interface. To use the web-application, the user only needs to have a browser on his device [1]. When creating web-data, the developer must take into account the constant updating of web browsers and, therefore, keep the product up to date. To date, many languages and tools have been created with which everyone can create their own website and post it on the Internet.

A web server is a server that runs in the background, waiting for a request from a user, and after receiving a request executes it [2]. The principle of operation of a web-server is to exchange HTTP-requests and HTTP-responses between the client and the server (Fig. 1.1).



*Fig. 1.1. Browser-web server relationship diagram*

The Python language with its Django framework and the JavaScript language with the Vue.js framework were used in the development of the web-application.

The PyCharm integrated environment was used to develop the software product, which allows you to develop Python programs for Windows, Mac OS and Linux.

Python is an interactive, object-oriented programming language. Like several other programming languages, it is supported by the GPL license, which means that this language can be downloaded and used for free. Python is loaded with a large library that can be used immediately so that the user does not have to write his own code to implement a particular function.

Django is a high-level Python web framework that allows you to quickly develop secure and scalable web sites [3-4]. It is free and comes with open source, an active community, and great documentation for beginners.

Vue.js is a library for creating web-interfaces that can be used both for individual pages, solving simple problems, and as a foundation for full-fledged industrial applications.

To implement the interaction between two frameworks, the Axios library for Vue.js and the DRF library, which works with standard Django models to create an API of project functions, were used.

The Django Rest Framework API consists of three parts:

- Serializer that converts information stored in the database and defined using Django models, into a format that is easily and efficiently transmitted through API;
- Viewer that defines the functions that will be available through the API;
- Router that defines the URLs providing access to each view.

Axios is a client library that uses defaults by default and runs on both the server and client side.

The interaction of Django and Vue.js looks like this (Fig. 1.2).

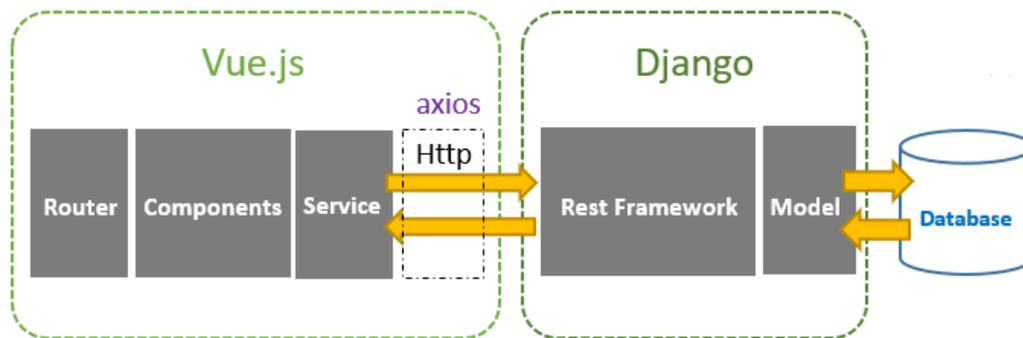


Fig. 2.2. Interaction of Django and Vue.js

All this is based on the principle that Django exports REST Api using the Django Rest Framework and interacts with the database using the Django model [7-8]. The Vue client sends HTTP requests and receives HTTP responses via Axios, and displays component data.

This is how the web application on the vue.js framework works and is developed, which allows us to conclude that this is the best choice for website development.

### References:

1. Пьюривал С. Основы разработки web-приложений. - СПб: Питер, 2015. - 272с.
2. Рудикова Л.В. Базы данных. Разработка приложений. – СПб.: БХВ-Петербург, 2006. – 496 с.
3. Метиз Эрик. Изучаем Python. Программирование игр, визуализация данных, web-приложения. 2-е изд. СПб.: Питер, 2017. - 469 с.
4. Django documentation. [Online]. Available: <https://docs.djangoproject.com/en/3.0/> Accessed: 20.03.2020.
5. The Python Tutorial. [Online]. Available: <https://docs.python.org/3/tutorial/#:~:text=The%20Python%20Tutorial,approach%20to%20object%2Doriented%20programming.> Accessed on 05.04.2020.
6. Вступ - Vue.js. [Online]. Available: <https://ru.vuejs.org/v2/guide/index.html> Accessed on: 30.04.2020.
7. Меле А. Django 2 в примерах / пер. с англ. Д.В. Плотниковой. – М.: ДМК Пресс, 2019. – 408 с.

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## The Internet of Things

The Internet of Things (IoT) is all around us and is quickly expanding. We are just beginning to reap the benefits of the IoT. New ways to use connected things are always being developed. The IoT helps individuals connect things to improve quality of life. Let us consider how many people are now using wearable devices to track their fitness activities. An example of such a device is a wearable shirt designed to track your fitness level. The IoT also helps organizations and industries improve resource management to become more efficient and is used in smart cities for connecting things to improve the lives of its citizens.

There are many different types of IoT-enabled devices available. However, most IoT devices use sensors, controllers, and actuators to perform functions. Feedback loops are used by the IoT device to provide real-time information to its controller based on current behavior. A closed loop exists when the feedback is continuously being received by the controller from its sensors. The controller analyzes and processes information, and if necessary, it can use actuators to modify conditions. This process is continuously repeated and adjusted.

For example, the figure diagrams the IoT components within a smart thermostat. A sensor (or multiple sensors) continuously sends temperature readings to a controller. The controller uses this feedback to monitor conditions and adjust the temperature as prescribed by the user. The controller can also communicate wirelessly with the user to enhance the IoT experience.

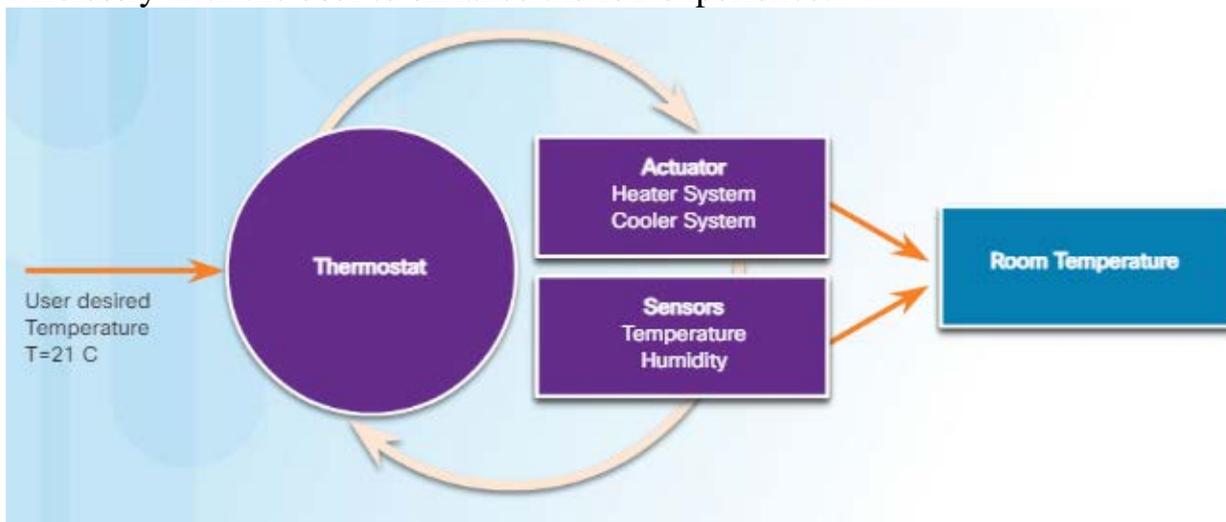


Fig. 1 Relation of human perception of reality

Key components of some of the simplest IoT systems include sensors connecting, through a wireless or wired connection, to actuators or controllers. Let us consider these components in more detail.

### *Sensor*

A sensor is a device that can be used to measure a physical property by detecting some type of information from the physical world. This information could be light, moisture, motion, pressure, temperature, or any other environmental condition. For example, a coffee farm could use sensors to collect a variety of information, such as sunlight, temperature, and soil moisture. This data can then be analyzed to help maximize the yield and quality of coffee beans.

A sensor may be connected to a controller either directly or remotely. Sensors and controllers are usually connected by means of analog or digital circuits and data are sent to a controller. That controller could react to the sensor data immediately and change the actuator settings. As an example, a Controller Area Network (CAN) is a standard used in most modern automobiles to allow for communication between sensors and controllers without any host computers. Most new cars are equipped with backup cameras or anti-collision sensors. These cameras and their sensors can alert the microcontrollers if an object is in the way and the microcontrollers will automatically cause the car to emit a warning signal or to apply the brakes.

The controller may also act as a gateway to an IP network and pass the sensor data to be stored or analyzed on servers in the fog or the cloud. The collected data and analyses can be used to trigger actions by people, systems, or machines. As examples, the quantity of cars on the road may cause a change to the traffic light system. The analysis of birth rates in different counties may cause a government to build a new school in a different location.

### *Actuators*

An actuator is a basic motor that can be used to move or control a mechanism or system, based on a specific set of instructions. Typically, in the Industrial IoT, there are three types of actuators:

- electrical – powered by a motor that converts electrical energy into mechanical operations;
- hydraulic – fluid pressure is used to perform mechanical movement;
- pneumatic – compressed air is used to enable mechanical operations.

The example in the figure displays an industrial actuator consisting of an electric solenoid used to control hydraulics. In other areas, an actuator can be responsible for transforming an electrical signal into physical output. This physical output could provide information to a user via LEDs or modify another device or environment. For example, the heater in the thermostat feedback loop is an actuator because it changes the status of the controlled environment (temperature) in response to an electrical signal.

### *Controllers*

Controllers are responsible for collecting data from sensors and providing network or Internet connectivity. Controllers may have the ability to make immediate decisions, or they may send data to a more powerful computer for analysis. This more

powerful computer might be in the same LAN as the controller or might only be accessible through an Internet connection.

IoT topology consists of sensors, controllers, routers and data centers. To reach the more powerful computers in the data center, the controller will first send data to a local router. This router is the interface between the local network and Internet. It can send data back and forth between them.

Controllers are also used in fog computing. Imagine smart traffic lights that contain sensors and actuators. The sensors detect and report traffic activity to the controller which is able to process this data locally and determine optimal traffic patterns. Using this information, the controller will send signals to the actuators in the traffic lights to adjust traffic flows. This is an example of machine-to-machine (M2M) communication. In this scenario, the sensors, actuators, and the controller all exist within the fog. That means that the information is not sent beyond the local network of end devices.

Controllers can be IP-enabled. The IP-enabled controller forwards information across an IP network, and allows individuals to access the controller remotely. In addition to forwarding basic information in an M2M configuration, some controllers are able to perform more complex operations. Some controllers can consolidate information from multiple sensors or perform basic analysis of data received.

The Arduino microcontroller and the Raspberry Pi (RaPi) are both types of controllers which are able to operate without the Internet and are commonly used by any individual. The key difference between them is physical size, available processing power, memory, and OS. Typically, the Arduino requires less power than the RaPi and is more suitable for analog input. The application should dictate which controller is the best to use. These two controllers are frequently used together. For instance, you can acquire data with the Arduino and then process the data using the Raspberry Pi. Regardless of how the actuator causes the movement to be performed, the basic function of an actuator is to receive a signal from the controller, and based on that signal, perform a set action.

As with many components in any system, some devices can have more than one function. This is the case for the controller in an IoT System. A controller can collect data from sensors without human intervention or network connectivity. As an example, a sensor determines that the temperature in an apartment has dropped below a pre-set level. The controller will process the data and send output to cause the heater (the actuator) to turn on.

A controller may also act as a gateway to the local network. In the previous example, if the IoT system is designed to capture the temperature changes within every apartment of the building, the controller may pass the data up to be stored or analyzed on servers in the local or edge network. Where the data is processed will impact the speed in which change can take place in the system. Data can be stored and processed on devices that are near the edge of the network or even closer to the sensors. This type of processing is called fog computing. Fog nodes that create areas for processing are part of this system.

A controller may also be a gateway to a cloud network. If the IoT system from our initial example is designed to aggregate the thermostat data from several different apartment buildings owned by the same company, multiple controllers and devices may store and process the sensor data in different fog nodes. The data from different fog nodes would be stored, aggregated, and analyzed. This analyzed data could then be used to make informed business decisions.

It should be emphasized that the IoT is certain to be our future. This reality is supported by an increasing number of devices connected to the World Wide Web that not only making the lives of individuals more comfortable, but also assisting large companies to organize their work properly and make required decisions. Furthermore, in the coming decades, the IoT will become such an ordinary and common thing as electricity or the Internet.

**References:**

1. Cisco Networking Academy: [Cisco Networking Academy Builds IT Skills & Education For Future Careers \(netacad.com\)](https://www.netacad.com/)
2. <https://www.i-scoop.eu/internet-of-things-guide/>
3. <https://www.ibm.com/blogs/internet-of-things/what-is-the-iot/>
4. <https://www.zdnet.com/article/what-is-the-internet-of-things-everything-you-need-to-know-about-the-iot-right-now/>

Oleh Danysh

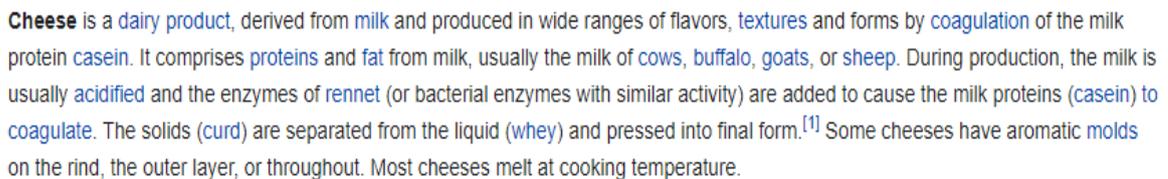
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## Windows clipboard text problem

We all often use programs like Microsoft Word to write various documents or assignments, for example, homework or essays that we prepare at the university. When writing articles or preparing reports, we sometimes use citation from different sources. People dealing with marketing and sales on the Internet, preparation of commercial offers and other types of activity related to obtaining information from the Internet, often copy-paste some part of information to speed their work up and not to write everything manually. But when you copy a text, you reproduce not only the text itself, but also all the characteristics that it has, namely: font, size, color, hyperlinks and other unnecessary features. The typical example is shown below:



**Cheese** is a [dairy product](#), derived from [milk](#) and produced in wide ranges of flavors, [textures](#) and forms by [coagulation](#) of the milk protein [casein](#). It comprises [proteins](#) and [fat](#) from milk, usually the milk of [cows](#), [buffalo](#), [goats](#), or [sheep](#). During production, the milk is usually [acidified](#) and the enzymes of [rennet](#) (or bacterial enzymes with similar activity) are added to cause the milk proteins ([casein](#)) to [coagulate](#). The solids ([curd](#)) are separated from the liquid ([whey](#)) and pressed into final form.<sup>[1]</sup> Some cheeses have aromatic [molds](#) on the rind, the outer layer, or throughout. Most cheeses melt at cooking temperature.

Fig. 1 (Source: Wikipedia)

For me, it has always been a problem, because I needed to change the parameters of the text every time I copied the information, because different sites often have their own fonts and text sizes. And this problem is common not only for me, but for most users, since the copied text needs to be standardized and got rid of the extra parameters listed above, what always costs time. For example, in some programs like Discord, the copied text is always white and not visible in a Word document. Besides, Wikipedia also has a huge number of hyper-links in the text and it takes a lot of time to clear the text from them.

As a result, there was a need to reduce the amount of time spent inefficiently for text editing, so I decided to use a program that would help me. On the Internet, the only one program called “GetPlainText” was found. When you run this program, it changes a copied text into a text with adjustable values. In result, some parameters, such as font, size and color will be those that you used before in your Word document, and there will be no hyperlinks. From now on, I will call such an adjusted text - “standard”. But this program has a minus: if you copy a new text, you will need to re-run this program to make your text standard. In my case, I needed a program that could standardize a text every time I need it.

Since I did not find any other similar program on the Internet, I decided to write my own one in the C # programming language. Unlike the “GetPlainText” program, it does not work only once at the start, it changes the text to the standard one every time you need it. In addition, you can safely copy other images, such as

photos, and nothing happens to them. It does not take much space and uses less than 1% of computer resources, but it greatly helps facilitate the work of an ordinary user. This program will provide a great benefit to various users in many industries. For example, not only students who process a lot of information from the Internet while preparing their scientific works, but also such specialists as web designers, who work with large amounts of information from different sources, technical professionals working with a large volume of technical documentation, specialists in content making in the world wide web can use this program to simplify and fasten their work. And this is not a full list of industries where this function will be of great benefit as it will save the specialists' time, and, accordingly, will make their work much more efficient.

I also tested my program to check how much time it takes to process information. I took texts from different sites and controlled the amount of time I had spent using the program and without it. The results showed that my program took about 40 seconds to deal with the information. And without a program, I spent 2 minutes and 50 seconds copying, pasting, and editing the same text. The biggest problem appears while working with hyperlinks. So, if the information you are working with does not contain a large number of hyper-links, then time saving is about 10-15%, but if you often work with such sites as Wikipedia or other resources with hyperlinks, the efficiency will reach almost 80%.

The screenshot below demonstrates the work of my program:

Cheese is a dairy product, derived from milk and produced in wide ranges of flavors, textures and forms by coagulation of the milk protein casein. It comprises proteins and fat from milk, usually the milk of cows, buffalo, goats, or sheep. During production, the milk is usually acidified and the enzymes of rennet (or bacterial enzymes with similar activity) are added to cause the milk proteins (casein) to coagulate. The solids (curd) are separated from the liquid (whey) and pressed into final form.[1] Some cheeses have aromatic molds on the rind, the outer layer, or throughout. Most cheeses melt at cooking temperature.

Fig.2 A Wikipedia text standardized with the help of my program

This function could be the beginning of a large software package that can help the users of the sophisticated computing equipment, because despite the fact that modern software allows you to solve many difficult tasks, some minor but useful features have not been implemented yet. What is more, such option as an automatic text replacement with a standardized version should be initially built into Windows as a parameter that users can turn on or off. Or this function could be even assigned to some key on the keyboard, and it could possibly become as famous as pressing ctrl-C to Copy and ctrl-V to paste. In the future, I would like to integrate these solutions into a single software package that could be used along with the standard programs such as Word, Excel, etc. This package could also include still unimplemented functions for processing and visualization images in a text, those that seem unimportant but are actually able to optimize the user experience, especially considering that users are more likely to use custom programs.

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### Overview of Wi-Fi 6

Wi-Fi is not just a technology that allows an access-point to share an Internet-connection between near connected multiple devices. Over the years the value and meaning of wireless networks has been expanded. However, complexity and number of tasks using a Wi-Fi technology has been increased too. This growth can be explained by the fact that a total amount of devices supporting wireless networks has been multiplied. Ten years ago, only smartphones, personal computers, laptops, tablets, and e-books used wireless technologies. Nowadays, except all devices previously mentioned, such new devices as smart-watches, fridges, doorbells, televisions, speakers, printers, smart plugs, thermostats, light bulbs, cameras, and other devices were added.

However, with a huge number of devices connected to an access-point, efficiency of this network is decreased resulting in delays, a narrower bandwidth, various collisions, congestion, and business losses. That is why, a new generation of Wi-Fi has to meet the needs of population.

The Wi-Fi 6 standard was released in 2019. With some improvements Wi-Fi Alliance decided to add new names to all existent and future versions of Wi-Fi [1]. According to the developers of Wi-Fi standards, version names can be listed as following:

- Wi-Fi 6 is 802.11ax;
- Wi-Fi 5 is 802.11ac;
- Wi-Fi 4 is 802.11n;
- Wi-Fi 3 is 802.11g;
- Wi-Fi 2 is 802.11a;
- Wi-Fi 1 is 802.11b.

Moreover, Wi-Fi Alliance introduced a user interface visual on the display [2]. It means, adding new icons to identify which generation of Wi-Fi uses an access-point. This visual is shown in Figure 1.

Generation of network connection	Sample user interface visual
Wi-Fi 6	
Wi-Fi 5	
Wi-Fi 4	

Figure 1 - A user interface visual on the display

The last generation of the Wi-Fi brings us some new features that will help to increase efficiency in using our networks. According to Wi-Fi Alliance, Wi-Fi 6 has some key improvements [3]:

- Higher data rates by more powerful data coding. It means that chips which accomplishing data encoding and decoding has become more powerful and can handle the extra work;
- Reducing network latency by implementing tools to transfer data without listening channels;
- Better performance in networks with many connected devices by adding simultaneous low-data-rate transmission from several users. It can be done by dividing channels into subchannels. As a result, a router is able to communicate with multiple devices at the same time;
- Better power efficiency installed by feature that allows an access-point exchange messages with devices in a network. The access-point sent control data when a device's Wi-Fi adapter is able to sleep or wake up. As a result, the Wi-Fi radio of device mostly spends time in a sleep mode;
- Updating security by using enhancing cryptographic strength and robust authentication. In addition, Wi-Fi 6 gives users improved protections by stronger password-based authentication which uses Simultaneous Authentication of Equals.

To understand the difference between Wi-Fi 6 and Wi-Fi 5, we are able to compare it with previous generation of Wi-Fi [4]. The picture of comparing two last versions of Wi-Fi is shown in Figure 2.

Simple Comparison of Wi-Fi 5 vs Wi-Fi 6

IEEE Standard	Wi-Fi 5 (802.11 ac)	Wi-Fi 6 (802.11 ax)
Frequency	5 GHz	2.4 GHz / 5 GHz
Maximum Link rate	433-6933 Mbit/s	600-9608 Mbit/s
Maximum Data Rate	3.6 Gbps	9.6 Gbps
Access Technology	OFDM	OFDMA
Antennas	4 x 4 MU-MIMO	8 x 8 MU-MIMO
Response Time	Longer	Shorter
BSS Coloring	No	Yes
Battery Life	Shorter	Longer
Modulation	256-QAM	1024-QAM
Channel Bandwidth (MHz)	20, 40	20, 40, 80, 80+80, 160
MU-MIMMO	Downlink	Uplink and Downlink



Figure 2 – Comparing Wi-Fi 6 with Wi-Fi 5

As a consequence, 802.11ax has a big number of improvements in comparing with 802.11ac.

The last generation of the Wi-Fi brings users new features and updates, for instance, reducing network latency, improved security, increased data rates, reduced power consumption and updated performance in big networks. Finally, Wi-Fi

Alliance updated new version names of Wi-Fi technology. After this release, users are able to understand which version of Wi-Fi they use in devices and access-points.

All those changes allow us to simplify our lives and enhance the quality of communication. By applying Wi-Fi 6 technology we do not have limits in connecting devices to our networks or data rates. It gives the opportunity to connect more devices at once, lets routers send data to multiple devices in the same broadcast, and allows Wi-Fi devices schedule check-ins with the router. Together, those features are able to keep transmission fast enough and provide stronger security mode. Moreover, manufactures are sure to develop new types of devices to meet demanding requirements.

**References:**

1. Wi-Fi Generations. [Electronic Resource] Access mode: <https://www.wi-fi.org/discover-wi-fi>
2. Wi-Fi 6: What's Different, and Why it Matters. [Electronic Resource] Access mode: <https://www.howtogeek.com/368332/wi-fi-6-what%E2%80%99s-different-and-why-it-matters/>
3. Wi-Fi Certified 6. [Electronic Resource] Access mode: <https://www.wi-fi.org/discover-wi-fi/wi-fi-certified-6>
4. SPLIT SCREENING WI-FI 5 VS WI-FI 6. [Electronic Resource] Access mode: <http://www.fiber-blog.de/en/293-split-screening-wi-fi-5-vs-wi-fi-6.html>

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## Ways to protect information from unauthorized access

It is 2021, the level of data protection and the awareness of people on this issue is quite high. I have long been interested in the question of device security and vulnerability. In today's world, is it possible to gain unauthorized access to a device? Have people learned how to protect information or will it still be easy to get access to what they want?

The purpose of this paper is to analyze the vulnerabilities of ip cameras with the ability to gain access to the device without performing complex operations, such as password bruteforcing. (I am not encouraging anyone to use for self-serving purposes. I'm not hacking anyone, just doing a security analysis of my personal cameras and devices).

To find the vulnerability in the ip ranges I will use the scanner or more specifically the Shodan search engine to find all the devices that are currently connected to the internet. By querying `realm="GoAhead", domain=":81"`

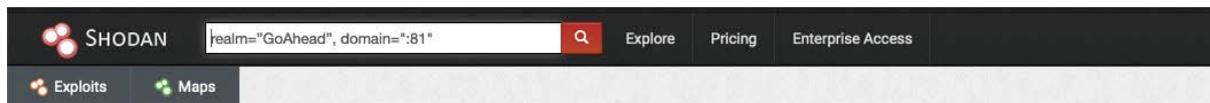


Figure 1 - Shodan search query

We get a result of 21,158 devices that have port 81 and are used by the "GoAhead" server based device.

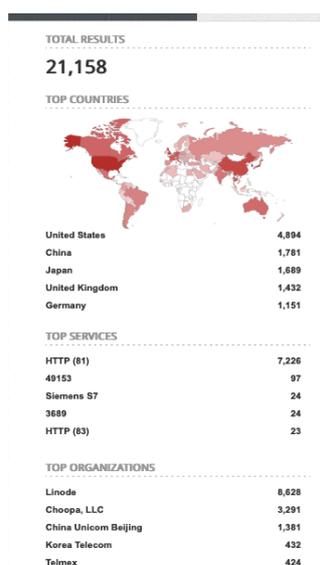


Figure 2 - Search result for the query

Now among the results need to find my camera, which is based on a server "GoAhead". Found my device with my IP address in the list.

```

Document Error: Unauthorized
177.125.12.110
Pgi Servicos De Telecomunicacoes Ltda Me
Added on 2021-02-06 00:59:12 GMT
Brazil, Recife

HTTP/1.1 401 Unauthorized
Server: GoAhead-Webs
Date: Sat Feb 6 00:59:12 2021
WWW-Authenticate: Digest realm="GoAhead", domain=":81", qop="auth", nonce="501e7139cf9682a0df4292d04e5f3fe9", opaque="5ccc069c403ebaf9f0171e9517f40e41", algorithm="MD5", stale="FALSE"
Pragma: no-cache
Cache-Control: ...
    
```

Figure 3 - Finding my ip address

Now, I want to check if I can access the ip camera or if an intruder can do it without my knowledge, without using bruteforce (password mining). The server "GoAhead" works on port 81, so it is worth to make a connection on this port. To do this in the search box in your browser, I put my IP address and add port 81. Doing this gives me information about what I need to activate.

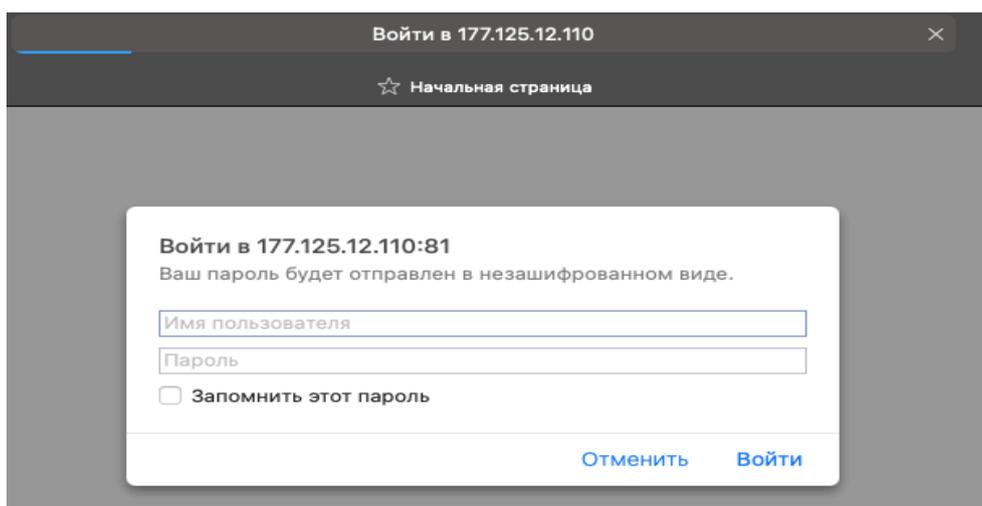


Figure 4 - The result of connecting to my ip address with port (the server "GoAhead")

Let's simulate the situation that I don't know the password and login to access. And I have no way to do a bruteforce. Since this could take a very long time. Let's try to refer to the configuration file. Since all logins and passwords in cameras are stored there. They must be encrypted and cannot be read from the outside. Even if you get this file somehow, it must be encrypted. Let's make a small request to try and get the configuration file from the server.

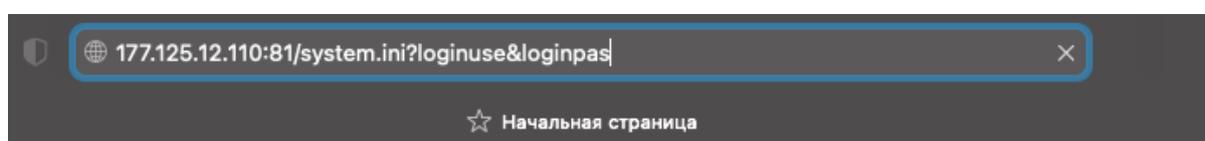


Figure 5 - Request to receive a configuration file

The result of the request is that we get the ability to download the configuration file from the camera:

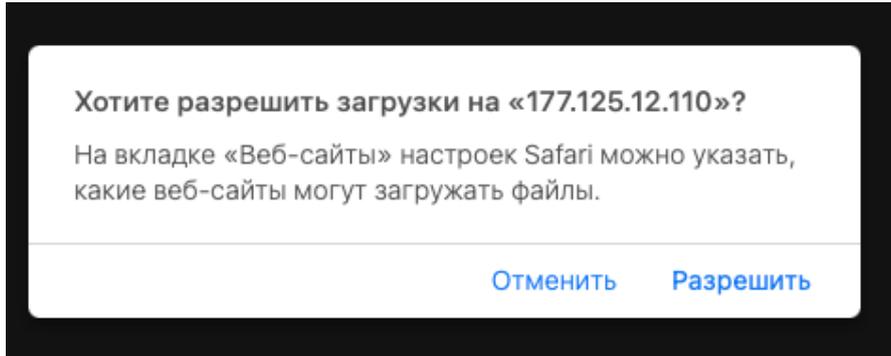


Figure 6 - Response from the Server to request the configuration file

Now let's open the downloaded file with the ini file utility and see what data is stored there.

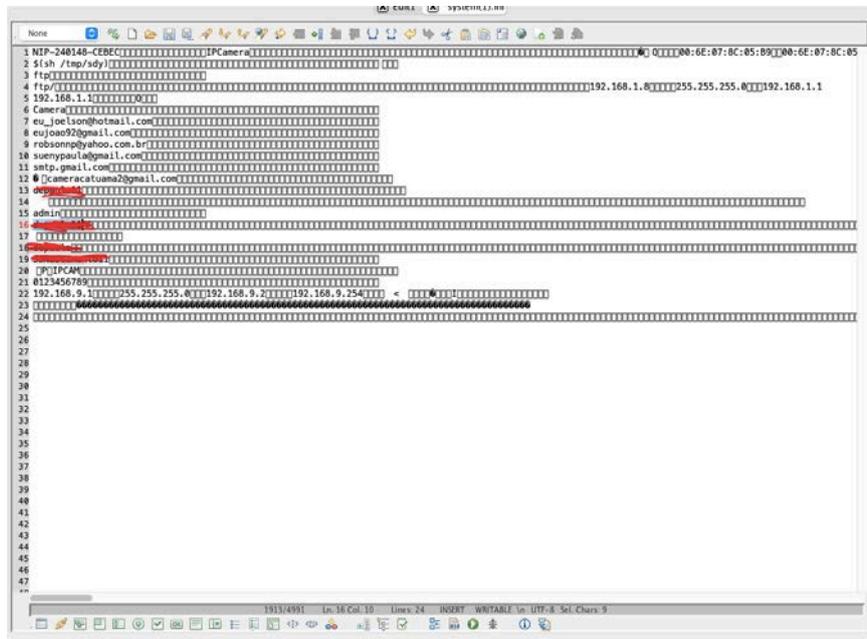


Figure 7 - the contents of the configuration file

As you can see the file contains information about ftp server, network mask, backup mail for saving video from the camera or motion sensor, and the most important - login and password to connect to the device on lines 15 and 16 and backup login and password on lines 18 and 19. Below is the information about the device, its model and type of device. Now I will try to connect to my ip camera using this data.

Figure 8 - Entering the login and password

As a result of a login, get remote access with full control and settings to his ip camera without bruteforce or any other method to break the password.

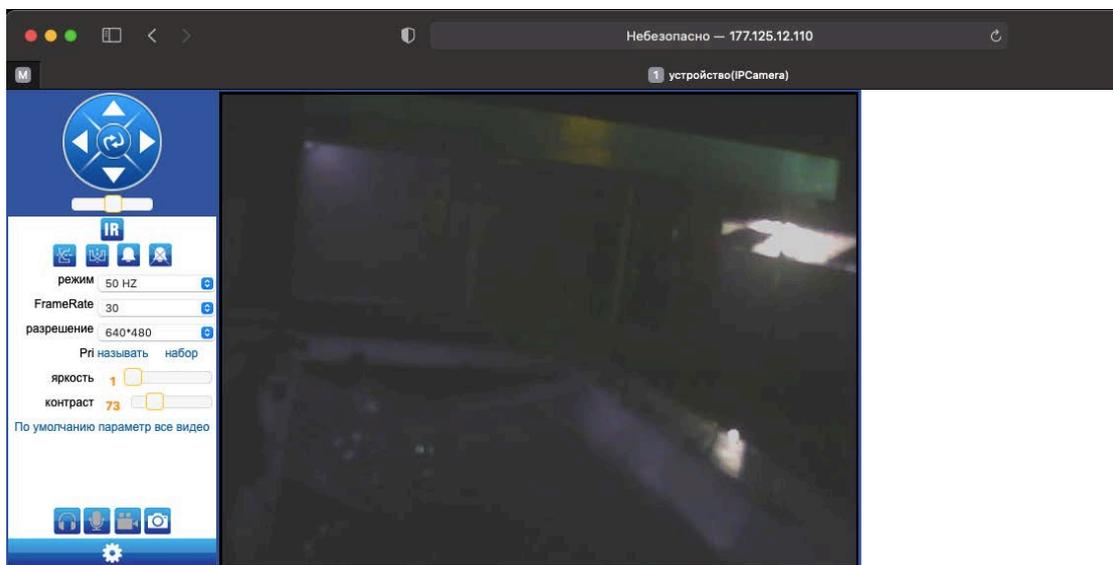


Figure 9 - Result of the connection to the ip camera

In this vulnerability ip camera is not in the role of security protection, but in the role of intruder's helper, because having access to the camera, he can know when I am not at home or disable the camera at all.

How to protect yourself from this kind of attack?

1. Do not use ip devices based on GoAhead server.
2. Update the firmware of the device.
3. Use recording device without internet access, only with the ability to record on ftp server and access video material from there.

To protect yourself from hacking or identity theft, treat your security more responsibly. Buy equipment that has been certified. Pay attention to the reputation of the manufacturer on the market. Also, do not engage in amateurish connection of your security devices. Consult with this question to a specialist. Moreover, try to use different and complex passwords for your security. In addition, with regard to ip cameras - do not install the server in an open place, it is better to do it in a safe or a private room.

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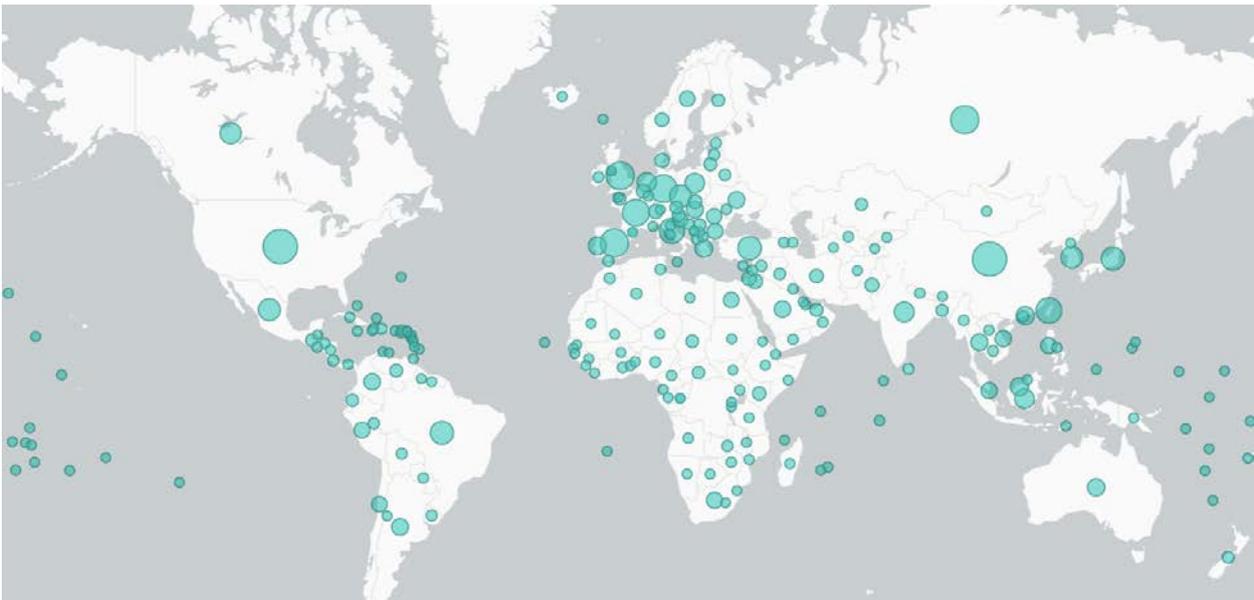
## **Cyber hygiene**

Nowadays our life is unpredictable and changeable. We cannot know what will happen in a minute. In order to be ready for something new, we should pay attention to the changes in the world, look back to analyze own and other people's mistakes, actions. Due to the situation connected with the pandemic, everyone has an opportunity to plunge into new technologies.

At the same time the IT-world has faced safety, access and privacy challenges as hackers do not waste time: the number of cyber-attacks is constantly increasing. Among other security breaches are identity leaks, hacking of health-care systems, attacks on traders operating through the Internet.

The staff and users also understood imperfections of websites, information security and encountered the lack of knowledge of new devices and software. Quarantine resulted in a widespread shift to remote work, what affected standard and established security regimes and stability of systems on the Internet.

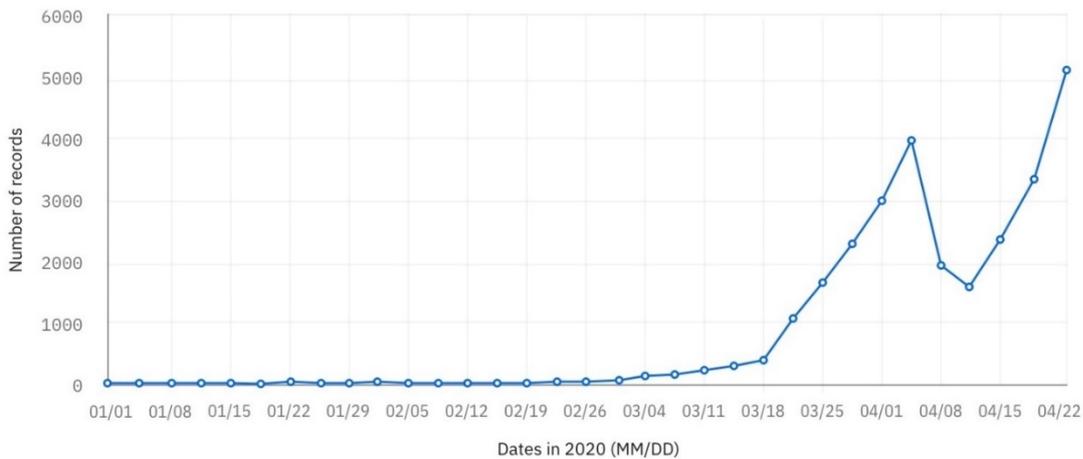
The big companies are trying to reduce perceived risks. For example, the threat intelligence teams at Microsoft are actively monitoring and responding to this change. Their data demonstrates that COVID-19 dangers are aimed at certain topics and a repetition of the attacks, which have been slightly modified in order to tie to this pandemic. This means we are looking for a replacement bait, but not a surge in attacks. They pointed out: "Every country in the world has seen at least one COVID-19 themed attack (Fig.1). The volume of successful attacks in outbreak-hit countries is increasing, as fear and the desire for information grows. Our telemetry shows that China, the United States, and Russia have been hit the hardest" [2]. Microsoft also tracks thousands of email phishing campaigns that cover millions of malicious messages every week. Of the millions of targeted messages sent each day, roughly 60,000 include COVID-19 related malicious attachments or malicious URLs. They constantly upgrade their company products and systems to make them safer in the modern environment. Thus, Microsoft Office 365 Advanced Threat Protection prevented a big phishing campaign that used a fake Office 365 sign-in page to capture credentials. Roughly 2,300 unique HTML attachments posing as COVID-19 financial compensation information were caught in 24 hours in this one campaign" [2].



*Fig.1. Relative impact of COVID-19 themed attacks across the world by file count (as of April 7, 2020).*

Cybercriminals, notorious for keeping up with current news and emerging issues, watch developments and design their attacks in the context of a wide variety of updates and initiatives related to the current pandemic. As a result, since late February 2020, IBM X-Force Research has discovered a significant number of new malicious COVID-19-related domains [3].

New DNS record trend related to general COVID-19-themed domains

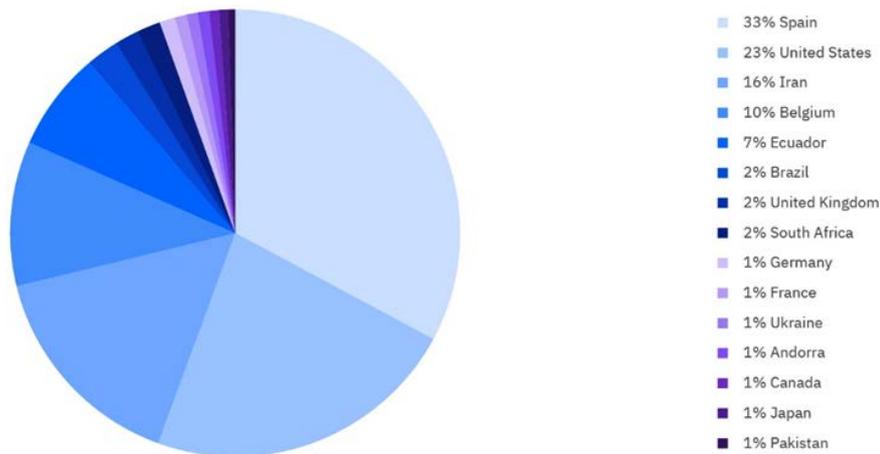


*F*  
*ig.2*  
*DNS*  
*record*  
*s* *in*

*COVID-19-themed domains.*

We also see that the countries with a broader COVID-19 outbreak tend to have more malicious activities, such as spam and phishing, related to COVID-19 threats.

Top countries with most COVID-19 Cyber Activities



IBM Security

IBM

The Interpol create hashtag #WashYourCyberHands and give some points, which is simple but effective in practicing cyber hygiene [6]. Therefore, to be more protective we should follow these tips:

- ✓ Self isolate your data
- ✓ Monitor your accounts and passwords
- ✓ Practice social distancing from unknown senders
- ✓ Use protective equipment such as an anti-virus
- ✓ Avoid contact with suspicious emails or attachments
- ✓ Clean your computer system and mobile devices and help someone, who need it.

“Success does not consist in never making mistakes but in never making the same one a second time”, said Bernard Shaw.

### References:

1. Монетизация кибератак на теме коронавируса и пандемии COVID-19. [Электронный ресурс]. Режим доступа: [https://www.anti-malware.ru/analytics/Threats\\_Analysis/Profit-of-Cyberattacks-on-COVID-19-and-Pandemic](https://www.anti-malware.ru/analytics/Threats_Analysis/Profit-of-Cyberattacks-on-COVID-19-and-Pandemic). Дата обращения: 07.02.2021.
2. Microsoft shares new threat intelligence, security guidance during global crisis. [Online]. Available: <https://www.microsoft.com/security/blog/2020/04/08/microsoft-shares-new-threat-intelligence-security-guidance-during-global-crisis/>. Accessed on: 07.02.2021.
3. What the Data Is Telling Us About the Current Rise in Security Threats During the COVID-19 Pandemic. [Online]. Available: <https://securityintelligence.com/posts/what-the-data-is-telling-us-about-the-current-rise-in-security-threats-during-the-covid-19-pandemic/>. Accessed on: 10.02.2021.

4. 2021 X-Force Threat Intelligence Index Reveals Peril From Linux Malware, Spoofed Brands and COVID-19 Targeting. [Online]. Available: <https://securityintelligence.com/>. Accessed on: 10.02.2021.
5. TechTerms. The Computer Dictionary. [Online]. Available: <https://techterms.com/>. Accessed on: 11.02.2021.
6. Cyberthreats are constantly evolving in order to take advantage of online behaviour and trends. The COVID-19 outbreak is no exception. [Online]. Available: <https://www.interpol.int/Crimes/Cybercrime/COVID-19-cyberthreats>. Accessed on: 11.02.2021.

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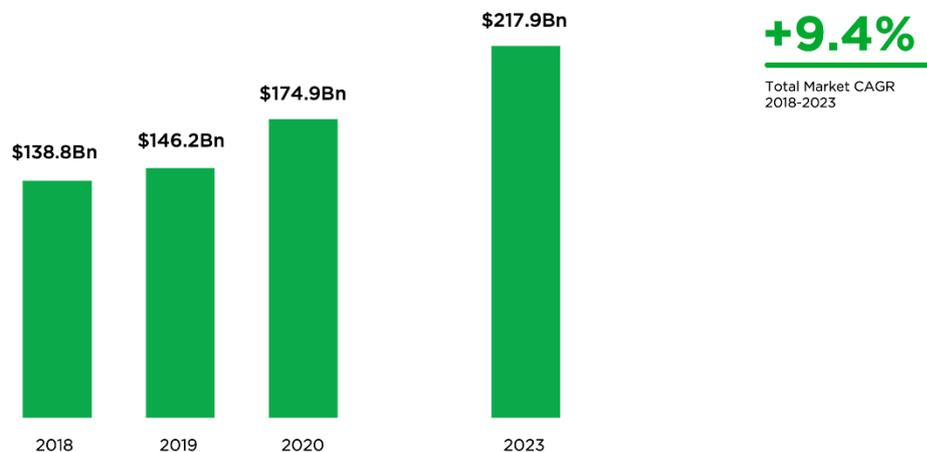
## Machine learning in game development

Almost every field of our society beginning from agriculture and finishing with healthcare has already been struck with machine learning as the revolutionary method of their development. These topics are often drawn attention unlike the field of game development which, according to Newzoo's Global Games Market Forecast, is going to be the most prosperous area in three years time.



### Global Games Market Forecast

Forecast Toward 2023



Source: ©Newzoo | 2020 Global Games Market Report  
[newzoo.com/globalgamesreport](https://newzoo.com/globalgamesreport)

Machine learning is the ability of system to learn and improve from experience, without being explicitly programmed. It is also more commonly known as AI (Artificial Intelligence) and is a subset of technologies that make up “Artificial Intelligence”. Thus, it could drastically affect the way of developing games. Machine learning is quite a powerful tool in hands of an experienced specialist. It can be easily used for creating more realistic in-game worlds, different dimensions and unique content. Machine learning algorithms have the ability to react to a player's actions dynamically and this is highly appreciated in gaming industry nowadays. The machine learning-based engine takes precedence over a usual one because of simplification of development process in the face of dynamic render of textures and shadow/ray tracing.

### So why does game development industry need to use artificial intelligence?

There are mainly two problems that developers can face in various ways while using machine learning:

1. Playing the game via Internet against human players.

## 2. Changing the development process.

First of all, Electronic Arts introduced project SEED to improve player experience in 3d First-person shooter games with concurrent actions. It can easily imitate less-predictable movement for NPCs (Non-Player Characters) by using machine learning instead of usual "AI" more familiar to modern game development. Using this technology, a developer can make unique gaming experience for each user session broadening players' universe.

Linking interactive speech system to machine learning-based game engine dramatically cuts down on time spent on scripting. There is no more need to write each dialogue manually if the game can do it by itself.

As for the visual component, leading companies such as Nvidia and Microsoft are currently working on a list of technologies, using machine learning to upscale textures, analyze on-screen information and render facial emotions, based on audio input. Also, Google uses the same technology to educate deep neural network named DeepMind, created to master the variety of Atari 2600 games with total perfection. DeepMind can easily go through the maze only by gathering visual information off the screen.

According to Google AI Blog, machine learning is currently used in their projects to adjust game balance by using AI to serve as play-testers. By running countless simulations and using trained neural network to collect data, this machine learning-based game testing base enables game designers to more productively make a game more unique, balanced, without departing from its original version.

It should be concluded that machine learning is an integral part of games and a test-bed for future machine learning approaches. It has a great potential in game development and gaming sphere is sure to become the most promising over the time because it can cardinaly cut down time and resources.

### References:

1. [Leveraging Machine Learning for Game Development](https://ai.googleblog.com/2021/03/leveraging-machine-learning-for-game.html). Available at: <https://ai.googleblog.com/2021/03/leveraging-machine-learning-for-game.html>
2. 6 Ways Machine Learning will be used in Game Development. Available at: <https://www.logikk.com/articles/machine-learning-in-game-development/>
3. How to Invest in Gaming and the Games Market for Venture Capital. Available at: <https://newzoo.com/insights/articles/how-to-invest-in-gaming-and-the-games-market-for-venture-capital-vc-private-equity-pe-investors-asset-managers-hedge-funds/>
4. Audio-Driven Facial Animation by Joint End-to-End Learning of Pose and Emotion. Available at: [https://www.youtube.com/watch?v=IDzrfdpGqw4&t=7s&ab\\_channel=TeroKarrasFI](https://www.youtube.com/watch?v=IDzrfdpGqw4&t=7s&ab_channel=TeroKarrasFI)
5. The Alchemy and Science of Machine Learning for Games. Available at: [https://www.youtube.com/watch?v=Eim\\_0jCQW\\_g&t=350s&ab\\_channel=GDC](https://www.youtube.com/watch?v=Eim_0jCQW_g&t=350s&ab_channel=GDC)
6. SEED - Imitation Learning with Concurrent Actions in 3D Games. Available at: [https://www.youtube.com/watch?v=LW20UbquVBU&ab\\_channel=ElectronicArts](https://www.youtube.com/watch?v=LW20UbquVBU&ab_channel=ElectronicArts)

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### **Computer virtual reality addiction**

The rapid development of computer technologies and their unusually rapid introduction into everyday life activate the processes of psychogenetic restructuring of the personality in the "man-computer" link, which are manifested by new psychopathological symptoms. It is the "man-computer" link that gives rise to the phenomenon called computer virtual reality, which in some cases is more preferable for the "computer user" than the surrounding world.

Dependence on CVR can be called an excessive, dominant in life hobby for a computer or a game console, used to escape from reality and leading to deformation or qualitative changes in social, professional, material and family values.

The reliability of this definition is confirmed by the results of a four-year observation of users of computers and game consoles, for which the "Questionnaire for people who have problems using a computer or game console" and "Incomplete sentences" has been developed.

The mass media published articles explaining the signs of the emergence of dependence on the CVR and published a "helpline" number. This phone number was addressed by 18 people, mostly relatives of people with problems.

More than 70 people responded (both in Ukraine and abroad). Feedback was established based on exchange of views and information on this issue. In total, more than a thousand people (schoolchildren, students of technical schools and universities), male and female, were interviewed, surveyed, etc. 37 cases of addictive behavior have been identified. According to the results, this number comprises almost males, with the exception of one case.

#### **Symptoms of CVR addiction founded during the test**

The following symptoms of addiction have been established, which can be divided into two groups:

- mental,
- somatic.

##### **Mental signs include:**

- the appearance of a feeling of joy, euphoria upon contact with a computer or a game console, or even while waiting ("anticipation") of contact;
- lack of control over the time of interaction with a computer or game console;
- the desire to increase the time of interaction ("dose") with a computer or game console;
- the appearance of a feeling of irritation, anger, or oppression, emptiness, depression in the absence of contact with a computer or game console;
- using a computer or a game console to relieve internal stress, anxiety, depression;
- the occurrence of problems in relationships with parents, at school or at work.

**Somatic signs** include:

- dry eyes;
- constipation;
- lack of appetite;
- slovenliness.

Usually, a predisposition is detected in the form of minimal cerebral dysfunction (cerebral predisposition). Interaction with a computer or game console quickly took on a character substitute-compensatory and hedonically motivated behavior. Build-up of signs addiction was manifested by mental, and then psychophysical discomfort, mostly emotional, out of communication with a computer or game console and restoring comfort at the beginning (or more often the anticipation of the beginning) of interaction with them.

**Maslow's hierarchy of needs is explaining the reason of CVR**

In general terms, all human needs that determine his behavior, regardless of age, have long been known and are usually represented in the form of a pyramid, called a Maslow's hierarchy of needs. Its main meaning is that the next level of needs is satisfied only after the previous one is satisfied. So, a person will not strive for self-expression when he is dying of hunger. This rule is practically inviolable for the first two levels, although it can have exceptions on the following.

But what does play have to do with the needs of the child and the adult? It turns out that the most direct.

First, let us take a quick look at a child's daily life. Such daily routine activities can be listed: sleeping in warm cozy home, eating good food, and providing with everything necessary for carefree life. Thus, the first two levels of needs are satisfied, and the child moves on to subsequent ones. He plays with other children, makes friends, goes to different clubs and sections and receives praise from parents and others for his actions. A similar past is usually called "happy childhood" because the satisfaction of all needs is happiness.

The fact that the advent of computers provoked a qualitative leap not only in the field improving the efficiency of work, but also in increasing the efficiency of rest, you can even say nothing. It takes time to get together with friends and, say, play paintball, it also needs physical training, good weather, money to rent equipment and playgrounds.

To take part in computer games and shoot with friends in a game, a home computer, the Internet access, and headsets are the only required tools. If your friends cannot keep you company, then there is always a great number of other players (online games) or, in extreme cases, bots with artificial intelligence, but you will still not be alone and will still feel like a member of the community. Even not possessing sufficient game skills (for complex shooters, strategies, races etc.), you are sure to be able to pick up something like a simple browser flash game that will allow you not to feel left out of the way of life. As a result, in any case, the existing needs are met to a much greater extent within the same available limited resources. And that is why the word "game" today is inextricably linked with the word "Computer".

Despite all the obvious advantages, computer games have many opponents. Usually, their arguments can be divided into three categories: someone says that computer games replace communication in the real world and take people away from reality; the latter argue that computer games are evil and a pointless waste of time; still others consider the computer a source diseases and abnormalities.

**References:**

1. N.V. Bordovskaya, “Psychology and pedagogy”, Saint Petersburg, 2011.- 624 p.
2. T.D. Martsinkovskaya, “Psychology and pedagogy”, Moscow, 2010. - 464 p.
3. William H. Davidow, “Virtual Reality is addictive and Unhealthy” [Electronic source] – Mode of access to the resource: <https://spectrum.ieee.org/consumer-electronics/gadgets/virtual-reality-is-addictive-and-unhealthy>
4. Virtual Reality and Drug Rehabilitation: The Future of Addiction Treatment [Electronic source] – Mode of access to the resource: <https://www.niznikhealth.com/research-articles/virtual-reality-and-drug-rehabilitation-the-future-of-addiction-treatment>

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### **AI in healthcare and medicine. Is there a need?**

Nowadays, AI is being more and more implemented in people's life. Investments in this area are growing steadily, and AI will soon cover almost all spheres, because it greatly simplifies our daily routine, reduces the cost of production for enterprises through automation, etc. But what about one of the most important areas – medicine? Do we really need AI there?

The matter is that, despite all the advancements in modern medicine, problems still exist, and if only being solved, medicine will move on to a completely new level of progress. And AI is able to solve many of those problems as it has some valuable advantages.

*Administrative work automation.* 30% of medicine costs are connected with administrative tasks. AI can automate many of these tasks, such as pre-authorizing insurance, following-up on unpaid bills, and maintaining records, to ease the workload of healthcare professionals and ultimately save them money [1].

*The problem of data volume and reliability.* Every year, thousands of clinical trial results are published, treatment approaches to famous diseases are redefined and standards of healthcare are being changed. Doctors develop professionally all their lives, and this is barely sufficient to be highly-skilled in one narrow specialization. Therefore, in challenging cases, a consultation of several specialists is required, but their decision may also be erroneous due to a human factor. Artificial neural networks operating with statistical reliability criteria are devoid of these shortcomings. They do not get tired, do not change their opinion under the pressure of someone's authority, and have a certain accuracy, which is constantly improving thanks to deep machine learning algorithms.

*Versatility and self-learning.* It is challenging for a person to change a profession, especially if it requires many years of training. Therefore, doctors generally select one area and improve their skills in it all the time. An experienced radiologist is unlikely to be able to examine the pathology with an ultrasound scanner and will not undertake an ECG deciphering. The peculiarity of neural networks is that they do not care what objects to analyze. These are universal and very flexible algorithms that can be trained for any mathematically identical problem. For example, in the field of auto-piloted vehicles and security systems, image recognition is widely used. These developments are easily adapted for medical diagnostics as well [2].

AI will give an opportunity to focus the attention of specialists only on complicated and challenging cases which require human interference. As such systems will easily get over the functions of primary sorting and controlling medical images (radiographs, tomograms, histological, cytological, genomic studies, etc.).

*Disease monitoring.* Using AI will also actively expand remote monitoring in the future. Presently there are outstanding technological conditions for home remote monitoring of patients with severe and chronic diseases, and early detection of health problems of healthy people [3].

*AI in surgery.* The advancement of artificial intelligence has transformed modern surgery towards more precise and autonomous interventions for the treatment of both acute and chronic symptoms. Through the use of such techniques, significant progress has been made in preoperative planning, intraoperative guidance, and surgical robotics [4]. AI robots are increasingly helping with microsurgical operations to lower the number of surgeries that can influence a patient recovery. What is more, experts expect to have more robotic manipulations in the following few years. “Artificial intelligence can help surgeons perform better,” said Dr. John Birkmeyer, chief clinical officer at Sound Physicians, a national practice of 3,000 doctors and medical practitioners. “We know that a surgeon’s skill varies widely, with huge implications for patient outcomes and cost. AI can both reduce that variation, and help all surgeons improve – even the best ones” [5].

Below is a description of the successful examples of the current use of AI in medicine.

Using deep machine learning in diagnostics is a sphere where AI has demonstrated a great potential. Early diagnosis is one of the most critical factors within the efficient result of a patient care. Deep-learning algorithms reduce the time it takes to diagnose serious diseases. The way AI rapidly processes large amounts of data and analyses possible causes of symptoms can significantly shorten the diagnosis-treatment-recovery cycle for several patients. The advantages of this are already being noticed in many areas.

Osaka University scientists have created a deep-learning algorithm that can accurately detect a variety of neurological diseases, including epilepsy. Patients' magnetoencephalography findings are scanned by AI, which compares them to tens of thousands of other scans from healthy people. It then searches the brain for potential lesions and other abnormalities. Since epilepsy often spreads across the brain, detecting irregular scans as soon as possible is critical to maximizing patients' care choices and achieving good results.

The area of joint replacement therapy is another example of how AI is improving health care quality by lowering operating costs. Peer Well, an intelligent software that guides patients through pre-operation physiotherapy, assists patients in preparing for complete joint replacement. According to Healthcare Finance, a study published in the *Annals of Translational Medicine* found that patients who used AI saw a \$1,215 reduction in surgery costs [6].

Surgical manipulations aided by robots are already available: Da Vinci Si is a surgical robot that is designed to be as painless as possible. Knowledge from previous surgical encounters is being used to refine the technology's techniques. The robot is equipped with three-dimensional cameras and a number of surgical instruments that mimic the movements of an operating surgeon. The surgeon would be able to conduct difficult operations with much greater accuracy and control over the instruments as a

result of this. They monitor the robot's arms using a computer console near the operating table [7].

As a result of this study, we can answer the question “Do we need AI in medicine? How important is it there?” So, the answer is: of course, we need that. AI is extremely important in the future developments in the sphere of medicine, as nowadays the world is lacking qualified specialists and it can make our curing much faster and efficient. The role of AI in the field of surgery deserves special attention, because robotization is the path to successful operations, that is, a significant decrease in failures over time and valuable assistance to surgeons who differ in skills.

### References:

1. Use of AI in healthcare & medicine is booming – here's how the medical field is benefiting from AI in 2021 and beyond. [Online]. Available: <https://www.businessinsider.com/artificial-intelligence-healthcare> Accessed on: 09.03.2021.
2. Искусственный интеллект в помощь врачам. [Online]. Available: <https://dx.media/articles/how-it-works/iskusstvenny-intellekt-v-pomoshch-vracham>. Accessed on: 09.03.2021.
3. Медицина будущего: перспективы и роль искусственного интеллекта. [Online]. Available: <https://ict.moscow/news/medtech-i-iskusstvennyi-intellekt/>. Accessed on: 09.03.2021.
4. Application of Artificial Intelligence (AI) in Surgery. [Online]. Available: <https://www.imperial.ac.uk/news/200673/application-artificial-intelligence-ai-surgery/>. Accessed on: 09.03.2021.
5. How AI-Assisted Surgery Is Improving Surgical Outcomes. [Online]. Available: <https://www.roboticsbusinessreview.com/health-medical/ai-assisted-surgery-improves-patient-outcomes/>. Accessed on: 09.03.2021.
6. AI in Healthcare: 4 Examples in Health Informatics. [Online]. Available: <https://healthinformatics.uic.edu/blog/ai-in-healthcare-4-examples-in-health-informatics/>. Accessed on: 09.03.2021.
7. 10 Powerful Examples of AI used in Healthcare Today. [Online]. Available: <https://getreferralmd.com/2019/04/10-powerful-examples-of-ai-used-in-healthcare-today/>. Accessed on: 09.03.2021.

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## **IT technologies in the field of industrial automation**

Automation of industrial production includes not only the direct organization of the product manufacturing process at all its stages but also comprehensively covers all areas of the enterprise, including analysis, planning, financial and economic activities, accounting, logistics, personnel management, etc. To synchronize all of the above, certain software packages are needed, which are based on advanced IT technologies.

### **Automation of production and logistics**

Mechanical engineering is one of those industries where automation projects are underway in most businesses. Planning, accounting of material and commodity values, direct production management, and many other internal business processes characteristic of machine-building enterprises are subject to automation today.

The use of information technology and the automation of production processes, which are so widespread in this industry in comparison with others, is primarily due to high competition. Improvement and automation of production methods and methods are a guarantee of the success of the enterprise. IT projects for the automation of mechanical engineering is aimed, among other things, at obtaining operational and relevant information, since without this it is impossible to make, no matter how effective and timely, a decision, which is known to be a decisive factor in logistics.

The use of information technology in the automation of this area of production also helps to reduce the cost of production, combined with an increase in the quality of products, ultimately leads to optimization of production, which is the ultimate goal of introducing information technology in mechanical engineering and logistics. Manufacturing automation has the following benefits: flexible structure, real-time decision support, concurrent processes, integrated enterprise-wide solution, fast implementation, open system, and much more.

### **Use of IT in design and production**

However, automation and IT technologies are no less necessary at the design and production stage than at the stage of selling finished products. The development and optimization of specialized software that allows you to "see" any detail or unit in 3D format, not just in the picture, but also in action, opens up incomprehensible horizons for designers. What used to take years of painstaking work and calculations, today becomes available in a few minutes. The use of automation processes in production is no less effective, since ensuring control over the progress of manufacturing and assembling various units ensures the manufacture of higher quality products, as well as a significant reduction in the amount of manual labor involved in the enterprise.

It is precisely the desire of manufacturers to reduce the amount of manual labor used in the enterprise as much as possible that often becomes the factor that contributes to the increase in the popularity of the use of IT technologies in the industry. The development of such "smart" machines, controlled by modern computer technology for mechanical engineering, is in full swing today. The use of such machines will significantly increase productivity while reducing costs associated with the so-called "human" factor.

The development of IT infrastructure in mechanical engineering will be aimed primarily at increasing the intellectual capital of the enterprise. The use of automation will allow in the future to give orderliness to the activities of all specialists of the enterprise, to simplify the relationship between consumers and manufacturers, and will become an effective basis for building an effective system of control over the quality of products.

### **The most demanded IT solutions and equipment used in the engineering industry**

- HP DL360 Gen10 Server can improve the quality of processing of the enterprise, speed up the process of obtaining the finished result, and also process an acceptable amount of information. It stands out from the ProLiant line for its low power consumption. It is also equipped with new high-performance Intel Xeon Scalable processors with up to 28 cores.
- The Lenovo ThinkSystem SR850 server stands out from a number of similar models for its useful functions and quality hardware. Conveniently located boards in the server provide an energy-efficient and cost-effective 4-socket solution with a large set of features in a 2U form factor, while excellent hardware, such as powerful Intel Xeon Gold and Platinum Scalable processors and 16 hard drives, provide this server with exceptional performance and power.
- Tower server DELL PowerEdge T640, developed on the basis of the next-generation Intel Xeon Scalable processor, will easily increase the productivity of your office. Suitable for fast and efficient data processing due to its dense structure, this server allows you to run mission-critical applications quickly and efficiently.

Thanks to the rapid development of technology and automation, according to research by McKinsey, by 2030 more than 800 million people will be unemployed – this is a fifth of the total working population. Meanwhile, automation will allow the world to cope with global problems – for example, an aging population. In Japan, one in four people is already over 65 years old. According to research, by 2065, older people will make up almost half of the country's population. It is automation and robots that will replace the missing workable class. In any case, using the currently available technology and software solutions, as well as leading technologies for managing an industrial enterprise, the company lays a solid foundation for its further development. This allows you to build a competitive strategy of activity, taking into account all existing risks, including production, financial, economic, marketing, environmental, market, and others.

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## **Development of an interactive web application for car rental optimization**

This article describes the automated system «Hertz» in the sphere of car rental services. It is the system that automates the process of renting a car. This will greatly simplify the storage of information, significantly reduce the time spent on processing requests from customers, such a system will be much easier to use, it will reduce the likelihood of errors that could make an employee during manual calculation, for example, of the final bill or surcharge.

Nowadays car sharing service is constantly evolving and over 100 million people all over the world are using this type of renting. It is very convenient because it provides a person with a vehicle he needs just for a limited period of time. For the sake of convenience, it requires a well-coordinated service system that includes electronic car reservation systems; road navigation information systems; insurance services, bonus programs, etc. Nevertheless, the existing car sharing services are too bulky or do not have any loyalty programs that could alienate clients. This allows us to offer a possible solution that is more user-friendly and acceptable.

In the beginning, the market analysis helped us to investigate the existing well-known systems of a similar subject. With this, it will be possible to come to certain conclusions about how to create your own system based on the advantages and disadvantages of these resources. For instance, let us take a look into websites of one of the most outstanding companies - Sixt and Avis.

If we compare the Sixt and Avis services, we can see that they contain sections with the following information:

- 1) conditions for providing rental services;
- 2) information about cars and their service centers;
- 3) conditions for granting discounts, participation in the loyalty program;
- 4) information about the company and its main purpose;
- 5) personal account of the client, which contains information about the order, and available after logging in;
- 6) contact details of the support service.

After detailed analysis of the existing websites for car sharing services, we can identify that all systems include such features as:

- websites are multilingual, without reference to the country;
- the client knows in advance the model and quality class of the car;
- instant confirmation that a certain car is available for the period chosen by the client;
- international support service for instant help on various issues.

All these options do make this service quite flexible and convenient to use. However, they miss some possible enhancements:

- not all sites have a loyalty program and discounts;
- the support service is not always available 24/7;
- there is no tracking of exceeding the mileage limit of the car.

Considering the mentioned above services that have significant disadvantages, such as the accumulation of information on the main page among which the user can get lost, it was decided to create the own system to optimize this kind of service with an emphasis on a combination of simplicity and informational content. The client, using the web application, would be able to get clear information about the cars that can be rented. It is also possible to sort cars according to your priority, for example, by the model of a car or by daily price. Moreover, the main feature of this service will be the calculation of the final price for clients based on odometer reading: at the end of the car rental, the client must upload a photo with the final odometer reading. This process is necessary to track mileage. If the limit for a certain period is exceeded, the system automatically calculates the surcharge, the formula of which is developed and described below:

$$price = |last\ day - first\ day| * (price\ per\ day + percentage\ to\ the\ driver\ per\ day)$$

Formula 1.1

While using a car-sharing service, the daily mileage limit was set at approximately 250 km per day. Depending on the quality class of the car, this value varies slightly.

The surcharge is calculated by the system automatically after the manager enters the final odometer readings before ordering. It is based on the following indicators: the initial day of the lease, the final day of the lease, the daily mileage limit of the car, the price of the car per day, the initial indicators of the odometer, the final indicators of the odometer. The formula look like this:

$$surcharge = \left| |limit\ per\ day - mileage| * \left( \frac{price\ per\ day * 2}{limit\ per\ day} \right) * number\ of\ rental\ days \right|$$

Formula 1.2

Consequently, knowing the shortcomings of the previous experience and evolving market demands the user-friendly service “Hertz” can become a competitive challenger on the market with the following interface and functionality.

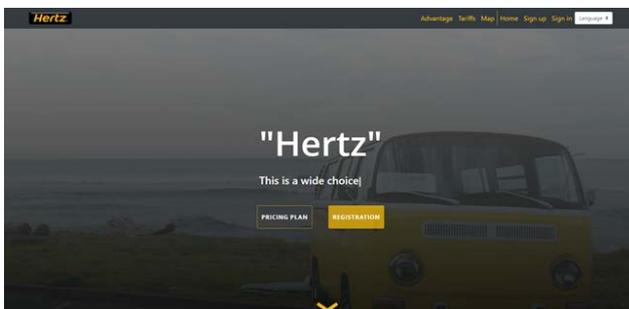


Fig. 1 - The main page

The main page contains the hyperlinks to the fundamental components of the service like:

- 1) A list of available cars;
- 2) client's orders;
- 3) user info page.

These components help users to easily find the data they are interested in, as well as be able to obtain comprehensive information.

After logging in, users get on the page with personal information about their cars and orders:

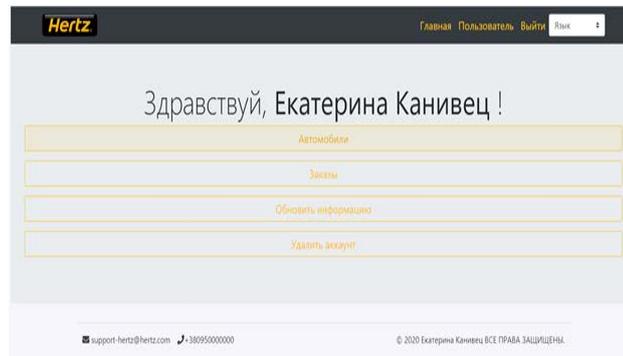


Fig. 2 - The user's page

In the "Automobile" view we can see the list of available cars. It could be filtered by its model or car type and sorted by its name or cost:

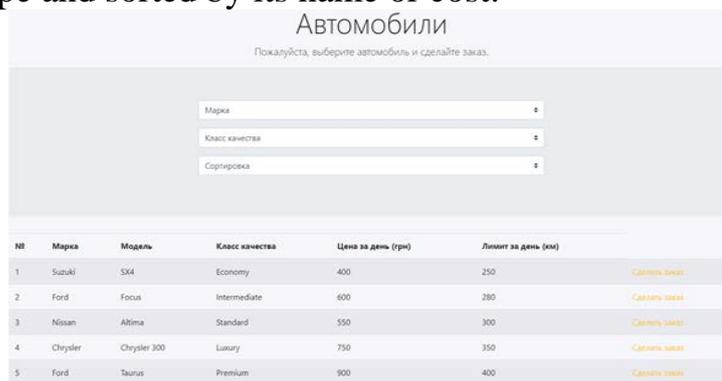


Fig. 3 - The car selection page

As it was said above, there is an opportunity to add final odometer readings. They are taken from the photo that the user uploads after the driving session. And after that the final price would be automatically calculated.

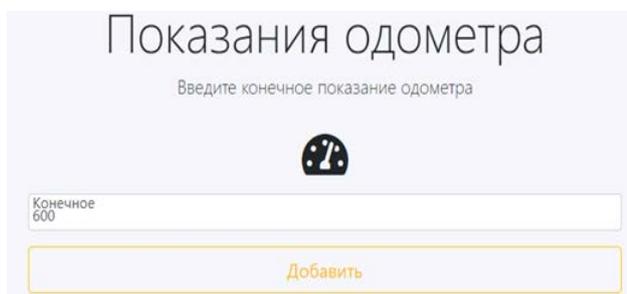


Fig. 4 - Adding the final odometer readings

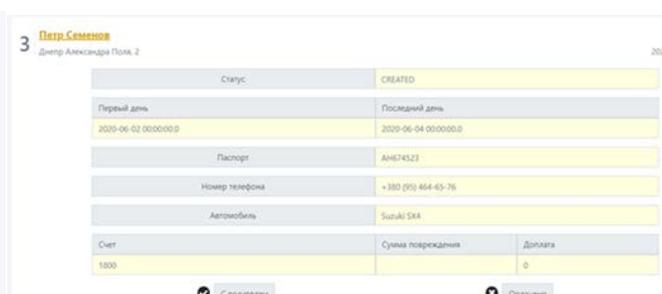


Fig. 5 - The order example

Let us consider the calculation of surcharges in the order above. We have the initial data:

- 1) Suzuki SX4 mileage limit per day - 250 km;

- 2) the number of rental days - 2;
- 3) daily rental price for Suzuki SX4 - UAH 400;
- 4) initial indicators of the odometer - 0 km.

In order to have a surcharge, the client must exceed 500 km (mileage limit \* number of rental days), so let the final value be, for example, 550 km. Using the previously derived formula for calculating the surcharge, we substitute the known data and calculate it:

$$\text{surcharge} = \left| |250 - 550| * \left(\frac{400*2}{250}\right) * 2 \right| = 300 * 6.4 = 1920 \text{ (UAH)}.$$

The result calculated by the system:

Доплата
1920

Fig. 6 - The calculated surcharge

To sum up, car sharing is a rapidly developing industry and it leads to the quick development of the systems that provide simple and useful interfaces. Existing systems providing car-sharing services were analyzed and it was found that they were too messy, overloaded with information and missing some useful features. Thus, the service that will fit all the requirements has been created. During the development of the system, a friendly user interface was implemented that meets the demands and trends of network users. In result, the order processing process is very fast, the calculation of the final bill and surcharge is done by the system automatically, which allows you to automate most of the processes and reduce the number of errors.

#### References:

1. Nixon, R. Building Dynamic Websites with PHP, MySQL, JavaScript, CSS and HTML5. Moscow: Mechanical Engineering, 2016.- 688 p.
2. Dronov V. PHP, MySQL and Dreamweaver. Development of interactive websites; BHV-Petersburg - M., 2016.- 480 p.
3. M. Davis and H. Putnam. A computing procedure for quantification theory. CACM, 7:201–215, 1960.
4. Freeman, Adam ASP.NET MVC 3 Framework with examples in C # for professionals / Adam Freeman, Stephen Sanderson. - M.: Williams, 2011.- 672 p.
5. Gonsalves, Anthony Learning Java EE 7 / Anthony Gonsalves. - M.: Peter, 2016.- 640 p.
6. Setter, RV We study Java on examples and tasks / RV. Setter. - M.: Science and technology, 2016.- 240 p.
7. Perry B.W. Java servlets and JSPs. Collection of recipes. M.: KUDITS-Press, 2009.- 768 p.
8. Jennifer Kyrnin. Bootstrap in 24 Hours, Sams Teach Yourself / Jennifer Kyrnin - Sams Publishing, 2015. - 432 pp.
9. Dronov Vladimir JavaScript and AJAX in Web-design; BHV-Petersburg - M., 2015.-- 736 p.

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## **Artificial intelligence: history and prospects**

Artificial intelligence (AI) is a software and hardware complex that simulates the nature of human behavior in solving problems. The concept of AI is not new. Ancient Greek myths told of the world's first robot, created by the god Hephaestus, a bronze machine that mimicked the behavior of a warrior-defender, protecting the island of King Minos from invasion. Of course, thousands of years ago, it was impossible to create a technology capable of imitating human behavior, but in 1956 artificial intelligence became an academic discipline, and there were reasons for that. First, computers began to appear, and second, machines could replace people in some dangerous or difficult industries. Initially, scientists tried to teach the computer to play checkers and when the machine first defeated man, it was clear that AI technology has prospects. If the computer can be taught to think like a human, then humanity can create the perfect technology that combines infinite computing power and intelligence for tackling the problems that no scientist can solve. But why, after so many years of research, any computer today cannot freely support normal human conversation?

***Machine learning of artificial intelligence is an outdated technology.*** Since AI mimics human behavior, scientists need to program a computer for learning so that it could solve problems based on its knowledge rather than on pre-established algorithms, like real people. So, in the 1980s, machine learning began to use. Machine learning (MN) is a level of AI, based on such concepts as *regression, classification, cluster analysis, and anomaly detection*. A specific situation helps to consider these concepts. For example, AI tries to create a successful business plan for a store. In this case, regression is a range definition in which some data will most often be determined. Namely, if we sell expensive cars, then the regression technique assumes that only a wealthy segment of the population can buy our goods and vice versa. As a result, before we get acquainted with the client, we will know approximately how much money we will receive and what costs the buyer may be willing to pay.

*Classification* is the ability to break down objects into characteristics. AI, for example, has to classify cars by manufacturer, color, size, weight and speed. We need to give the computer a large number of different vehicles for determining characteristics of the new items. So, cluster analysis, made by AI, is the search for the objects based on characteristics of definite cars that this company produced. Detecting anomalies is a guess that all of these algorithms may contain incorrect information, and artificial intelligence should be ready to detect it. For example, a monthly sale report shows that one employee entered sales data incorrectly. He wrote that 500 cars were sold when the total number in the warehouse was only 627. This anomaly has to be solved or predicted. The main problem of MN is the possible lack of data or their inaccuracy. However, AI can make a mistake, so now MN cannot exist without human control.

***Deep learning of artificial intelligence will create a new human.*** If machine learning tries to mimic the algorithms of data processing by our brain, deep AI learning copies the whole learning process, mimicking the neural connections of the brain at a very primitive level. Of course, a deep level of learning became possible due to the improvement of hardware and technology. There are many videos on the YouTube platform where AI learns to play games, create music and recognize different people. There is a starting point for artificial intelligence, id est a set of functions and a goal. A bright illustrative example is Siri AI used by Apple to help users with their products. Siri has a general configuration but adapts to customers and learns to understand their requests. Thus, AI can learn on its own and does not require human supervision. It chooses the most productive functions that bring it closer to victory and, ultimately, achieves the goal. This method of learning is similar to evolution because evolution often rejects unnecessary functions of organisms, adapts to any changes and fulfils its purpose to support life. Under these conditions the creation of a self-sufficient computer and giving it time to learn can transform it into a human being.

The teaching methods that can create artificial intelligence capable of fully maintaining a dialogue with man have been already created but no computer in the world can yet calculate all possible factors closely connected with all nuances of human communication and emotional intelligence. It is possible that quantum computing technology will be able to provide sufficient power to such a mathematical apparatus as a neural network because even now, quantum computers solve some specific problems much faster than conventional ones. But a human dialogue is the culmination of the development of human intellect, which no machine can simulate.

### **References**

1. <https://www.investopedia.com/terms/a/artificial-intelligence-ai.asp>
2. <https://blogs.oracle.com/russia/ai-ml-dl-differ>
3. <https://blogs.oracle.com/bigdata/machine-learning-techniques>
4. <https://youtu.be/AeXaqmEfS5w>
5. <https://www.bbc.com/ukrainian/features-50165223>

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## Cryptocurrency as one scenario of our future development

Cryptocurrencies have long been in the public eye, but only now they are coming as a financial tool. Cryptocurrencies have a large potential in developing countries by simplifying access to financial services. More and more banks are beginning to cooperate with many different cryptocurrencies. The Development of crypto is growing with a stunning speed and this information can be confirmed by the people who became rich overnight and got an opportunity to finance growing. A great example is Bitcoin - the most famous of all, and it has already got a permission to develop and flourish for many people and companies.

An example of the growth of bitcoin from 2018 to 2021:



### What cryptocurrencies are?

It needs to figure out what the cryptocurrencies are. If you reduce the meaning to a simple view, you will understand that the cryptocurrencies are just a method of exchange finance on the internet which are used to hold finance transactions. And the most important is that it is not controlled by anyone. This feature makes cryptocurrencies fully immune to the famous ways of government interference.

### Origin and performance

Cryptocurrency has been created on the basis of decentralized technology which let users make payment without necessity to get connected to banks. They use a distributed public ledger called blockchain. Blockchain creates a lot of records of

transactions that can be only added rather than changed or deleted. It is the independent log is safer than paper records or institution accounts which could be hacked. The platform archived the information about buyers and sellers and record it as a “hash” or string of numbers which are generated by a math function. When a certain number of “hashes” is reached, this group is converted into some blocks on the server so that is why it is called as “blockchain”. The blockchain is updated every 10 minutes and stored on many servers worldwide. Cryptocurrencies are used in a closed system and that means that there is a fixed amount and new coins can be created by the following of the strict set of the rules.

Digital money is created by the mining process where computer power is used to solve complicated mathematics tasks to generate coins. This process requires miners to keep “hashing” the header block again and again by reiterate until one of the miners create a valid block of hash. When a “hash” is found, the unit will be transmitted to the network. Other nodes will verify if the “hash” is valid and then add the block to the blockchain and move on to mining the following unit.

Moreover, users can buy crypto from brokers and then keep or spend them using crypto wallets. Also, it can be a good idea for investing for a long time. So, we can highlight certain advantages and disadvantages of using cryptocurrencies.

#### **Advantages of their use**

##### *Simplicity*

If you have a business, you probably faced some brokers or legal representatives which need a lot of transaction fees that you have to pay for every exchange. It is not convenient and unprofitable. When you use cryptocurrencies, a need for the intermediary is not required. The process would be from one to one by the secure network. It leads to less confusion with payment because two parties of the transaction know each other.

##### *Decentralization*

A lot of crypto coins are controlled by the developers and people who use these coins. Decentralization helps to keep a freedom and uncontrolled cryptocurrency so that no one organization can designate the value and flow of the coin, which will safe its stability and secure in contradistinction to government-controlled fiat currency.

##### *Confidence*

If you use a credit card the transactions history would be noted and will be available for banks. Each time when you use your credit, the bank records it. This lets you know what a balance you have. Transaction of cryptocurrency you make is a unique exchange and the terms of it can be agreed with the other part. It protects your privacy, your financial history, and your identity.

##### *Secure*

When transfer was carried out, it cannot be canceled unlike transactions by credit card companies. This is a method against fraud which needs an agreement to be made between a seller and a buyer for the refund. The strong way of encryption is a safeguard against swindle and account hacking and guarantee of consumer privacy.

#### **Disadvantages of using digital money**

##### *Using for illegal transactions*

The security and privacy of cryptocurrency are high. It is too hard to track down some users by the government by their wallet data. Bitcoin has been used as a way of exchange to illegal items such as drugs or weapons. Also, cryptocurrencies are used for converting their unlawful money through the clean exchanger to hide the source of it.

#### *Data losses result in financial losses*

The developers of coin strive to create untraceable source code and a reliable hacking defense. It would make it safer to keep money as a cryptocurrency than in cash or on bank deposit. But if a user loses a key from his wallet, it would be impossible to get it back. The wallet will be locked with the number of coins which it has. It leads to the financial losses.

#### *Accessible to hack*

Cryptocoins are very secure. However, many exchanges store the wallet data of users. Unfortunately, this data can be stolen by the hackers. After getting access they can easily transfer funds from your wallet. For instance, some exchanges like Bitflox and MT Gox, have been hacked not so long ago and thousands or millions of Bitcoins were stolen. Nowadays, most exchanges are highly improved their secure but anyway they are a potential for next hack attack.

Cryptocurrency is actually a revolution in the sphere of digital transactions and it is ready to become a part of the common methods of payment. The future belongs to cryptocurrency and it will stay here for a long time yet. It can be a good form of investing only if we know the best methods to guard our funds from the risks.

### **References:**

- 1)Crypto Wallet Types Explained. Available at:  
<https://academy.binance.com/en/articles/crypto-wallet-types-explained>
- 2)Advantages and Disadvantages of Cryptocurrency in 2020. Available at:  
<https://www.geeksforgeeks.org/advantages-and-disadvantages-of-cryptocurrency-in-2020/>
- 3)How Cryptocurrencies Can Help Global Economy. Available at:  
<https://www.finextra.com/blogposting/18159/how-cryptocurrencies-can-help-global-economy-and-build-a-better-future>
- 4)What is cryptocurrency, how does it work and why do we use it? Available at:  
<https://www.telegraph.co.uk/technology/0/what-cryptocurrency-why-how-work-bitcoin-ethereum/#:~:text=How%20do%20cryptocurrencies%20work%3F,and%20held%20by%20currency%20holders.>
- 5)What Is Cryptocurrency Mining? Available at:  
<https://academy.binance.com/en/articles/what-is-cryptocurrency-mining>

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## Mobile hacking

The development of information technology is opens up many new ways for growing up in various industries. However, development entails new ways of acquiring valuable resources, including information. As a result, society becomes a victim in hands of hackers.

Excessive development has led humanity to the fact, that each user needs “the availability of technology at hand”. Thus, the new branch of mobile development was appeared. However, this is a double-edged sword. As mentioned above, with the development of technology, new ways and methods to hack these resources are created.

Statistic show (Fig. 1), that amount of users is growing up exponentially [1].

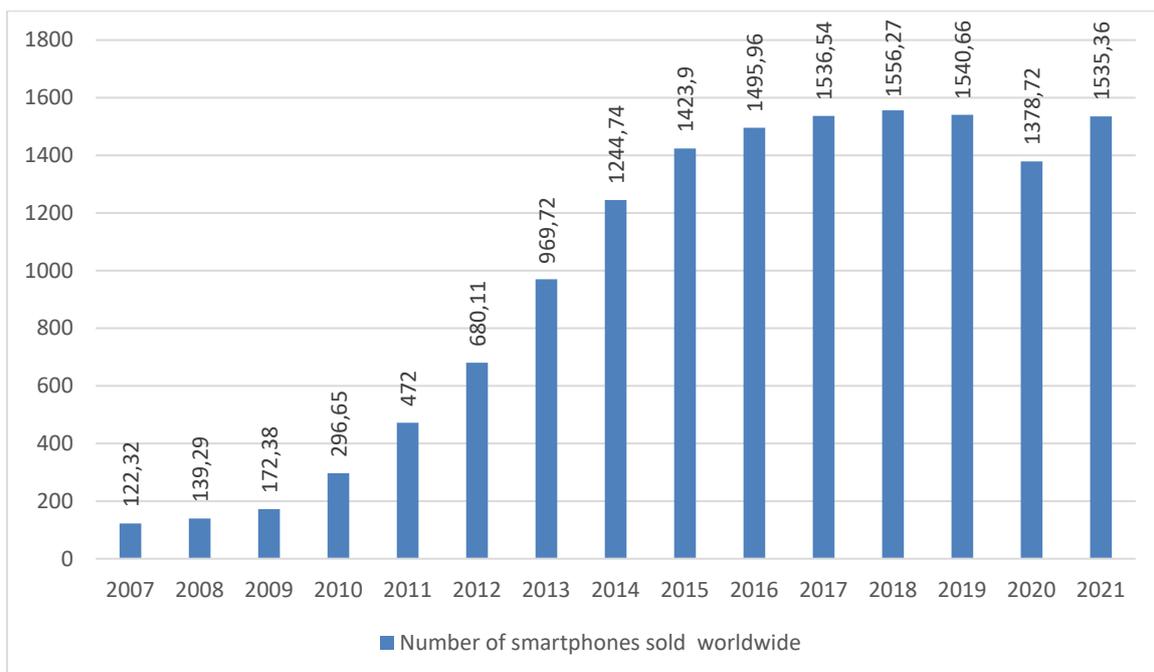


Fig. 1. Number of smartphone sold worldwide (adapted from Statista, 2021)

Based on the popularity of smartphones, a new direction of hacking has emerged, which is called mobile hacking.

Mobile hacking is a complex of methods and practices where intruder forces access into phone or its communications. This type of hacking can avoid advanced security systems using unsecured Internet connections or Wi-Fi points [2].

However, the main problem of the attack realization is depended from user securing experience and type of the operation system (OS). Unfortunately, most of the users don't know, how to protect mobile devices from intruding and this

"misunderstanding" gives an opportunity to breach into the OS of the smartphones and steal data from them [2, 4, 5].

The most popular OS is:

- Android OS;
- iOS.

Understanding that fact, the next statistic explain, which OS is most dangerous for using (Fig. 2). During 2020, an analysis of mobile OS was carried out, in which many vulnerabilities were identified [3].

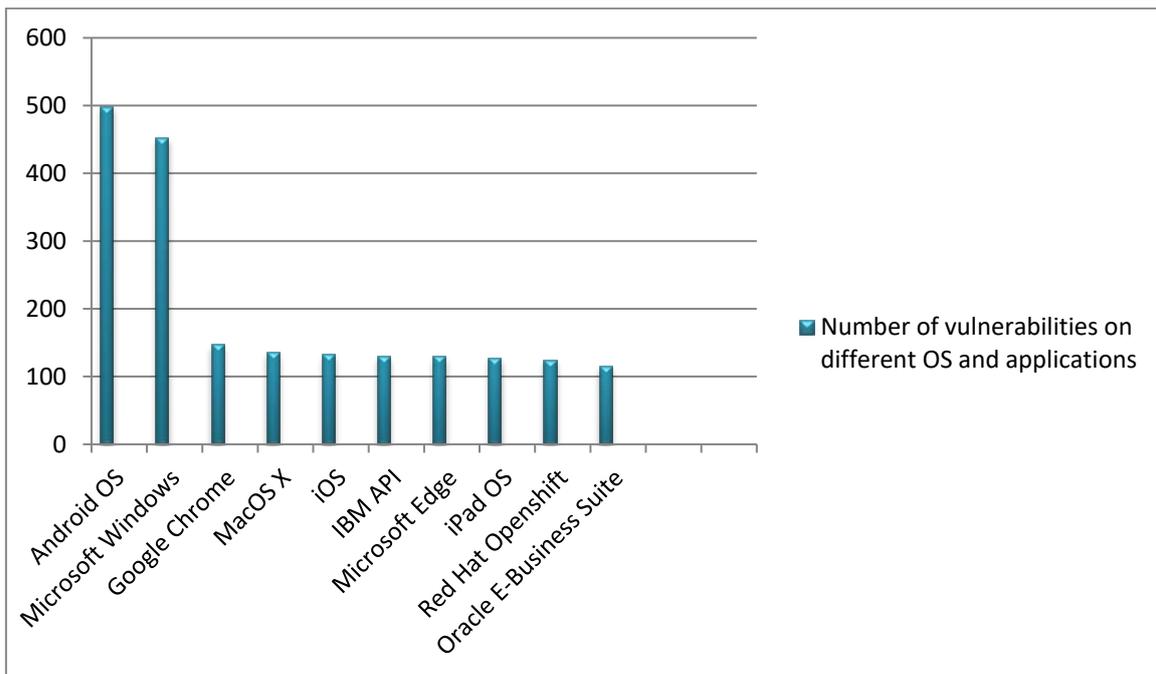


Fig. 2. The most vulnerable products

Taking into account the vulnerabilities of any mobile application or OS, an attacker is exposed to a different attack vectors on a mobile device. Typically, the victims are users who actively interact with "critical infrastructure application". These structures include banking systems, corporate applications of companies etc. The range of attacks can be focused on the mobile application or mobile OS. Based on the previous statistic, the next pie chart (Fig. 3) explains types of attacks which are used on the victims [3, 4].

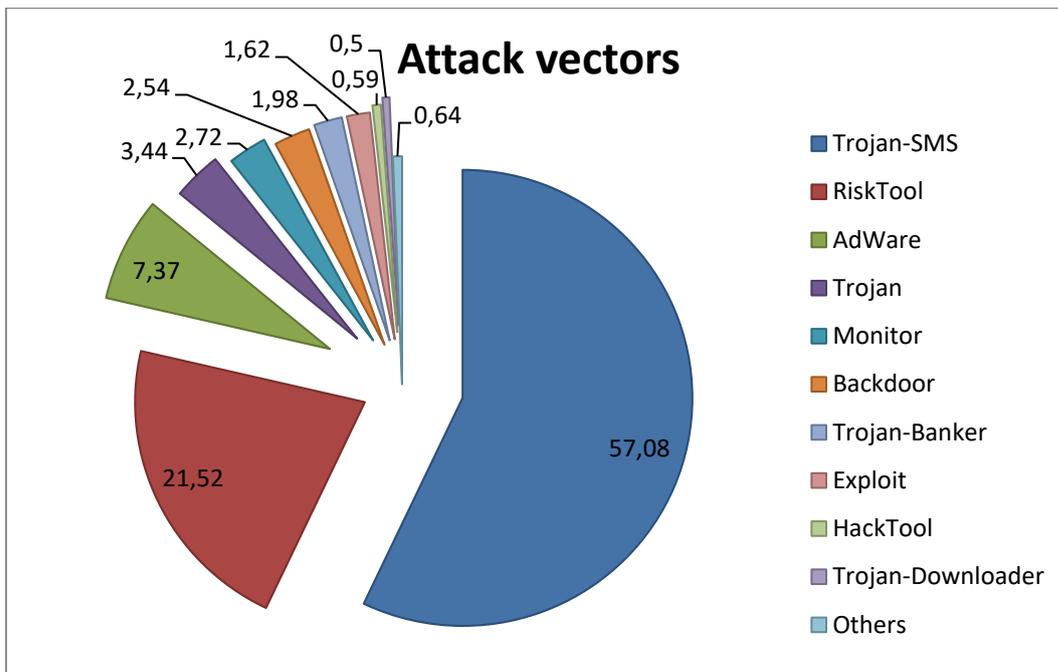


Fig 3. Attack vectors on the mobile devices and applications.

The development of any sphere of technology leads to negative cost and the reduction of this influence depends not only from security systems, but also on the user's understanding and experience in protecting their own resources. Society must be interested in conserving its own resources. This is important in order to avoid and protect potential cyberattacks in future [5].

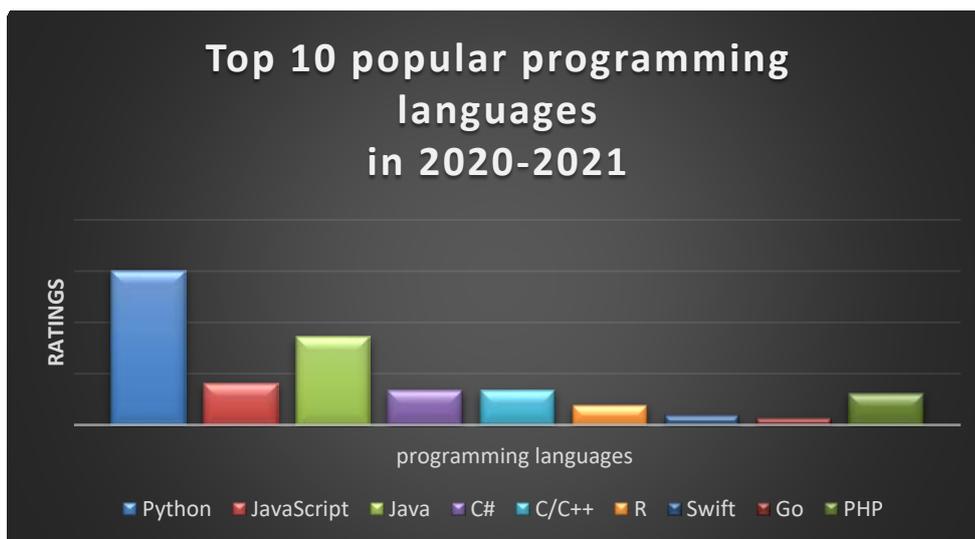
### References

1. Number of smartphones sold to the end users worldwide (2021). Statista. Title [online]. Available at: <https://www.statista.com/statistics/263437/global-smartphone-sales-to-end-users-since-2007/>. Accessed on: March 17, 2021.
2. How to stop phone hacking? (2021). Kaspersky Labs. Title [online]. Available at: <https://www.kaspersky.com/resource-center/threats/how-to-stop-phone-hacking>. Accessed on: March 15, 2021.
3. Vulnerability reports (2021). HelpNetSecurity. Title [online]. Available at: <https://www.helpnetsecurity.com/2020/07/22/vulnerability-reports-2020/>. Accessed on: March 02, 2021.
4. Android attacks use financial malware (2021). Cards&Credits. Title [online]. Available at: <https://www.paymentscardsandmobile.com/60-android-attacks-use-financial-malware/>. Accessed on: February 27, 2021.
5. How can we protect ourselves from cyberattacks? (2021). Nest. Title [online]. Available at: <https://www.latrobe.edu.au/nest/can-protect-cyber-attacks/>. Accessed on: February 15, 2021

## How to choose the best software development tool for a beginning programmer?

Nowadays IT-industry continues to develop rapidly. Every day we see that the number of people who are interested in programming is increasing. Usually, most beginners face up with the question of which programming language is worth learning. But in addition to it, the choice of the right IDE (Integrated Development Environment), in which a programmer will create his programs, is also a very urgent problem for beginners. So, let us consider the factors that can help beginners to make their choice.

First of all, to make the task a bit easier, we will discard some of the old and unnecessary languages and focus our attention on those, which are popular and demanded today. After analysing different sources, we can make a general rating of the most popular programming languages in 2020-2021[1-3]:



Next, we need to decide by what criteria we will compare programming languages. Our choice, of course, will depend on the functionality of the language itself and on the type of task, which a programmer needs to solve. So, let us briefly describe the functional features of each language:

- Python has a simple syntax, good integration with other languages, a large library of standards and toolkits, it runs on any OS and supports many services;
- JavaScript was created for web development, it is quite easy to learn and it has a wide variety of addons and libraries;
- Java can be run on various OS, has a wide variety of libraries, but it is not so easy to learn;
- C# is object-oriented, it has a large code library, an expanded set of functions and operations, but it is not so easy to learn too;

- C is a high-performance language with the code which is easy to debug, but it is not suitable for more modern use, and has a complex syntax;
- C++ is a high-performance language that works well for multi-device and multi-platform systems, it has a complex syntax;
- R is extensible, can be run on many OS, but it is not so easy to master;
- Swift was created for iOS app development, it has simple syntax, runs code quickly, compatible with Objective-C, can be used for both client-side and server-side development;
- Go is an efficient, readable, and secure language for system-level programming with a large standard library and extensive documentation;
- PHP code is easy to debug, it has a wide variety of libraries, it isn't hard to learn.

The other difference between languages lies in their areas of application. In Web development, if we speak about Front-End (creating web pages, programs for them, styles etc.), JavaScript should be used. If we speak about Back-End, that is server software development, Python, Java, C# and PHP are the languages of choice. In creating desktop applications, Java and C# are the best options. On the one hand, Java is a bit easier and faster programming language, but C# has more capabilities. Game development is an area where C++ and Python are widely used, due to their functional features. In creating mobile applications, if we speak about Android systems, the preference should be given to C# and Java. If we speak about IOS platform, Swift is the best choice. In creating cloud-based applications, GO is considered to be a very suitable and useful programming language. As for data analytics, here we should choose R, which is mainly used in applications related to statistical analytics and data processing [4].

So, you can choose the most suitable programming language depending on your preferences, but if you do not clearly understand what exactly you want to do, then you could choose Python for learning, since it is very popular and can be applied in many areas, it has a simple syntax and other advantages.

The other list of recommendations refers to choosing the right IDE, which is a set of different tools like a text editor, compiler, debugger and others. IDE plays a big role in the process of creating an application, affects the quality and efficiency of work. Here are some of the best IDEs for different languages:

- MS Visual Studio is a good option for everyone, it has a lot of different features, but at the same time, you need to have a powerful PC, where you can work with C++, C#;
- Eclipse has a big functionality and flexibility of the environment due to its modularity, there you can work with C, C++, Java, PHP, Python and other languages;
- XCode is an official Apple's compiler, which has a smart code analyser, here you can work with Swift, C++, Java and others;
- NetBeans has an understandable interface, has a good functionality, but it requires a powerful PC. In this environment you can work with Java, JavaScript, PHP, Python and other languages [5,6].

So, following these recommendations, the beginning programmers can make the right decision how to develop professionally.

## References:

1. The 10 Most Popular Programming Languages to Learn in 2021. [Online]. Available: <https://www.northeastern.edu/graduate/blog/most-popular-programming-languages/>. Accessed on: 16.02.2021.
2. Топ-10 языков программирования в 2020 году по версии GitHub. [Электронный ресурс]. Режим доступа: <https://tproger.ru/articles/top-10-jazykov-programmirovaniya-v-2020-godu-po-versii-github/>. Дата обращения: 16.02.2021.
3. Названы самые популярные языки программирования. Среди них полумертвый COBOL. [Электронный ресурс]. Режим доступа: [https://www.cnews.ru/news/top/2020-07-27\\_nazvany\\_samye\\_populyarnye](https://www.cnews.ru/news/top/2020-07-27_nazvany_samye_populyarnye). Дата обращения: 17.02.2021.
4. Какой язык программирования стоит выучить первым? [Электронный ресурс]. Режим доступа: <https://itvdn.com/ru/blog/article/which-programming-languages-begin-to-teach-in-it>. Дата обращения: 17.02.2021.
5. 10 лучших IDE. [Электронный ресурс]. Режим доступа: <https://timeweb.com/ru/community/articles/5-luchshih-ide-1>. Дата обращения: 18.02.2021.
6. Популярные среды разработки и их недостатки. [Электронный ресурс]. Режим доступа: [https://geekbrains.ru/posts/ide\\_negative](https://geekbrains.ru/posts/ide_negative). Дата обращения: 18.02.2021.

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### **Dealing with data breaches in business**

Data leakage in business can threaten not only monetary, but also reputational losses. Reputation is more expensive than money, and in recent years, many IT giants have faced the problem of data leakage. The most sensational story with a data leak occurred in early 2018 with Facebook. Cambridge Analytica illegally collected the data of 87 million users of the social network and transmitted them to the third persons, including, presumably, the campaign headquarters of the 45th US President Donald Trump, who used them for political advertising in 2016. As a result, Facebook was obliged to pay a record fine of \$5 billion [2].

Another example is the situation with the popular messenger WhatsApp. Through vulnerability, hackers installed spy programs on the smartphones of users. Moreover, both Android and IOS owners suffered. Hackers called users and thus installed malicious software. The victim could not answer the call as the spyware was installed, the Ukrainian Interfax reports [1].

Subsequently, information about the incoming call often disappeared from the list of incoming calls, and users did not even understand the reason why.

The way cybercriminals carried out the attack on WhatsApp is striking. Pegasus malware was developed by the Israeli company NSO Group to prevent terrorism in the Middle East. However, once in the hands of criminals, the goals of the creators of the virus turned into a Pandora box. As a result, hackers were able to turn on the camera and microphone on the phone, read mail and receive data about the user's location.

Data leakage affects not only large companies, but also business as a whole. Among the most common ways to capture data are the simplest but most reliable spam and phishing.

Attackers hack CRM and get access to the client database. Then, they make the site exactly like yours and register a similar email address. After that, they send customers an offer that cannot be refused, for example, a letter with a notification of discounts. Usually customers go to the site and pay for the goods. Attackers make a profit and customers lose money.

Alternatively, even easier, as in the previous case, attackers crack CRM and receive your customer's email. Then, they send them letters with a link to a malicious site that steals user passwords. Attackers will receive passwords and will be able to steal money from people's electronic wallets [2].

The scenarios described are different in complexity and coverage, but they have one goal - to steal as much user data as possible, and no one is immune from this.

Based on IBM data, the cost of information loss in the world is steadily increasing.

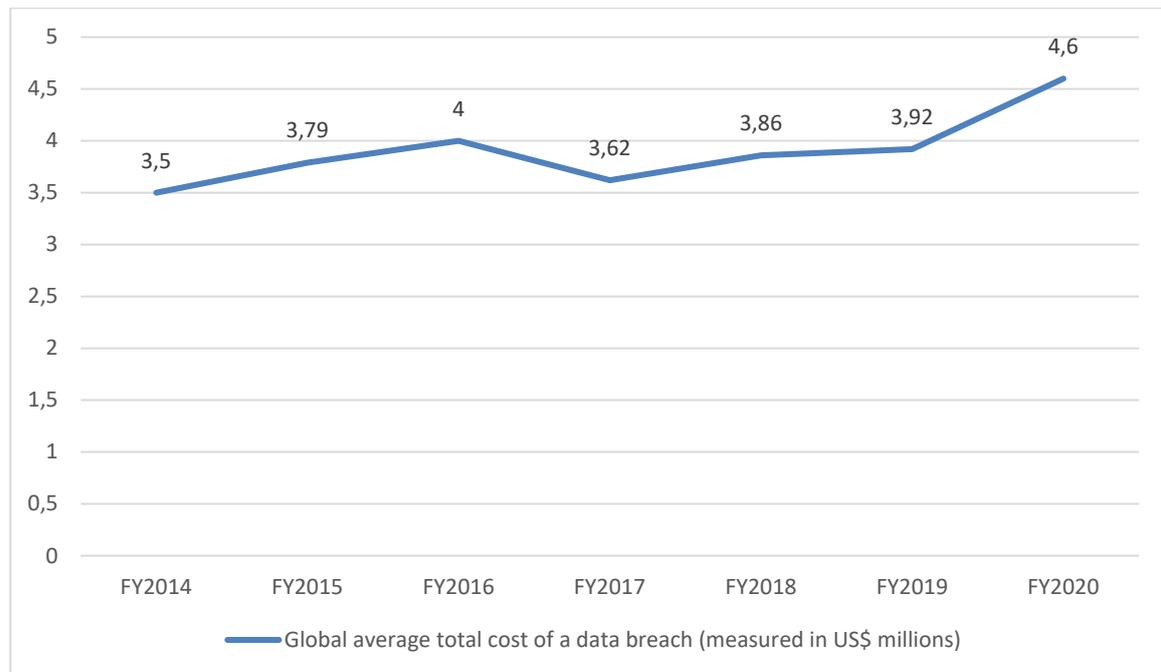


Fig 1. Global average total cost of a data breach (adapted from IBM security 2019 Cost of a Data Breach Report [3]).

Therefore, it is vital for companies to apply measures to protect information. They include:

- **Portable encryption.** You should be encrypting any sensitive data, which leaves your network. To do this, you need software systems in place since you cannot rely on employees alone. It only takes a lost USB stick, laptop or phone to deliver a severe blow to a business [4].
- **Endpoint protection.** Software should be used for effective protection of endpoints of IT infrastructure of companies. This solution provides enhanced protection, preventing information attacks on physical and virtual environments.
- **Email content control.** Software must be capable of analyzing the content of a letter on various components and structure to implement the policy use of e-mail.
- **Intelligent firewalls.** Network security devices are used to monitor incoming and outgoing network traffic. They are based on an established set of security rules and help to decide whether to allow or block specific traffic [5].
- **Device control.** It protects your data by preventing it from falling into the wrong hands via removable storage media.
- **Assessment of security permissions.** There exists a set of rules for providing access to information.
  - **Print control.** Multi-function printers (MFPs) are typically unmonitored and have high data leakage potential.
  - **Secure back-ups provide reliable security.**
  - **Image text analysis.** Security measures help analyze text in images, preventing data disclosure.
- **User education.** Users should know that data breaches are not always intentional. Employees may not be aware that they are committing a crime.

Therefore, it is necessary to train personnel regularly on the company's safety policies, and inform users about new trends in information security.

### References

1. WhatsApp scandal: hackers installed spyware via messenger  
[Electronic resource] // Tech.24.tv – Resource access mode:  
[https://tech.24tv.ua/ru/skandal\\_s\\_whatsapp\\_hakery\\_ustanavlivali\\_programmy\\_shpio\\_ny\\_cherez\\_messendzher\\_n1153048](https://tech.24tv.ua/ru/skandal_s_whatsapp_hakery_ustanavlivali_programmy_shpio_ny_cherez_messendzher_n1153048)
2. Data leakage protection in business: how to prevent and how to fight  
[Electronic resource] // Planfact – Resource access mode:  
<https://planfact.io/blog/posts/zashchita-ot-utechek-dannyh-v-biznese-kak-predotvratit-i-kak-borotsya>
3. What's new in the '2019 Cost of a Data Breach Report?'  
[Electronic resource] // Threatravens – Resource access mode:  
<https://threatravens.com/n1loddwhvbw/>
4. 10 ways to protect sensitive business data  
[Electronic resource] // Quostar – Resource access mode:  
<https://www.quostar.com/blog/10-tips-to-help-prevent-a-data-leak/>
5. What is firewall?  
[Electronic resource] // Cisco – Resource access mode:  
[cisco.com/c/ru\\_ru/products/security/firewalls/what-is-a-firewall.html](https://cisco.com/c/ru_ru/products/security/firewalls/what-is-a-firewall.html)

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### **Neuralink: are people ready for this big technology breakthrough**

Neuralink has been developing since 2016 and reached a big progress from that time. According to one of the “Wait But Why” articles, published in April 2017, Elon Musk (the founder of Neuralink) stated that the company could make devices for curing different kinds of serious brain diseases, and also, in the future, would greatly improve and change the environment where people live and work.

The thing is that the microchips, while placed under the heads’ skin, could transfer signals from the brain or, better to say, neurons to any device you want. This microchip is a kind of “a decoder” that decrypts our brain signals to the useful ones. According to the official information on the main site of Neuralink, the company’s aim is to help people with a serious disease, spinal cord injury, by letting them to have the ability to manipulate computers and mobile devices just right using their brains.

It sounds good, but is it actually so? The real question can be formulated in such a way: “Are those people ready to get this implant in their heads?”

The issue of safety is a main problem and fear. No one knows how the implantation is going to be. And no one knows what could happen later. As the company admits, they have not begun clinical trials yet and still have not got any data related to the human ‘safety. But as it was designed from the beginning, the issue of safety was a prior one. Particularly, the Link includes technical novelties to improve the safety of the surgical procedure in comparison to already existing BMI appliances or just common neurosurgery. As it is known, the procedure of anesthesia is always a great risk and sometimes is followed by negative consequences. Their “Neurosurgical Robot” is able to put in electrodes more efficiently and reliably. And, as it should be emphasized, this robot is already being designed to insert electric threads through an opening in the skull which is 23 mm in diameter. Combined with other improved robotic surgical tools, this probably will allow a company to get rid of general anesthesia and implant a microchip under conscious sedation. Inserting this device into the brain is always some risk of bleeding. Neuralink is trying to decrease that risk by using micron-scale threads implanted with a special needle whose diameter is approximately the size of many neurons in the brain. Moreover, due to the fact that each thread is inserted apart, the Neurosurgical Robot will be designed to get away of injuring blood vessels anywhere in the brain.

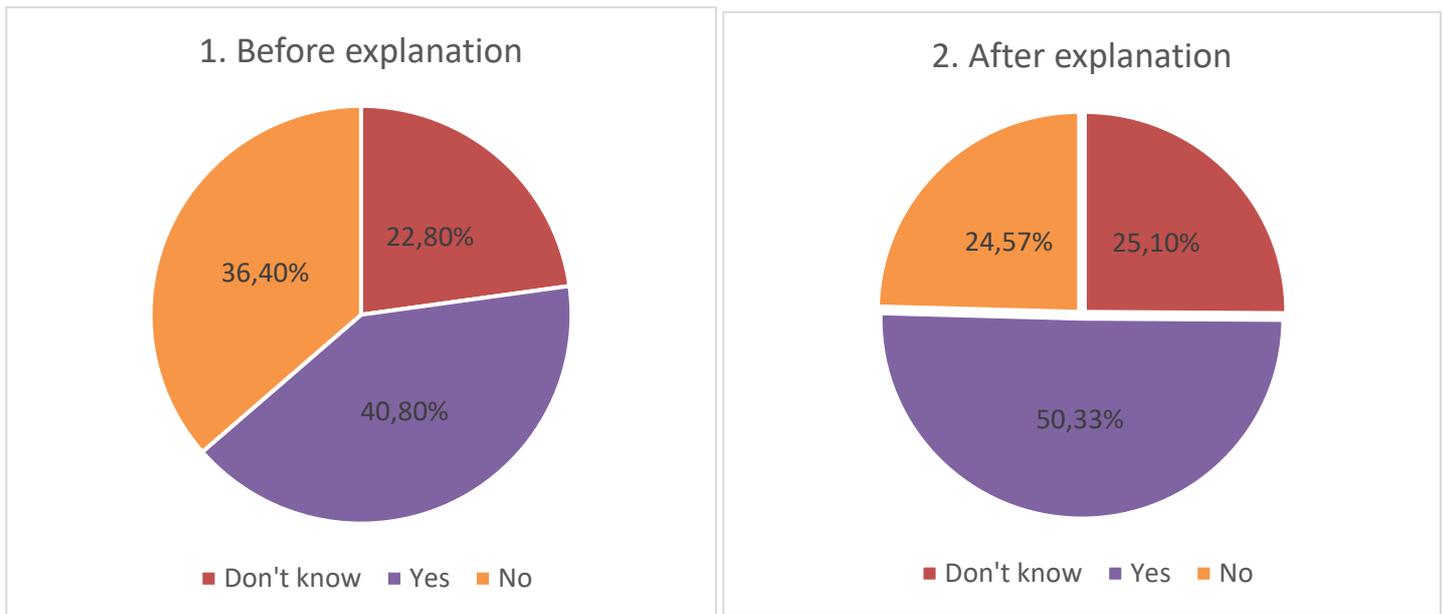
Unfortunately, these claims do not make people more trustful and less sceptic. Many people believe Elon Musk to be able to control them through this microchip. No matter how funny it sounds, but it actually raises a big concern.

Another important issue is security. The real thing is that these microchips, like other devices, can be hacked. So, they must be secure and reliable. And Neuralink is sure to

comprehend any possible scenario. The researchers are going to provide well-made built-in security on every layer of the product. It will use strong cryptography defensive engineering, and extensive security auditing.

Bringing all the facts together, Neuralink is certain to have a big potential and I really would like it to get implemented.

I conducted 2 surveys where people were asked to evaluate the chances of that idea. In the 1<sup>st</sup> survey people were given initial information about implanting microchips and were asked whether they would like to apply the chips for themselves. In the 2<sup>nd</sup> survey more detailed information was provided in terms of the process and its consequences. The results of the survey are given on the pie charts.



As you can see, there were some changes, but they turned to be insignificant. These two pie charts have demonstrated that:

- 1) the percentage of people who were strongly against implanting microchips has gone down for about 10%
- 2) there was an increase in the number of people who do not really know (find it difficult to answer)
- 3) we can see a rise in the number of people who were told more detailed.

These statistics is very rough, but we can already judge how peoples' opinions have changed.

After conducting this research, I decided to consider this issue from another side. I asked myself: "Why should I tell people about implanting microchips without any preparation work? That does not have any sense". That is why I decided to ask people whether they would like to control devices by just using their own brains. Most of them surely said "yes". And it turned to be the issue of marketing. People do not like to be asked something unexpected, so there should be some preliminary explanation to be prepared for the main topic.

Taking into consideration all above mentioned, I came to the conclusion that peoples' readiness for Neuralink microchips totally depends on how the company introduces

their innovation. The algorithm of introducing something unusual and innovative should be fulfilled in such a way:

1. **Preparation phase, part 1:** tell people some story, make people interested in presentation, catch attention.
2. **Preparation phase, part 2:** tell how good it will be if ... (depends on a story), hinting to the company product.
3. **Main phase, part 1:** tell about the research done, the topic of the research can be “Is it possible to make this *product*?”
4. **Main phase, part 2:** “A great work has been done, and now we are ready to ...” tell people about real opportunity for the *product* to be a part of our life.
5. **Main phase, part 3:** Introduce *the product*, its key features and so on.
6. **End phase:** tell additional information, date of possible launch, costs etc.

If this algorithm is followed, the percentage of people who would like the idea will increase significantly.

### **Summing up all the things**

1. There is no certain answer in terms of people readiness to changes. It depends entirely on the company.
2. The way of informing people about something innovative and sophisticated highly affects their future opinion about this issue.
3. Considering Neuralink as a really prosperous company, it can be concluded that this company has a very big potential to succeed and provide the humanity with very useful devices that would be able to help people in solving a lot of problems in different areas.

### **References:**

1. A quick guide to Elon Musk’s new brain-implant company, Neuralink. <https://cutt.ly/JznldOL>
2. Elon Musk is setting up a company that will link brains and computers. <https://cutt.ly/Xznz8Bm>
3. Elon Musk Launches Neuralink to Connect Brains With Computers. <https://cutt.ly/PznlU5D>
4. Neuralink and the Brain’s Magical Future. <https://cutt.ly/EznlLJP>
5. Neuralink Launch Event <https://cutt.ly/Hznl7uo>
6. Understanding the brain; Interfacing with the brain; Engineering with the brain. <https://neuralink.com>

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## **History of development of artificial intelligence**

Artificial intelligence is a term that refers to the field of computer technology. Mostly it performs creative functions, develops intelligent machines that have human-like thinking, work and react like people.

The first ideas for creating machines with consciousness originated in ancient Greece. Hellenic mathematician Philo of Byzantine in the 3rd century B.C. invented a mechanical maid who filled a bowl with wine and water. In the Middle Ages and Modern Times, scientists created mechanisms that replaced human labor. For example, in the 17th century, Blaise Pascal invented the mechanical digital computing machine; in the 19th century, Joseph Marie Jacquard created the programmable loom. However, it was only after World War II that it was possible to develop programs that would perform complex intellectual tasks. In the 1950s, scientists from various fields began to ponder the possibility of an artificial brain. Neuroscience research has shown that the brain is a neural network. Alan Turing suggested that any kind of computation could be digitized, and by 1950 he had developed a test that determined the level of similarity between machine actions and human consciousness, which was later called the Turing test. And already in 1951, the first SNARC neural network was created. Nevertheless, the term «artificial intelligence» was first used at the Dartmouth Conference in 1956, at the same time the scientific discipline «Research of Artificial Intelligence» appeared.

Soon afterwards, many machines were created that understood human speech, were able to maintain conversations on given topics, and robots that played board games such as chess. Now artificial intelligence takes an important position not only in the development of science. A typical medical application of AI is scanning digital images to help detect visible health abnormalities and possible illnesses. With the help of artificial intelligence, people have advanced in the field of military affairs, since AI allows you to provide classification and semantic segmentation of images, as well as detect and identify threats, and assess the intentions of the enemy. Robots have gained popularity in many branches of the heavy industry, where work for humans is often considered dangerous. Thanks to artificial intelligence, personal finances and investments can be managed and trading decisions can now be made faster. And at the University of California, artificial intelligence is being used to solve socially significant problems like homelessness. With the help of scientific advances, AI has made it possible to imitate a humanoid composition. It is also heavily used in the games industry. For example, in video games there are bots that play the role of an adversary if human participation is unavailable or undesirable.

In addition, artificial intelligence has become an integral part of mass culture. Isaac Asimov with a collection of science fiction stories «I, Robot» and Dan

Simmons with a cycle of science fiction works «Songs of Hyperion» are the most widely known in literature. The cinema is famous for its adaptations of The Matrix, Blade Runner, Star Wars, The Terminator. However, art has distorted the concept of AI, endowing the world with dystopian features. Hence, public concerns about artificial intelligence and its potential threat to humans developed.

Nevertheless, there is no reason to worry, because at this stage of development, artificial intelligence technology is not so smart. It can change any industry, but its possibilities are not limitless. The main problem with AI is that learning is only possible on the basis of data, otherwise it is impossible. For example, a chess system cannot drive a car, and vice versa. Such systems are capable of performing one specific task, and therefore they are still far from human multitasking.

At the moment, in the field of artificial intelligence, there is an involvement of many subject areas, which are more of a practical relation to AI, rather than fundamental. Many approaches have been tried, but not a single research group has yet approached the emergence of artificial intelligence. However, the largest research and development centers, such as the Massachusetts Institute of Technology and the National Institute of Modern Industrial Science and Technology, have already made some discoveries. The most famous of them are: Deep Blue is an AI system that defeated the world chess champion; Watson is an IBM development capable of perceiving human speech and performing probabilistic search; MYCIN is an expert system that can diagnose a small set of diseases; 20Q is an AI-based project based on the classic 20 Questions game.

In conclusion, it can be said that artificial intelligence technology has enormous potential. For example, in the future, it is planned to create applications that can recognize faces to interpret emotions and non-verbal gestures or one voice among many others in a noisy room. And for better functionality of this and other systems, it would be useful to create a unified AI control system. It would also have a positive effect on the above-mentioned spheres of life such as economics, medicine, and would give impetus to the widespread use of artificial intelligence technologies.

### **References:**

1. <https://vc.ru/tech/89646-mehanicheskaya-sluzhanka-i-vendingovaya-mashina-iz-drevney-grecii-kak-sozdavali-robotov-do-rasprostraneniya-elektrichestva>
2. <https://iot.ru/wiki/iskusstvennyy-intellekt>
3. [https://www.cnews.ru/articles/2019-11-12\\_chno\\_ozhidat\\_ot\\_razvitiya\\_tehnologij](https://www.cnews.ru/articles/2019-11-12_chno_ozhidat_ot_razvitiya_tehnologij)
4. [https://www.sas.com/ru\\_ru/insights/articles/analytics/what-is-artificial-intelligence.html](https://www.sas.com/ru_ru/insights/articles/analytics/what-is-artificial-intelligence.html)

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## Face recognition technology on smartphones

In today's world, a smartphone is a multifunctional device that stores and processes a large amount of personal information, so the problem of data protection and security is relevant. Today there is more than one way to identify a person: the most common and reliable are the PIN code and fingerprint. However, more and more smartphones use the function of face recognition. The question is: Face ID is an advanced technology of the future or a step backwards in information security methods?

Since the 1960s, experts have tried to teach a computer to recognize a person, but even a slight change in facial expression and poor lighting has turned it into a daunting task. The first method was based on using a linear grid. It means that a person had to manually mark the distinctive face characteristics and transmit them to the computer. But technology is not standing still, and a computer's ability analyzes photos from several angles has been the new stage of evolution. So, the system has learned not to respond to changes in emotions, hair length, glasses and other factors that make it impossible to recognize faces in previous ways.

Improvement continues to this day - no system in the world works in 100% of cases. A smartphone is improving steadily to recognize people's faces. Modern developers use neural networks - a mathematical model in which numbers pass by connections, multiply and add up. However, learning neural networks requires powerful graphics processors and additional time. Consequently, developers download on the smartphone only the trained and improved neural system that can adapt rapidly during its work. The task of the neural network is to recognize individual facial features and distinguish them. Each sign is not an image of eyebrows or eyes; it is a certain number associated with a specific part of the face. Collected features form a vector. Thus, each time you try to unlock the phone, the neural network creates a new feature vector and compares its value with the previously created one. The distance between the vectors of the same face is minimal, and between different is the maximum.

There are several recognition technologies:

**1) with a selfie camera.** Developers use this technology for Android smartphones in the budget segment. It does not require additional costs for various sensors but is less secure. The main disadvantage is the dependence on lighting because in the dark a smartphone is almost unable to recognize a person's face with a selfie camera. Experts from the Dutch consumer protection organization Consumentenbond tested 110 devices running Android and found that 42 of them can be unlocked with an owner's photo. The smartphone tries to identify the typical glare of glass or paper that cannot be on a face, but it does not always work.

**2) Building a depth map.** Apple uses this principle in its gadgets. Additional sensors on the iPhone are needed to distinguish a living person from a photo or 3D mask. With the help of these sensors, it builds a map of depth, that is, sees your face in three-dimensional space. Accordingly, all deceptive methods associated with 2D fakes (photos, screenshots, videos) are eliminated immediately. Apple has stated that this method is even safer than Touch ID: an error rate of 1: 1,000,000. The 3D scanning method is safer than 2D scanning. The future lies in face recognition technology. It is a complex but secure method of protecting information. The smartphone does not save a photo of its owner, but sets of numbers, id est vectors, are stored instead, and the distance between them is compared constantly. Expensive devices equipped with special sensors can already produce results with high accuracy and speed. Demand for this technology is growing exponentially. The field of using face recognition has gone far beyond smartphones. Such technologies are used in the banking system to combat fraud, at self-service checkouts in supermarkets, at customs et cetera. The investigation in this sphere is promising.

### References

1. <https://worldvision.com.ua/evolutsiya-tekhnologii-raspoznavaniya-litsa-ot-natelnykh-kamer-do-videonabludeniya/>
2. <https://habr.com/ru/post/472948/>
3. <https://deep-review.com/articles/face-id-and-face-unlock-explain/>
4. <https://deep-review.com/articles/smartphone-ai-and-neural-networks/>
5. <https://www.securitylab.ru/blog/personal/bezmaly/345459.php>
6. <https://evergreens.com.ua/ru/articles/face-id-business-spheres.html>

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## **Common problems in starting IT business**

The IT sphere is considered as one of the most promising and demanded. Rapid growth, lack of boundaries for development and low entry thresholds allure young entrepreneurs to start their own business in IT. But as any other business, IT is full of difficulties and pitfalls, so it is important to analyze your strength, understand the specifics of the market and have a clear plan of action [1].

Learning about potential difficulties your company and employees can encounter on a day-to-day basis is one of the best ways to care about your business future and success as it brings the power of change and allows the manager to implement the best strategies for success.

Technology is always upgrading: right as we have the latest and the most modern device or tool, a newer and smarter model is getting into the market. To avoid some of these challenges, it is vital to know about the most common IT problems that can appear at a workplace. Problems can be small, such as slow performance, or harsh including the “blue screen of death”. Most of them can be fixed with just restarting a computer, others require time and efforts.

Even if a company has the best team of IT experts with the most protected database in the world, it may be still at risk. Company experts might not have as much control over the network and servers as they think they do. Therefore, the more people know about the problems they can face, the easier it will be to control and resolve them.

The most common problems can be divided into 2 types – technical and human.

Technical problems include:

### *1. Poor network security.*

Network security is considered as one the most vital parts of keeping any business safe. Having a secure and reliable network is important for businesses of all sizes, even if only 5 employees work in the office. Hackers do not differ to attack small or big company files and data. Sometimes, they even specifically target small businesses because they know that such a company might not have a strong security policy and can be easily hacked with a friendly phone call to a staff member.

Cybersecurity is something every business should always think about and, therefore, all the necessary steps must be taken to ensure that its network and technology appliances are secure. Employees should be well-trained in security issues, the company’s firewall must be always enabled, all company data must be backed up, and passwords ought to be kept updated [2].

### *2. Backup and disaster recovery challenges*

If anyone has ever experienced a power shutdown, or accidentally deleted any important file, had a server crashed or faced any other data disaster problems, then he understands how important it can be to have the latest backup and emergency recovery plan. Having a good backup solution for inevitable events is critical to eliminate downtime and associated costs [3].

### *3. Technology updating problems*

Systems need continuous maintenance to ensure they operate correctly and safely. With the correct IT processes, problems can be predicted, planned and resolved before they become critical. "An ounce of prevention is worth a pound of cure", said Benjamin Franklin [2].

Engaging with technology is a big part of an employee day. Using old and slow systems makes life and work much more difficult, which ultimately decreases productivity. A company will have fewer IT problems at the present moment and in the future depending on how updated and new its IT systems are.

On the other hand, as new technologies emerge, they sometimes cannot work with old systems or applications. This can lead to double data entry, the need to search for information in multiple places, and other inefficiency. Careful planning before execution can minimize these problems.

Human-related problems include:

#### *1. Lack of professional experience*

A common problem that entrepreneurs face is a lack of expertise in specific processes. Even if you already had relevant experience and participated in projects as a developer or an employee, it does not always mean that you can organize it yourself.

The first difficulty is how to determine the real deadline for the project. Due to the peculiarities of the development process, it is not always possible to accurately inform the customer about the deadline for the work completion. Lack of proper experience and fear of losing a client force companies to estimate approximate terms, based only on a limited vision of a development process. As a rule, this has nothing to do with reality.

#### *2. Cash gaps and team trust*

Despite the fact that people can enter the IT business without much investment, they may still have to face financial problems. It would seem, what trust has to do with it. There are months when employees can be left without full salary because of payment time shifting. At that moment, you could even have to resort to a loan to pay salaries. And only the trust of your team, which will not leave the company at a difficult time, can help to get out of this and stabilize the work.

#### *3. Difficulty in hiring personnel*

The first problem here is the lack of qualified personnel. Despite the fact that the market is full of resumes of various developers, in reality there are very few sensible ones. For example, every second person who is "good at HTML / CSS" considers himself a worthy candidate for the position of a frontend developer. As a result, the search for a suitable specialist is delayed.

The second problem is how to keep qualified personnel, because according to statistics, there are always several job offers for one smart specialist, even if he is not currently looking for a job. As a result, he chooses the most interesting in terms of income. And a young company is often not able to make as profitable offer to a specialist as a large one can do. At the same time, according to HeadHunter, the IT sector has a large annual increase in young specialists at the junior level, who do not have sufficient experience in dealing with large projects [1].

To avoid the above mentioned problems when starting your own IT business, you must adhere to the following rules:

- try to give your team new, but maximally stable hardware and software;
- always have a fresh backup and do not forget to ask your employees to do the same;
- announce the deadlines to the customer with a small margin - in case of unforeseen problems;
- when evaluating a project, be guided by the average market price;
- gather a team of loyal professionals around you who trust you.

And you will definitely succeed with good planning and faith in yourself and your team.

### References:

1. К чему готовиться при открытии IT-бизнеса: 8 проблем, о которых надо знать. [Электронный ресурс]. Режим доступа: <https://rb.ru/opinion/k-chemu-gotovitsya-pri-otkrytii-it-biznesa/> Дата обращения: 04.03.2021.
2. Top 10 Most Common IT Problems For Businesses (With Easy Solutions) [Online]. Available: <https://www.ais-now.com/blog/top-10-most-common-it-problems-for-businesses-with-easy-solutions>. Accessed on: 04.03.2021
3. 7 Most Common Technology Problems for Small Businesses. [Online]. Available: <https://blog.accentonit.com/7-most-common-technology-problems-for-small-businesses> Accessed on: 04.03.2021

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## **Internet Piracy: Methods of Combating**

Today one of the most global problems on the Internet is the problem of Internet piracy, which is closely linked to a related problem - copyright infringement. Everything from music and movie premieres to unpublished scholarly works and confidential documents is dumped on the Internet. The reason for this phenomenon is, first of all, imperfect and ineffective legislation. So, this article will discuss types, methods and peculiarities of combating Internet piracy.

Let us start with the types of Internet piracy which are divided into 5 major categories:

- video piracy that refers to the illegal distribution of copies of movies or TV programs on external digital media. This happens by copying and posting on the Internet;
- audio piracy connected with the copying and distribution of copies of music albums and individual compositions;
- literary piracy with the most obvious example of copyright infringement when electronic libraries appear on the Internet providing the opportunity to download books, essays and other literary works;
- software piracy meaning the illegal "leakage" of programs and software products that are still under development. This type of piracy also implies the possibility of removing the system of protection put in place to prevent the illegal use of copyright products;
- computer game piracy, which is one of the most common types of piracy on the Internet.

The main cause of Internet piracy is an imperfect legislation of the world countries, which would regulate the issue. The lack of an effective mechanism to influence the violators, as a consequence of disfunctional legal framework in many countries, has led to the fact that the problem acquires a global dimension.

Nowadays the world community is doing its best to work out the effective mechanisms that would simplify and accelerate the possibility of controlling the copyright protection on the Internet. The examples include the EU Directive on Electronic Business Activities; HADOPI, a law adopted in France in 2009; DMCA law (USA); ACTA Law.

In Ukraine the issue of combating piracy was not considered systematically with further development of the legal framework and its entry into force until 2014. It is due to such a negligent attitude to the globally significant problem that the level of piracy in Ukraine has become large-scale.

The current Law of Ukraine "On Copyright and Related Rights", adopted back in 1993, provided only protection of property and non-property rights of copyright

subjects, what does not refer to the protection of copyright and intellectual property rights on the Internet. Only at the end of October 2014 the Cabinet of Ministers approved the draft Law of Ukraine "On Amendments to Certain Legislative Acts of Ukraine Regarding the Protection of Copyright and Related Rights on the Internet", which aims to introduce the existing mechanisms to counteract Internet piracy.

According to the U.S. Trade Mission, the Motion Picture Association of America and the International Intellectual Property Alliance, Ukraine has been a leading violator of copyright and distributor of unlicensed products on the Internet for years. It is very important for Ukraine to get rid of the negative image concerning Internet piracy. This is the only way our country can attract active business assets and, therefore, large-scale investments.

Before 2014, the fight against Internet piracy was talked about in the context of piracy as a phenomenon, paying little attention to pirates as subjects. The new draft law assumes not only the blocking of pirated content (including the pre-trial possibility of its complete removal), but also sanctions against individuals (both the Internet pirates themselves and those who publish their content on their web resources). Thus, for example, individuals who refuse to remove pirated content from their site are imposed a fine from 500 to 1000 untaxed minimum incomes for non-compliance with the requirement to block the illegal content which violates copyrights. Penalties in similar amounts will also face those entities that refuse to identify a user of their site caught in the act of piracy.

It is supposed that this very draft law will help bring the legislative framework of Ukraine closer to EU legislation, which will provide a noticeable reduction of Internet piracy in our country, and as a consequence, not only improve our image, but also have a beneficial effect on the national culture and the economy, allowing the development of Ukrainian television and film industry.

Undoubtedly, the most important method of combating internet piracy is the reliable protection of proprietary products. However, as domestic and world practice shows, today hacking of security software is more a separate type of Internet piracy than a method of combating it.

Today, experts distinguish three main methods of combating virtual piracy:

1. *Education*. This entails seminars, conferences, and forums in which speakers address the issue on a wider scale. The purpose of such events is to convince potential virtual "thieves" of the negative side of misappropriation of other people's property placed on the Internet without the permission of the owner.
2. *Propaganda*. Its purpose is to demonstrate the advantages of the licensed products and disadvantages of pirated copies. One of the effective variants of such propaganda is the organization of PR-campaigns in mass-media, focused upon the problems of copyright theft, stealing of intellectual property by means of illegal copying, downloading and using the products in the Internet.
3. *Power Technique*. It involves identifying and bringing to criminal or administrative responsibility the producers (distributors) of illegal products on the Internet. This method is the most effective, but also the most complicated.

Many countries have proven to be effective in the fight against Internet piracy. Among the leaders fighting for property rights on the Internet are: the US, France, the Netherlands, Denmark, Sweden and Japan.

The effectiveness of their methods is not only in the legal framework properly regulating this issue, but also in the personal responsibility felt by the citizens themselves, which means that they do not risk to break the law.

The most loyal and at the same time effective way of combating internet piracy has been developed in France. Hadopi Law is a project of "three warnings". The first warning about imposing sanctions is received by the infringer via e-mail, the second warning is an official report on the violation of the copyright by the Internet user, the third (and the last) warning is a reason for action: a special authorized agency searches the infringer and deprives him of access to the Internet for a period prescribed by the commission. In addition, this agency fines an unruly citizen for a very tidy sum.

The most convoluted, but loyal to the Internet users, is the anti-piracy bill developed in the Netherlands. There users are allowed to download movies and music, but only if they do not pursue a commercial intent. However, downloading software is beyond the scope of this right: copying and distribution of any unlicensed software is punishable by a fine. All formerly operating torrent trackers, whether with literature, music or movies, are considered illegal and have no place on the World Wide Web, so the distribution of any audio, video or literary material (originally downloaded for non-commercial purposes) is punishable under current Dutch law.

Perhaps the most serious country in the fight against Internet piracy is Japan, which passed a radical law: any Internet user who illegally downloads a file from the Internet (of any content) must pay a fine of \$25,000. An alternative to paying the fine is serving two years in a prison colony. If a Japanese citizen also uploads a file from his personal computer illegally, then the fine he has to pay will be \$130,000, or 10 years in prison in case of non-payment.

Back in October 2015, as a part of the reform of the law enforcement system, the head of the Ministry of Internal Affairs Arsen Avakov announced the creation of the cyberpolice, a special additional body regulating legitimate activities on the Internet. The main task of the cyber police will be the protection of property rights in virtual space, combating all manifestations of Internet piracy and helping online experts.

At the moment the new law enforcement agency is being recruited, which implies a certification contest for those who decide to become cyber policemen, retraining of the personnel and creation of new functionality of the future law enforcement agency in Ukraine.

The main goal of the Ukrainian Cyber Police will be to counteract cybercrime through the implementation of the state policy in the areas of payment systems, E-commerce, economic activity, intellectual property (Internet piracy and card sharing), information security.

In addition, the competence of the cyber police will include: informing the population on the issue of crimes on the Internet; analysis of information on cyber

threats and possible cybercrimes; cooperation with foreign colleagues on this issue; introduction of advanced computer technologies to detect violations in virtual space; 24-hour operation of contact points where any Internet user can report on an offense or consult on the issue of his interest.

Be that as it may, the amount of illegal content and illegal downloads on the Internet, are steadily increasing worldwide. Weak legal mechanisms of regulation and lack of personal responsibility of users are the main reasons for the growth of Internet piracy to this day. Meanwhile, a wave of protests and actions of 'pirate' parties promoting the free downloading of films, music and software periodically sweeps the globe. Their main slogan is freedom and privacy of a person and citizen.

**References:**

1. В поисках эффективного оружия против «сетевых разбойников». [Электронный ресурс]. Режим доступа: [mediasat.info/2016/02/04/network-robbers/](http://mediasat.info/2016/02/04/network-robbers/).
2. Интернет-пиратство: методы борьбы. [Электронный ресурс]. Режим доступа: [mediasat.info/2016/05/11/internet-piratstvo-metody-borby/](http://mediasat.info/2016/05/11/internet-piratstvo-metody-borby/)

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## **Load Testing: Causes of Application Failures and Solutions**

Load testing is a subtype of performance testing, collecting indicators and determining the performance and response time of a software and hardware system or device in response to an external request in order to establish compliance with the requirements for this system.

Load testing refers to the practice of simulating the expected use of an application by emulating the work of several users at the same time. Such testing is most suitable for multi-user systems, more often using a client-server architecture (for example, web servers). The main purpose of load testing is to monitor the system's performance by creating a certain expected load on the system (for example, by virtual users) and, usually using identical software and hardware.

One of the best approaches to using load testing to measure system performance is testing early in the development phase. Stress testing at the first stages of the readiness of an architectural solution in order to determine its consistency is called 'proof-of-concept' testing.

### Some principles

In general, the system response time obeys a normal distribution function. In particular, this means that, having a sufficient number of measurements, it is possible to determine the probability with which the system's response to a request will fall within a given time interval. The spread of the system response times is influenced both by the number of requests per system node and the number of nodes itself, each of which adds some random amount of delay in processing requests.

With a sufficiently large number of measurements of the request processing time in any system, there will always be requests which processing time exceeds the maximums specified in the requirements.

### Performance metrics

One of the results obtained during load testing and used for further analysis is application performance indicators.

CPU (Central Processing Unit) resource consumption is a metric that shows how much time from a given certain interval was spent by the processor on calculations for the selected process.

RAM (Random-access memory) consumption is a metric showing the amount of memory used by an application.

I / O (input-output) subsystem metrics can significantly affect system performance, so collecting storage statistics can help identify bottlenecks in this area.

Bug is a slang word used primarily by users and software testers. It means a programming error leading to incorrect operation or even serious program failures, up to and including refusal. These errors are not always obvious, and therefore they are

called "bugs", which in translation from English (bug) means an insect, and in a specific sense - hidden defects.

Writing a bug report is one of the building blocks of achieving these goals. It should be smooth and beautiful. Otherwise, we run into problems: developers have to spend time reproducing the bug, instead of writing code.

In an ideal world of QA (Quality Assurance), a specialist adds a bug to the tracking system only if he can reproduce the problem. The messages about defects that come from the customer and users do not always contain the maximum of useful information. In such cases, the QA specialist must either independently determine the problem, or contact the persons who announced its presence and collect all the missing information.

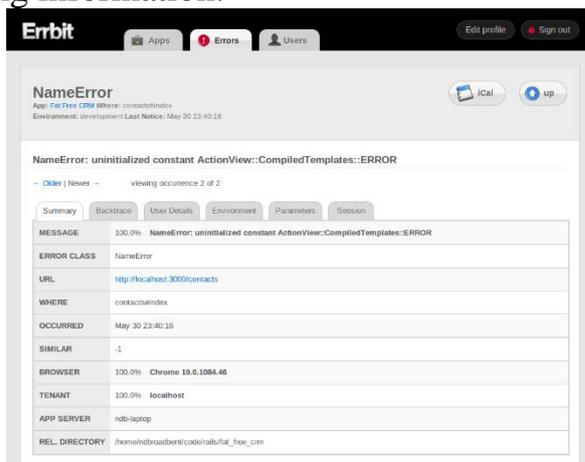


Fig.1 Errbit – the system for the automatic collection of information about errors

Today there are many systems for the automatic collection of information about errors. For example, Errbit for web or Crashlitics for mobile apps. They can be integrated with your bug tracking system and convey all the technical details of the problem. However, automatically generated tasks should be carefully examined by the tester to identify and add steps reproducing the problem. After that, the task is transferred to the developers.

## References:

1. Нагрузочное тестирование. [Электронный ресурс]. Режим доступа: <https://ru.wikipedia.org/wiki/%D0%9D%D0%B0%D0%B3%D1%80%D1%83%D0%B7%D0%BE%D1%87%D0%BD%D0%BE%D0%B5%D1%82%D0%B5%D1%81%D1%82%D0%B8%D1%80%D0%BE%D0%B2%D0%B0%D0%BD%D0%B8%D0%B5>. Дата обращения: 25.03.2021
2. Быстродействие системы с точки зрения пользователя. [Электронный ресурс]. Режим доступа: <https://simpleone.ru/blog/bystrodejstvie-sistemy-s-tochki-zreniya-polzovatelya/>. Дата обращения: 25.03.2021
3. Баг. [Электронный ресурс]. Режим доступа: <https://www.seotemple.ru/glossariy/bag/>. Дата обращения: 25.03.2021
4. Errbit. [Электронный ресурс]. Режим доступа: <https://8d9.ru/program/errbit>. Дата обращения: 25.03.2021

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## Social crimes: analysis, techniques and prevention

Even if the system is completely protected, there is a possibility of information leakage simply due to the human factor, while this may be completely unobvious and implicit. The main vulnerability in this chain of information theft is human, which is effectively exploited by social engineers with the help of their manipulation techniques [4].

The concept of social engineering is somewhat remote from the technical component, since the fundamental factor is human connections. As a rule, the attack algorithm includes finding personal information about the victim, communicating with victim and gaining trust, unobtrusively obtaining information and completely cutting off any connections [4]. Very often, victims are unaware of being under the influence of a social engineer.

There are a variety of schemes and methods of obtaining the necessary information, which vary depending on the method of action, the technical means involved, etc. The concept of social engineering is referred to as security on the Internet, but a similar phenomenon exists outside of it, extending also to phone calls and SMS [4]. Entire national organizations suffer from complex advanced persistent threat attacks.

According to the “Data Breach Investigation Report 2020” by Verizon, 96% of social crimes are hold via email, 3% with the use of website, and only 1% of attacks are completed by phone and SMS [1].

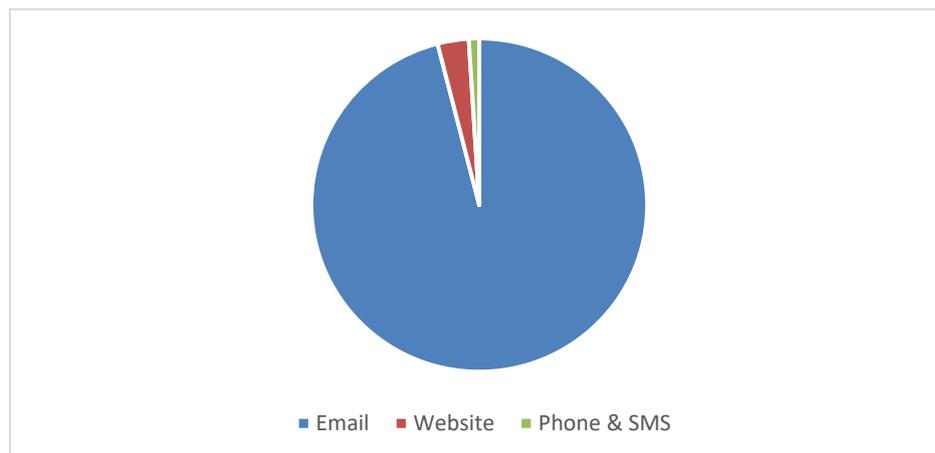


Fig. 1. Resources used for attacks

The types of the information obtained by these methods are analyzed. The following diagram demonstrates what kinds of information are compromised most often.

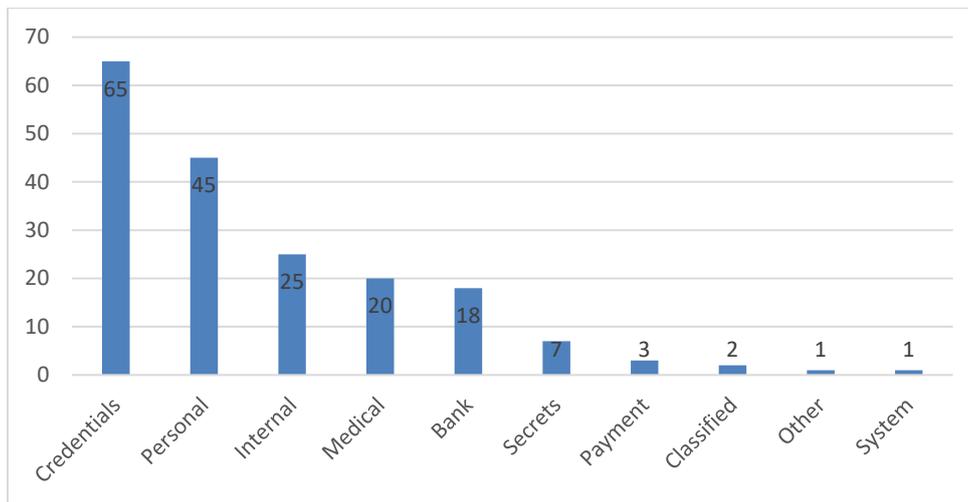


Fig. 2. Types of information gathered via social engineering (adapted from Verizon (2020)).

The popular types of attacks among social engineers are classified by Terranova Security, INFOSEC [3,6]:

1. Phishing.

This technique only affects sensitive information such as credentials and bank accounts. Due to its usefulness, it is the most popular social engineering method. However, despite its widespread prevalence, people still do not have the skill to prevent such schemes. The main algorithm of action is to inform the victim of the fact that the attacker's problem requires a quick solution, and only the victim can help with it. It is worth clarifying that in this case, the perpetrator positions oneself as a reliable source.

2. Vishing.

Being a subcategory of phishing, it has its own features, the main of which is voice. It is also based only on the urgency of the issue and the persuasion of the victim to the actions planned by the attacker.

3. Baiting.

As the name suggests, the perpetrator always uses bait. As a rule, the victim is not aware of this fact, and at the same time, this is a test for the presence of such qualities in a person like curiosity [3], as well as greed. An example of this technique is the accidental finding of a flash drive or online advertising about winnings. In the first case, the technical device is infected with malware, and in the second, it is a deception in order to bait a curious victim.

4. Pretexting.

When an employee contacts a person via e-mail or a call for necessary and often confidential information, the natural reaction is to disclose the data without verifying their identity. However, this phenomenon is often a technique of "impersonification" used by criminals. It is very easy to call yourself a colleague and take possession of information that should be available to the employee.

### 5. Quid Pro Quo.

An interesting offer is about getting what you want in response to the provision of some information. Trustful victims are being led on these terms, not realizing the consequences of disclosing confidential information and not realizing that such beneficial offers are just deception.

The above schemes are applicable to absolutely everyone, without exception, and can be aimed at obtaining not only the personal information of the victims, but also the commercial secrets of enterprises. In order to prevent social crimes both entrepreneurs and individuals have to consider the following rules defined by Security Metrics, Imperva, CISA [2,4,5]:

1. Organize security trainings for employees.
2. Ignore emails from unknown senders, and do not open any attachments to it.
3. Be suspicious of requests and suggestions from unknown or unfamiliar people.
4. Even if it is not directly related, protect information system and track suspicious activity via antivirus and software that can avoid the negative influence in case of human mistake.
5. Protect valuable and sensitive information and keep it safe.

According to the Verizon's report, companies around the world have started to do more phishing tests (Fig. 3). This result obviously demonstrates the growth of understanding the problem of social engineering.

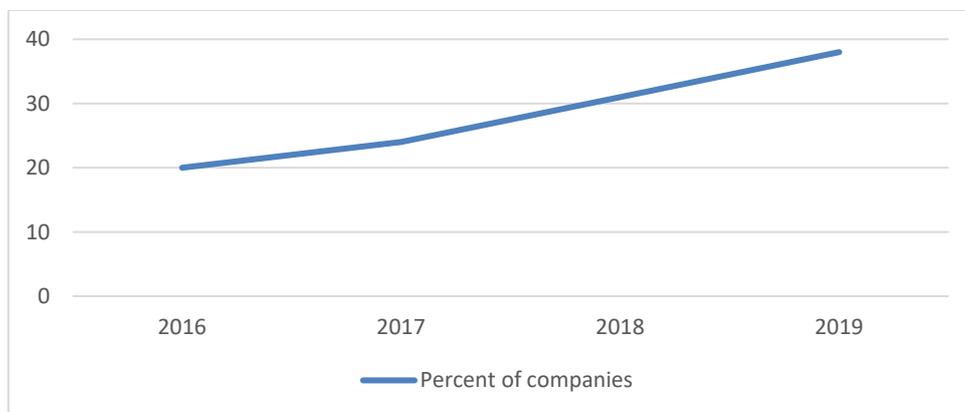


Fig. 3. Phishing tests for employees statistics

### References

1. 2020 Data Breach Investigation Report [online]. Verizon. Available at: <https://enterprise.verizon.com/content/verizonenterprise/us/en/index/resources/reports/2020-data-breach-investigations-report.pdf>. Access date: 10.03.2021
2. 5 tips to train workforce social engineering [online]. Security Metrics. Available at: <https://www.securitymetrics.com/learn/5-tips-train-workforce-social-engineering>. Access date: 10.03.2021
3. Examples of social engineering attacks [online]. Terranova Security. Available at: <https://terrnovasecurity.com/examples-of-social-engineering-attacks/>.

Access date: 10.03.2021

4. Paganini P.(2020). Social Engineering Attack [online]. Imperva. Available at: <https://www.imperva.com/learn/application-security/social-engineering-attack/>. Access date: 10.03.2021
5. Avoiding Social Engineering and Phishing attacks [online]. CISA(2009). Available at: <https://us-cert.cisa.gov/ncas/tips/ST04-014>. Access date: 10.03.2021
6. Common social engineering attacks [online]. INFOSEC. Available at: <https://resources.infosecinstitute.com/topic/common-social-engineering-attacks/>. Access date: 10.03.2021

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## **Use of face recognition subsystem in security video surveillance systems**

The development in artificial intelligence technology has influenced the use of methods for detecting and recognizing faces in video surveillance systems. These methods allow to locate the position of a face on the image and process its characteristics, which can be used to perform calculations to solve recognition problems.

Face recognition is a set of machine learning and computer vision algorithms for image processing of a person's face in order to identify unique qualities and characteristics for further identification [1].

Computer or machine vision is one of the division of artificial intelligence, which studies the technology of obtaining images, their processing and use of processed data in various tasks without human intervention [2, 3]. Machine learning is also one of the divisions of artificial intelligence, which studies methods that allow you to turn a computer into a device that can solve certain problems on their own [4].

There are the following ways to train the machine:

- supervised learning - a method in which the machine first analyzes a training sample of data that contains input data and the corresponding output results, and then tries to predict the learning outcome for data that the computer has not yet encountered;

- unsupervised learning - with this method the machine is not provided with a training sample, it analyzes the data set and tries to identify patterns between them;

- deep learning - a type of machine learning based on artificial neural networks in which multiple layers of processing are used to extract features from data [5, 6].

Face recognition technology is in high demand for video surveillance systems, as it allows you to automatically extract face data for the identification from the video stream without an operator. Modern video analytic systems can detect images of faces from the crowd, and then identify them by comparing with the templates stored in the database. To implement this technology, methods of neural networks are used.

A neural network is a mathematical model and its software or hardware implementation, which is built on the principle of operation of biological neural networks. It consists of neurons - computing units that receive information, perform simple calculations and pass them on to other neurons. Neurons in the network are organized in layers. In general, the neural network in many cases can be represented as follows [7, 8]:

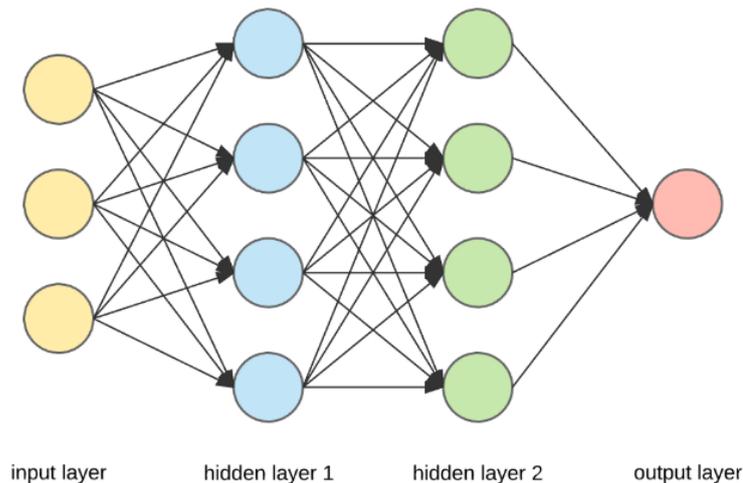


Fig. 1. Scheme of a neural network

The neural network feeds information to the input layer, which is then sequentially processed by the neurons of the hidden and output layers. Each of them calculates its value, which is converted by the activation function into the output of a neuron, which is transmitted to the input of another. The output values of the output layer are taken as a result of the network [8].

The neural network video surveillance system can be implemented in two ways: to process data on a server using special software or to analyze the data on the video surveillance device itself.

In the first case, a camera transmits video data to the server that analyzes data, identifies face of a person and compares it with the template stored in the database.

In the second case, image processing and analysis will be performed by a camera with the necessary hardware installed. In this case, the already processed metadata is transferred to the server.

There are special digital cameras in video surveillance systems, which have the ability to transmit video data in digital format over a network using the TCP / IP protocol. The use of these cameras allows you to build scalable distributed video surveillance systems and get very high quality images.

So the use of subsystems for face recognition in video surveillance systems can increase the efficiency and speed of their work and fully automates the process of person identification.

### References:

1. Методы обработки и распознавания лиц в задачах биометрии / Г. А. Кухарев, Е. И. Каменская, Ю. Н. Матвеев, Н. Л. Щеголева; под ред. М. В. Хитрова. СПб.: Политехника, 2013. 388 с.
2. David A. Forsyth, Jean Ponce. Computer Vision: A Modern Approach. London: Pearson, 2011. 800 p.
3. Ян Солем. Программирование компьютерного зрения на языке Python. Москва: ДМК-Прес, 2016. 312 с.

4. Петер Флах. Машинное обучение. Наука и искусство построения алгоритмов, которые извлекают знания из данных. Москва: ДМК-Пресс 2015. 400 с.
5. Шарден Б., Массарон Л., Боскетти А. Крупномасштабное машинное обучение вместе с Python. Москва: ДМК-Пресс, 2016. 358 с.
6. Траск Э. Грокаем глубокое обучение. СПб.: Питер, 2019. 352 с.
7. С. Николенко , Е. Архангельская , А. Кадулин. Глубокое обучение. Погружение в мир нейронных сетей. СПб.: Питер, 2020. 480 с.
8. Тарик Рашид. Создаем нейронную сеть. Москва: Вильямс, 2016. 272 с.

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### Machine Learning as one of the trends in cyber security

Artificial Intelligence and Machine learning have been used by security vendors for a long time. To distinguish these two notions, it can be specified that AI means a computer imitation of human behavior in one way or another. While Machine Learning (ML) is often described as a subset of AI, consisting of the techniques that enable computers to draw data-driven inferences and provide AI applications.

Nowadays, a lot of cybercriminals use machine learning to create phishing emails that are almost indistinguishable from regular mails, and search for vulnerabilities in an application code [1]. However, this technology is also widely used by cyber security specialists proving much more efficient data protection for businesses. The chart below demonstrates that today a big number of global companies give a preference to ML security products as more reliable in data protection [2]:

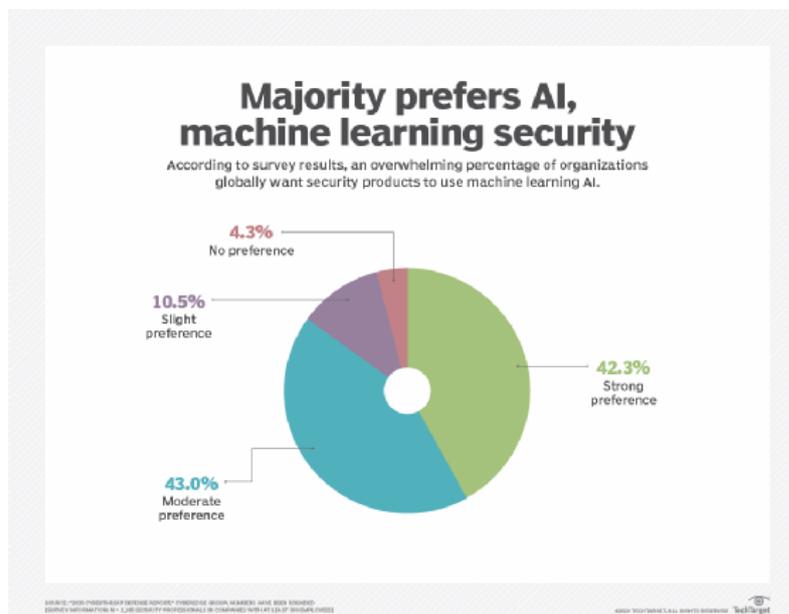


Fig.1 ML security product survey results

Here are some examples of the efficient use of machine learning in cyber security.

*Detection and prevention of malicious attacks.* There is a whole range of attacks to which various companies and industries are exposed:

- A cyber attack from within where a disgruntled employee of a retail company can exploit access to the confidential company and customer data.

- DDoS attack. With a lot of processing power, an attacker can severely burden a service so that real users will have difficulty accessing it.
- Attacks that exploit vulnerabilities in hardware. Every new device that connects to the company's local network is a potential target for hacking.

Darktrace, an AI company specializing in cyber protection, was established in 2013 and is headquartered in [Cambridge](#), UK and [San Francisco](#), US with over 44 offices worldwide. It has developed a solution to many of the problems mentioned above. For each enterprise, they offer a personal "immune system" that analyzes the flow of information within the company and looks for vulnerabilities of all kinds. The clients of this company include such giants as Ebay, Samsung and Micron. Using teacher less machine learning techniques, Darktrace learns a company's unique "DNA" finding anomalies in a device and user behavior patterns.

Another DarkTrace-antigena technology is artificial intelligence, which is able to counteract various attacks accurately and in a timely manner [3]. There is also a large number of companies that use machine learning to detect cyber attacks. These include ImmuniWeb, Intruder, and many others.

#### *Eliminating bugs and vulnerabilities at the code writing stage*

The more code there is in a project, the harder it is to find and fix bugs. So the cost of finding and fixing bugs increases as the project develops. In this case artificial intelligence can provide instant feedback that can help identify bugs early in the process.

The IBM Institute for Systems Science reported that the cost of fixing a bug found after a product release is from four to five times more expensive than the one found during the designing process [4]. And in the case of a code bug that leads to a vulnerability found by attackers it is up to 100 times riskier.

The Game developer Ubisoft has created an artificial intelligence tool that can warn programmers about potential bugs during code compilation. CLEVER, a model that uses modern approaches to cluster a text, has been trained on Ubisoft's code and bug fixes that span a decade. According to the developers, the system can detect 79% of commits that could contain a potential bug. The system also knows how to suggest potential fixes to the developer, based on previous experience [5].

#### *Increasing the effectiveness of human analysis*

In large companies, security analysts are involved in malware detection, network analysis, endpoint protection, vulnerability assessment, and other operations.

In 2016, MIT's Computer Science and Artificial Intelligence Laboratory (CSAIL MIT) developed a system called AI2, an adaptive machine learning safety platform that helps analysts find such mistakes. By reviewing millions of lines of logs, the system is able to filter the data and pass it on to human analysts, reducing the number of false alerts.

In the beginning the system gets all the logs and using the learning algorithms without a teacher tries to find and rank the anomalies. From there, as feedback is received from the analyst, the system learns and makes more and more relevant predictions. An experiment conducted by CSAIL showed that the attack detection rate increased to 85 percent with a five-fold reduction in false positives [6].

Of course, these are not the only classes of solutions where artificial intelligence technology has found its application. Machine learning is already being actively used in almost all classes of IS solutions, making it possible to take a major step in the development of the IS industry and increase the resulting level of organizational security. However, we should not forget that cybercriminals do not doze off and are also constantly improving their tools and attack technologies.

**References:**

1. Machine Learning for Cybercriminals 101. *Towards data science*: web-site. URL: <https://towardsdatascience.com/machine-learning-for-cybercriminals-a46798a8c268> (accessed 10.03.2021)
2. Unpack the use of AI in cybersecurity, plus pros and cons. *TechTarget*: web-site. URL: <https://searchsecurity.techtarget.com/tip/Unpack-the-use-of-AI-in-cybersecurity-plus-pros-and-cons> (accessed 10.03.2021)
3. The Enterprise Immune System. *DARKTRACE*: web-site. URL: <https://www.darktrace.com/en/products/enterprise/> (accessed 10.03.2021)
4. The True Cost of a Software Bug: Part One. *Celerity*: web-site. URL: <https://www.celerity.com/the-true-cost-of-a-software-bug#:~:text=The%20Systems%20Sciences%20Institute%20at,identified%20in%20the%20maintenance%20phase.%E2%80%9D> (accessed 10.03.2021)
5. Ubisoft and Mozilla team up to develop Clever-Commit, an AI coding assistant. *TC*: web-site. URL: <https://techcrunch.com/2019/02/12/ubisoft-and-mozilla-team-up-to-develop-clever-commit-an-ai-coding-assistant/#:~:text=Game%20developer%20Ubisoft%20today%20announced,as%20new%20code%20is%20committed> (accessed 10.03.2021)
6. System predicts 85 percent of cyber-attacks using input from human experts. *PatternEx*: web-site. URL: <https://www.patternex.com/news-articles/ai-system-predicts-85-percent-of-cyber-attacks-using-input-from-human-experts> (accessed 10.03.2021)
7. Using the power of machine learning to detect cyber attacks. *Fintech News*: web-site. URL: <https://www.fintechnews.org/using-the-power-of-machine-learning-to-detect-cyber-attacks/> (accessed 10.03.2021)

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## Functors in modern C ++

A functor is any object for which the function call operator is defined. As a part of functional programming style C++ provides many built-in function objects as well as support for creation and manipulation of new functor.

The UML diagram shows one of the possible implementations of the Functor with an overloaded call operator (picture 1).

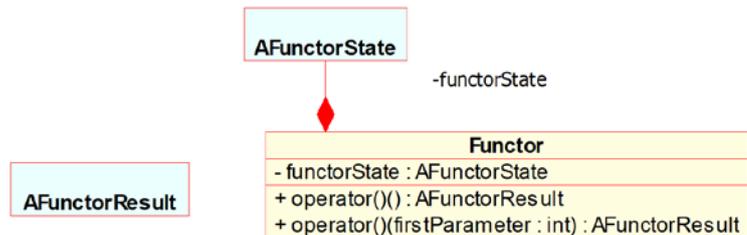


Fig. 1: UML diagram of a possible implementation of a functor

Two data types are used: AFunctorState and AFunctorResult, which are determined by the specifics of the task or by the parameters of the class template. Overloaded call operators have different signatures and therefore their set is not limited to the two above.

Listing 1 shows one of the possible implementations of the Functor class module.

```

#ifndef FUNCTOR_H
#define FUNCTOR_H

class Functor {
public:
    // Constructors/Destructors

    // Default Constructor
    Functor();
    // Destructor
    virtual ~Functor();

    // Functor's call operator with
    // empty parameter list
    // @return AFunctorResult
    AFunctorResult operator();

    // Overloaded functor's call
    // operator
    // @return AFunctorResult
    // @param firstParameter The first
    // parameter of operator
    AFunctorResult operator(int
    firstParameter);

protected:
    // Protected attributes
private:
    // Private attributes

    // The object that contains
    // functor's state
    AFunctorState functorState;

    // Set the value of functorState
    // The object that contains functor
    // state
    // @param value the new value of
    // functorState
    void setFunctorState(AFunctorState
    value)
    {
        functorState = value;
    }

    // Get the value of functorState
    // The object that contains functor
    // state
    // @return the value of
    // functorState
    AFunctorState getFunctorState();

    void initAttributes();
};

#endif // FUNCTOR_H
  
```

```

#include "Functor.h"

// Constructors/Destructors
Functor::Functor() {
    initAttributes();
}

Functor::~Functor() { }

// Methods

AFunctorResult Functor::operator() {
    AFunctorResult aFunctorResult;
    return aFunctorResult;
}

AFunctorResult Functor::operator(
    int firstParameter) {
    AFunctorResult aFunctorResult;
    return aFunctorResult;
}

AFunctorState
Functor::getFunctorState() {
    return functorState;
}

void Functor::initAttributes() { }

```

*Listing 1: Possible functor implementation*

The functor implementation (listing 1) additionally contains an access method `getFunctorState` for the internal state `functorState` and the state initializer `initAttributes`.

Built-in functions and methods are used to work with functors [Table 1].

*Table 1: Built-in functions for working with functors [1]*

Standard	Name	Module	Description	Notes
C++17	<code>invoke</code>	<code>invoke</code>	invokes any Callable object with given arguments	function template
C++17	<code>not_fn</code>	<code>not_fn</code>	creates a function object that returns the complement of the result of the function object it holds	function template
C++17	<code>default_searcher</code>	<code>search</code>	standard C++ library search algorithm implementation	class template
C++17	<code>boyer_moore_searcher</code>	<code>search</code>	Boyer-Moore search algorithm implementation	class template
C++17	<code>boyer_moore_horspool_searcher</code>	<code>search</code>	Boyer-Moore-Horspool search algorithm implementation	class template
C++20	<code>identity</code>	<code>identity</code>	function object that returns its argument unchanged	class
C++20	<code>bind_front</code>	<code>bind_front</code>	binds a variable number of arguments, in order, to a function object	function template
C++20	<code>unwrap_reference</code>			
C++20	<code>unwrap_ref_decay</code>			
C++20	<code>equal_to</code>	<code>ranges</code>	function object implementing $x == y$	class
C++20	<code>not_equal_to</code>	<code>ranges</code>	function object implementing $x != y$	class
C++20	<code>less</code>	<code>ranges</code>	function object implementing $x < y$	class
C++20	<code>greater</code>	<code>ranges</code>	function object implementing $x > y$	class
C++20	<code>less_equal</code>	<code>ranges</code>	function object implementing $x \leq y$	class
C++20	<code>greater_equal</code>	<code>ranges</code>	function object implementing $x \geq y$	class
C++20	<code>compare_three_way</code>	<code>ranges</code>	function object implementing $x \lt;=> y$	class

Lambda expression constructs a closure: an unnamed function object capable of capturing variables in scope.

Lambda expressions are closely related [2] to the notion of a functor because one of the kinds of lambda expressions with context capture is treated as a functor by the compiler. Such lambda expressions are called stateful-lambda and have the syntax [3]:

```
[ captures ] ( params ) -> ReturnType { body }
```

A short definition of each field of a lambda expression:

- the "captures" field is used to indirect access transfer to variables from the surrounding lambda scope. By default, lambda statements do not have access to objects from the outside. This field is also known as the lambda-introducer in the C++ specification. It can be left blank if there is no need for access transfer;
- the field "params" (lambda declarator) - is used to define the parameters of the function: their type and quantity. It is also an optional field, as in any function;
- "ReturnType" indicates the data type that will return the lambda expression as the result of execution. If not specified, the lambda will return the type that is specified in the return;
- "body" — expressions that will be executed inside the lambda.

The stateful-lambda attribute is non-empty captures. A possible version of the compiler's implementation of such a lambda is:

```
[&capturedParameter] ( ParmType p ) ->
ResultType {
    p+= (ParmType)
    capturedParameter++;
    return (ResultType) p;
}
class NoName {
private:
    CapturedParameter& cp;
public:
    NoName(CapturedParameter& cP) :
cp(cP) {}
    ResultType operator()(ParmType
p) const {
        p+= (ParmType) cp++;
        return (ResultType) p;
    }
};
[capturedParameter] ( ParmType p)
mutable -> ResultType {
    p+= (ParmType)
    capturedParameter;
    return (ResultType) p;
}
```

```
[capturedParameter] ( ParmType p ) ->
ResultType {
    p+= (ParmType)
    capturedParameter;
    return (ResultType) p;
}
class NoName {
private:
    CapturedParameter cp;
public:
    NoName(CapturedParameter cP) :
cp(cP) {}
    ResultType operator()(ParmType
p) const {
        p+= (ParmType) cp;
        return (ResultType) p;
    }
};
class NoName {
private:
    CapturedParameter cp;
public:
    NoName(CapturedParameter cP) :
cp(cP) {}
    ResultType operator()(ParmType
p) {
        p+= (ParmType) cp++;
        return (ResultType) p;
    }
};
```

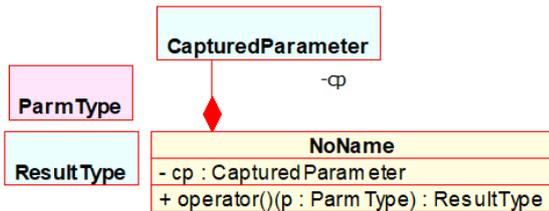


Fig. 2: UML diagram of a possible implementation of a stateful-lambda as a functor

All three examples of lambda expressions above are stateful lambdas with different ways of capturing context. As you can see from the corresponding functor implementations, there are little differences in the processing of the captured context and the automatically generated call operator [4] by the compiler.

The standard development in C++ is directed towards the improving the automation capabilities and parameterization of functional programming [5], in particular, functors and lambda calculus. At the same time, the indicated C++ language tools are undergoing significant changes by abandoning out of date practices, their using with a large and complex syntax [6].

## References

1. Function objects. Access mode: <https://en.cppreference.com/w/cpp/utility/functional>
2. Simon Brand, Passing overload sets to functions, 2018. Access mode: <https://blog.tartanllama.xyz/passing-overload-sets/>
3. Jason Turner, C++ Weekly — Ep 128 — C++20's Template Syntax For Lambdas. Access mode: <https://www.youtube.com/watch?v=ixGiE4-1GA8>
4. Ivor Horton, Peter van Weert, Beginning C++20 / Ivor Horton, Peter van Weert. — Apress, 2020. — 825 p. — ISBN 9781484258835.
5. Alex Vasilev, C++ in Examples / Alex Vasilev. — CreateSpace, 2020. — 356 p. — ISBN 979-8658804095.
6. Anthony Calandra, Modern C++ features, 2020. Access mode: [https://github.com/AnthonyCalandra/modern-cpp-features/blob/master/\\_CPP20.md](https://github.com/AnthonyCalandra/modern-cpp-features/blob/master/_CPP20.md)
7. Cris Kobryn, UML 3.0 and the future of modeling. Access mode: <http://www.cs.unibo.it/cianca/wwwpages/ids/lecture/Kobryn.pdf>

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## Neural interfaces — the next step of human evolution

If you wanted a smartphone and could afford it, would you get it? Probably, yes. And just like that, day by day, humanity moves at an unprecedented rate to turn all of those spectacular science fiction dreams and wishes we have ever had into reality. Recent human history is closely tied to the continuous growth, creation and evolution of science and technology, new discoveries and innovations.

However, as a species, we are limited in a variety of ways, including our cognitive abilities, the vulnerability of physical bodies, the limitations of human senses, and the challenges we face in the mental and psychological realms. With *brain-machine interfaces* (BMI), it would be possible to restore and enhance visual and motor function, as well as treat, and perhaps even cure many serious conditions. These include neurological, psychiatric and neuromuscular illnesses, such as epilepsy, Alzheimer disease, depressive disorder etc. [5].

### What Are Neurons and How Does Everything Work?

The reasoning behind how *brain-computer interfaces* (BCI) works is because of the way our nervous system functions. We have about 100 billion cells in our brains called *neurons*. They form a giant network, constantly interacting with each other.

Our neurons are active anytime we think, shift, feel or recall something. It also includes many involuntary processes such as organ function and the body's respiratory, cardiovascular, and immune systems. Everything that a person senses, hears, feels and thinks is an *action potential* — that is bursts of neural activity. In fact, neurons are cells which communicate in the language of electricity. They fire electrical impulses in particular patterns. These impulses of action potentials produce an electromagnetic field that can be read using an electrode placed next to the neuron.

A *neural implant* is a device, typically, an aforesaid electrode, that is inserted into the body and comes into contact with tissues that contain neurons and interacts with them.

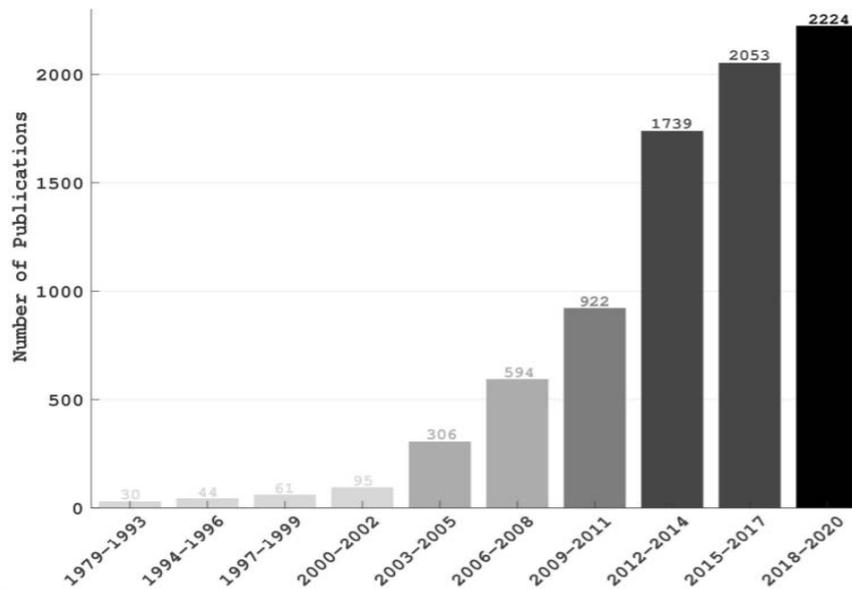
### Steps from Being an Idea to Becoming a Reality

The concept of connecting the brain to a computer system is dated back to the **1960s**, when the first primitive neurointerface was tested. It was then that Yale University physiology professor *Jose Delgado* put together a bulky device with electrical sensors, which he later *implanted into the brains of bulls and attempted to control them through a portable transmitter*. For a few decades, neuroscientists had been observing and manipulating human neural activity — collecting data and preparing the ground for the moment when the technology would allow us to start human trials [7].

And in the early 2000s, a new stage in the development of neurophysiology began. Neurointerfaces have firmly found their application in medicine. **In 2004**, an

American *Matthew Nagle*, who had been paralyzed a few years earlier, became the first person to have a *BrainGate* microchip implanted in his brain. At first, with the help of this device, just imagining that he was moving his hands, Nagle learned to move the cursor across the computer screen, then turn on the TV, change channels, pick up objects with a robotic hand, and play computer games. He had it done by the sheer power of mind. Isn't it that kind of magic described in science fiction? [1]

The number of research groups engaged in this field is constantly growing. **Figure 1** shows how the number of published articles related to this topic increases over time [6].



**Fig. 1.** The number of publications over the years

(According to an article “Progress in Brain Computer Interfaces: Challenges and Trends”)[6]

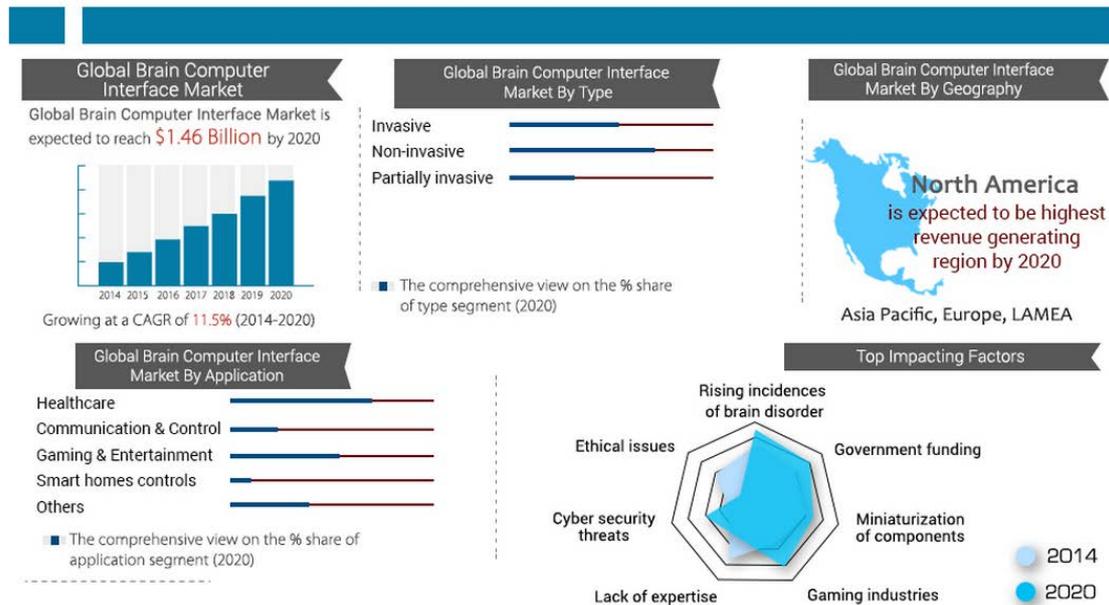
To give more examples, **in 2017**, Californian scientists created a prosthesis that can *improve a person's memory by about 30%* after it is connected to the brain. Experts from the University of California, using a neural interface, neuromuscular stimulation and suspension, *taught a person paralyzed below the waist to walk*. Brazilian researchers, along with colleagues from the United States, Switzerland and Germany, were able to *partially restore the spinal cord* in patients using a neurointerface, virtual reality and an exoskeleton. And all of this is just a drop in the great ocean of endeavors.

Every year billions of dollars are spent on BMI research (**Figure 2**). Moreover, the funding budgets keep on growing. **In 2018**, it became known that *Nissan* was developing a neural interface that *would allow the car to better respond to changes in the environment*, as if anticipating the driver's reaction before he turns or applies the brakes. *Facebook* and a billionaire-entrepreneur *Elon Musk* have also announced intentions to work in the field of BCI development.

As shown in **Figure 2**, even though, currently, the main area of application of neurointerfaces is medicine, businesses are beginning to show interest in this field, focusing their attention on developing various services that can be controlled using the "power of thought" [3]. Neurointerfaces can also find, and are already finding, use in controlling robots.

# Global Brain Computer Interface Market

Segmentation and Forecast, 2013 - 2020



**Fig. 2.** Global brain computer interface market  
(According to the report by Allied Market Research)[3]

## Neuralink Plans

*Neuralink* is a neurotech company founded by Elon Musk in San Francisco in 2016 has recently become the key player in research and development of implantable brain-machine interfaces. The company has already created such innovative things as: *NI chip* designed to be implanted into the brain, *a robot that will implant the chip* and *a smartphone app to control the microchip*. Neuralink plans to begin clinical human trials in 2021. In the next 4 years, the company is already planning to release chips for people who have suffered a stroke, have congenital or oncological diseases, and suffer from paralysis [4]. The goal of Neuralink is to record and stimulate neural impulses and do so better than existing methods allow, without major surgical intervention. They suggest the electrode which is placed in the brain to read the pulses with thickness about 1/10 the thickness of a hair. This is about the same size as a neuron. A robot performs the electrode implantation procedure. This reduces the trauma of the operation and the risks of damaging blood vessels.

## It Is a Contradictory Matter, Though

Nevertheless, the introduction of neural interfaces is certainly a cause for concern. Contrary to what is stated above, such technologies can exacerbate social inequalities and give corporations, hackers, advertisers, and governments new ways to exploit and manipulate people. Additionally, in order to introduce electrodes into a healthy person, there is still no legal or ethical basis. There is also a security problem, or rather the possibility of hacking, which will arise as soon as we successfully connect the brain to a computer [2]. Or if a neurointerface doesn't get your intention right, will it make you, the user of that device, responsible for such a thought?

**To Sum Up.** It will take years, maybe even decades, before neural interfaces become a part of our daily life. Still, it is already clear that the development of brain-

machine technology is moving towards the world in which it will be possible to make sense of the mental activities of people, manipulate the processes associated with emotions or intentions, and communicate with each other without words. We would also be able to restore and enhance body parts, as well as treat, and perhaps even cure many conditions that are deemed untreatable at this point of time.

**And the last questions:** Would you like to have microchip which makes you a sort of superhuman but also could be hacked? And supposing you could afford it, would you eventually get it?

### References:

1. Jiahui Wang, Tianyiyi He, Chengkuo Lee., Development of neural interfaces and energy harvesters towards self-powered implantable systems for healthcare monitoring and rehabilitation purposes, *Nano Energy, Volume 65, 2019, 104039*, ISSN 2211-2855. Access mode: <https://doi.org/10.1016/j.nanoen.2019.104039>.
2. McMenemy David. 2021. Ethical Issues in Brain–Computer Interfaces. *Intelligent Computing for Interactive System Design: Statistics, Digital Signal Processing, and Machine Learning in Practice (1st ed.)*. Association for Computing Machinery, New York, NY, USA, 273–275. Access mode: <https://dl.acm.org/doi/abs/10.1145/3447404.3447419>.
3. Moralis Pedro, (2015, September 7). *World BCI Market - Opportunities and Forecasts, 2013 – 2020*, [Electronic resource]. Access mode: <https://bciovereeq.blogspot.com/2015/09/world-bci-market-opportunities-and.html>.
4. Musk, E., & Neuralink (2019). An Integrated Brain-Machine Interface Platform With Thousands of Channels. *Journal of medical Internet research*, 21(10), e16194. Access mode: <https://www.jmir.org/2019/10/e16194>.
5. Roberts Rohan, (2019, August 18). Transhumanism and Education., [Electronic resource]. Access mode: <https://medium.com/awecademy/transhumanism-and-education-51569c73347b>.
6. Saha S, Mamun KA, Ahmed K, Mostafa R, Naik GR, Darvishi S, Khandoker AH and Baumert M (2021) Progress in Brain Computer Interface: Challenges and Opportunities. *Front. Syst. Neurosci.* Access mode: [https://www.researchgate.net/publication/330357386\\_Progress\\_in\\_Brain\\_Computer\\_Interfaces\\_Challenges\\_and\\_Trends](https://www.researchgate.net/publication/330357386_Progress_in_Brain_Computer_Interfaces_Challenges_and_Trends).
7. Vaughan TM, Heetderks WJ, Trejo LJ, et al. Brain-computer interface technology: a review of the Second International Meeting. *IEEE Transactions on Neural Systems and Rehabilitation Engineering* : a Publication of the IEEE Engineering in Medicine and Biology Society. 2003 Jun;11(2):94-109. DOI: 10.1109/tnsre.2003.814799. Access mode: <https://europepmc.org/article/med/12899247>.
8. Zając, B., & Paszkiel, S. (2020). Using brain-computer interface technology as a controller in video games. *Informatyka, Automatyka, Pomiary W Gospodarce I Ochronie Środowiska*, 10(3), 26-31. Access mode: <https://ph.pollub.pl/index.php/iapgos/article/view/1543>.

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## 10 Best Kali Linux Tools for Penetration Testing

The most popular Linux distributive for ethical hacking is “Kali Linux”. This OS has many interesting and useful tools for security testing. There are a lot of similar operation systems for penetration testing such as: Parrot, BackBox, Fedora Security Lab, Dracos Linux and others. But this OS is one of the best.

*The advantages of this OS are the following:*

- It can be used for penetration testing.
- This platform is available in 32 bits as well as 64 bits.
- Kali Linux can be updated without the need to download a new version.
- This OS can encrypt the full disk.
- You can easily automate and customize the Kali Linux installation on the network.
- Support for USB live installs.
- It has a forensics mode that can be used for forensic work.
- 

Top 10 Kali Linux tools for penetration testing include:

- 1. Nmap.** It is a free open source utility used by system administrators to discover networks and check their security. Nmap is fast, comes with detailed documentation and graphical interface, supports data transfer and network inventory.
- 2. Turbo Intruder.** It is a faster analog of Intruder, equipped with a scripting engine for sending many HTTP requests and used to analyse the result. If you need speed it is advisable! It is very effective at finding vulnerabilities related to Race Condition, since it has a small Python scripting engine inside which has special functions for testing Race Condition (for example, sending requests at once). Extensibility allows you to script various logics, for example multi-step authentication.
- 3. Aircrack – ng.** Aircrack – ng is a top wireless password hacking tool for WEP, WAP and WPA2. It intercepts packets from the network, performs analysis using it to recover passwords. It also has a console interface. In addition to this, Aircrack-ng uses a standard FMS attack (Flarer-Mantin-Shamir attack) along with the use of KoreK and PTW attacks to speed up the process and faster WEP.
- 4. Hydra.** It is an open source product for brute-force passwords in real time from various online services, web applications, FTP, SSH and other protocols. The feature of the tool is that it does not brute force by hash, but directly uses requests to the server, which means that you can check whether the firewalls are

configured correctly, whether such attempts are blocked, and whether you can even determine such an attack on the server.

5. **Wireshark.** It is a traffic analysing application for computer networks, Wi-Fi and some others things. This software knows the structure of network protocols, and therefore, allows you to parse a network packet, displaying the value of each field of the protocol of any layer. Since “pcap” (a special library) is used to capture packets, it is possible to capture data only from those networks that are supported by this library. However, Wireshark can work with a different data formats, correspondingly, you can open data files captured by other programs, which expands the capture capabilities.
6. **Metasploit Framework.** The Metasploit Framework is an open source platform that security experts use to validate vulnerabilities and conduct security assessments to raise awareness in this area. There are many tools in this project that professionals can use to create security environments for testing vulnerabilities. It works like a pentest system.
7. **Freddy.** It is a plugin that allows you to check vulnerabilities related to Java and .NET deserialization in web applications. It can work in several modes, and also adds additional checks in using a standard Burp scan. It has a fairly large library of various exploits and checks for deserialization under the hood.
8. **sqlmap** is an open source penetration testing tool that automates the process of identifying and exploiting SQL injection vulnerabilities and hacking database servers.
9. **Nessus.** It is a program for automatic searching of known flaws in the protection of the information systems. It can detect the most common types of vulnerabilities. It is primarily used for port scanning and identifying the services that use them. Services are also checked against the vulnerability database.
10. **Wifite2** is a free open source Wi-Fi network auditing utility developed in Python to work perfectly with pentester distributions. This is a complete examination of Wi-Fi and therefore offers improved performance. The utility does an excellent job of unmasking and hacking hidden access points, cracking weak WEP passwords using a lot of hacking techniques and tools.

If you are engaged into penetration testing, this list of the most efficient tools can be of much use. Social engineering is a big deal and it is important to know how to protect data against hacking attacks.

### References:

1. SQL Injection. [Online]. Available: <https://habr.com/ru/company/gaz-is/blog/429706/> Accessed on: 14.03.2021.
2. 21 Best Kali Linux Tools for Hacking and Penetration Testing. [Online]. Available: <https://itsfoss.com/best-kali-linux-tools/> Accessed on: 14.03.2021.

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### **Public service automation**

There is a reason to believe that the post-industrial labor market in the coming decades, after the fourth industrial revolution, will undergo all kinds of transformations. Similarly, the labor market was transformed with each previous industrial revolution: the further, the more. It is worth noting that, as a rule, industrial revolutions create much more jobs than they destroy, but in completely different, previously unseen, spheres of work. For example, a huge in scale sphere of human activity associated with horses and equestrian transport sank into oblivion as a result of the invention of a completely new mechanism - an internal combustion engine. Transport, using the energy of fuel combustion as a draft force, has forever replaced horse-driven carriages, horse trams and other excellent vehicles of that time that needed horses. But at the same time, a huge new infrastructure of automotive production and sales came to replace blacksmiths, grooms and other workers in the equestrian transport sector.

The process of transformation of the production of various material products under the influence of the achievements of mankind in the field of information and robotic technologies began a long time ago and its consequences are irreversible. It is important to note that the progress affects not only the manufacturing economic sector, but also the economic service delivery sector. So, the subject of the research in this publication is the possibility to automate official positions in Ukraine, which will be replaced by the staff who create and maintain software, web services, databases and the so-called Big Data.

In fact, both scientific and political discourse are moving towards the automation of the bureaucratic process. Significant shifts in this direction were made by electronic document management systems (EDMS) and Enterprise Content Management (ECM) systems, designed to help employees of bureaucratic structures and private corporations simplify the storage, sorting and circulation of documents [2]. These systems are aimed at facilitating intradepartmental document flow.

One of the challenges of the 21st century is to create a comfortable system of public services for users (citizens). The most comfortable and extensive system of public services was formed in Estonia, its development began at the dawn of the Internet in 2000, in the post-Soviet era of modernization of the outdated and incompetent state institutions [3]. Modern developed countries strive to digitalize both public services and the media space, business and other spheres of human activity. So, for example, the Council of the European Union, also known as the Council of Ministers, has set the tasks of "promoting the digital transformation of Europe while respecting human rights and protecting people" for 2021 and the subsequent years.

When trying to consider the global trends towards digitalization and the transition of various spheres of service, banking and bureaucracy to electronic form, it can be seen that the transition to the "electronic government" is easier for countries that do not have large, complex and effective management and finance structures. For example, the transition to internet banking and "E-Government" in Estonia was easier to carry out than in such countries as Germany and France, despite the fact that the latter countries are more developed and richer (see Fig. 1) [7]. The reason for the problematic transition of these countries to "E-Government" is complex political structures with a rich history, formed over the centuries [3].

2020 UN E-GOVERNMENT SURVEY

Table 1.3 Leading countries in e-government development in 2020

Country	Rating class	Region	OSI value	HCI value	TII value	EGDI value (2020)	EGDI value (2018)
Denmark	VH	Europe	0.9706	0.9588	0.9979	0.9758	0.9150
Republic of Korea	VH	Asia	1.0000	0.8997	0.9684	0.9560	0.9010
Estonia	VH	Europe	0.9941	0.9266	0.9212	0.9473	0.8486
Finland	VH	Europe	0.9706	0.9549	0.9101	0.9452	0.8815
Australia	VH	Oceania	0.9471	1.0000	0.8825	0.9432	0.9053
Sweden	VH	Europe	0.9000	0.9471	0.9625	0.9365	0.8882
United Kingdom of Great Britain and Northern Ireland	VH	Europe	0.9588	0.9292	0.9195	0.9358	0.8999
New Zealand	VH	Oceania	0.9294	0.9516	0.9207	0.9339	0.8806
United States of America	VH	Americas	0.9471	0.9239	0.9182	0.9297	0.8769
Netherlands	VH	Europe	0.9059	0.9349	0.9276	0.9228	0.8757
Singapore	VH	Asia	0.9647	0.8904	0.8899	0.9150	0.8812
Iceland	VH	Europe	0.7941	0.9525	0.9838	0.9101	0.8316
Norway	VH	Europe	0.8765	0.9392	0.9034	0.9064	0.8557
Japan	VH	Asia	0.9059	0.8684	0.9223	0.8989	0.8783

Fig. 1 Rating of countries with the most developed "digital states" according to the EGDI scale (E-Government Development Index).

The E-government has a wide range of objectives including better delivery of public services to people, enhancing business and industry collaborations, citizen empowerment through access to information, or more effective governance. The resulting advantages of e-government include less corruption, higher transparency, and higher comfort, development in income and also reduction in costs.

Advantages of E-Governance:

1. *Speed.* The technology makes communication faster as Internet and smartphones enable instant transmission of high volumes of data all over the world.
2. *Saving Costs.* A lot of government expenditures go towards the cost of buying stationery for official purposes. Letters and written records consume a lot of stationery. However, replacing them with the Internet services can save money every year.
3. *Transparency.* The use of e-governance helps make all functions of the business transparent. All the governmental information can be uploaded onto the Internet.

The citizens can get access to any information they want, whenever they need it, at their convenience.

4. *Accountability*. Transparency is directly linked to accountability. Once the functions of the government are available, we can hold them accountable for their actions.

E-government is not all about advantages but it also has some disadvantages. The primary disadvantages of e-government are the absence of public Internet access for all citizens, reliability of the published information on the web by the governmental agencies, and also capabilities of government and its agencies which can affect public opinions potentially.

Disadvantages of E-Governance:

1. *Privacy violation*. Once government implements e-services, people will be compelled to communicate with it on a wider scale electronically. In result, the government receives more and more information about its citizens, what could possibly lead to a lack of privacy for civilians.
2. *Being too costly*. Implementing, maintaining and optimizing e-government is not cheap and requires a lot of money.
3. *Limitations in accessibility*. E-government cannot be accessible by all citizens including those who live in distant regions, or have low rates of digital literacy and low income.

However, Ukraine has good basis for creating an "E-Government". It is a country that actively uses computer technologies both for creating a comfortable banking environment, delivery services and for introducing computer systems into the state apparatus. That is why September 2, 2019 the Ministry of Digital Transformation of Ukraine was created. This ministry deals with the problems of digitalization in all sectors of the state: defense, medicine, education, etc.

One of the large-scale projects of the Ministry of Digital Transformation is the state web resource "Diia", which should become the "E-Government" in the future. The service is really convenient, practical and constantly evolving. "Diia" already has a significant impact on the process of relations between the citizens and the state. The company Kitsoft, which takes part in the creation of the Ukrainian "E-Government", has posted an article, which describes the principle of the application operation and its main components [5]. This technology is progressive both from the point of view of the approach to the implementation of software and from the point of view of the principles of providing bureaucratic services. The official website of the Ministry of Digital Transformation of Ukraine says that by 2024 the project will cover all the public services in the country. Another goal set for 2024 is to attract 6 million Ukrainians to the development of digital skills [6].

The problem of "E-Governments" is very important for many countries of the world. The demand for specialists with the necessary knowledge and skills to form the states of the future is growing. Ukraine keeps up with global trends and pursues a policy of digitalization of state bodies. However, today the level of digitalization is not sufficient and will develop in the coming years. The problem is urgent and requires further research.

The world is changing and humanity is striving from an industrial society to an information society. These changes happen in social, political, and economic spheres. It creates the opportunities for the automation of bureaucratic positions and building "E-Government". This idea is one of the main agendas in the developed countries. In Ukraine, the development in this area is being actively carried out. As the country needs specialists to build a new technological state, the IT industry is expected to be developing in the coming years with many noticeable changes in the labor market.

**References:**

1. Schwab Klaus. The fourth industrial revolution. - 2016.
2. Andrey Kolesov. The concepts of EDMS and ECM. [Online]. Available: <https://www.itweek.ru/ecm/article/detail.php>? Accessed on: 03/02/2021.
3. Brian Lufkin. The world's first digital government. [Online]. Available: <https://www.bbc.com/ukrainian/vert-fut-russian-41746784>. Accessed on: 03/02/2021.
4. Trio EU plans to strengthen Europe. [Online]. Available: <https://www.tatsachen-ueber-deutschland.de/ru/germaniya-i-evropa/trio-es-planiruet-ukreplyat-evropu>. Accessed on: 03/02/2021.
5. Alexander Efremov. How Kitsoft developed the Diya portal is a big story. [Online]. Available: <https://ain.ua/2020/06/30/kak-v-kitsoft-razrabatyvali-diya/>. Accessed: 03/02/2021.
6. Official site of the Ministry of Digital Transformation of Ukraine. [Online]. Available: <https://thedigital.gov.ua/ministry>. Accessed: 03/02/2021.
7. UN E-Government Survey 2020. UNITED NATIONS New York. – 2020. P.49.
8. Official site of the project "Diia City". [Online]. Available: <https://city.diia.gov.ua/>. Accessed: 03/02/2021.

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### **State in a smartphone: experience of Ukraine**

The state should be able to provide convenient, simple and understandable services for its citizens. Digitalization is a way to optimize these processes and interactions of the state with its citizens, using digital technologies. This is the course that Ukraine has adopted since the end of 2019. Digitalization allows transferring various services online. In result, it reduces the level of corruption and eliminates standing in a line to order a service and, therefore, saves the time of citizens. It also accelerates the interaction of government institutions with each other. With due attention, online services or the "state in a smartphone" remain safe, in some cases it excludes the human factor, what makes it more secure than paper counterparts.

The Ministry of Digital Transformation was established on 2 September 2019. That day Mykhailo Fedorov was appointed as the Minister of Digital Transformation. The first project, which was announced to the public, was " the state in a smartphone". The goal of this project is to provide 100% of government services online by 2024.

The Ministry is responsible for developing e-services, providing transport infrastructure with the access to high-speed Internet, provision of open data, interaction of state registers and databases, conducting audits and development of the digital part of each ministry, electronic document management and identification. There are several projects that implement the following tasks: mobile app "Diia", e-service portal "Diia", project "Broadband", Diia City. The Ministry of Digital Transformation is a founder of the state-owned enterprise "DIIA", that was registered on 9 December 2019.

Since its establishment, the Ministry has primarily followed the example of e-Estonia. Estonia started the digitalization process back in the 1990s. Estonian schools have been provided with computers and the Internet, and information technology has become one of the mandatory tools of the educational process. The path from the idea to its implementation turned out to be rather short. In 1997, the initiative became a state program with budget funding. This program helped raise the percentage of Estonians who use the internet from 29 percent in 2000 to 91 percent in 2016. This allowed Estonia to launch online ID system in 2002. Physical copies of ID cards were paired to digital copies and allowed Estonians to pay taxes online, vote and use online banking. Three years later, in 2005, the government conducted an experiment – the local elections were held online. And two years later, voters were able to vote via the Internet in the parliamentary elections. Now 99% of Estonian residents have ID cards.

The first successful project released for public in Ukraine was a mobile app called "Diia". With this release, Ukraine has become the first state in the world that launched digital passports and has become the fourth country in Europe that launched digital driver licenses and vehicle technical passports.



Fig.1.....

The Prime Minister Oleksiy Honcharuk and the Deputy Prime Minister, the Minister of Digital Transformation Mykhailo Fedorov announced a closed beta testing of the app with the first 2 documents: driver licenses and vehicle registration certificates on 11 December 2019. The App identifies users via BankID through the system of the National Bank or other participating banks. Once you complete the identification within the app, you do not have to take original documents with you anymore.

Then, after 2 months of beta-testing, “Diia” was officially launched on 6 February 2020. At the beginning of 2021 there were 9 documents in the app: driver's license, vehicle registration certificate, ID card, biometric passport, RNTRC (Registration Number Taxpayer Record Card), transport insurance policy, student ID, internally displaced person card and birth certificate. With this app the users can pay a fine, share copies of digital documents and validate another person's digital documents. Regarding security, sharing documents through the application excludes human participation in this process, and, therefore, ensures that your copies of documents will not be available to unscrupulous company employees, and document validation through the app guarantees the authenticity of the document.

However, there are several potential threats the users of the “state in a smartphone” system can face: the temporary unavailability of the application can let down those citizens who, at some point, rely only on the application and do not take the original documents with them. Also, a hacker attack or an unscrupulous data center employee can jeopardize the confidentiality of data.

In December 2020, the Ministry of Digital Transformation started bug bounty programs for the “Diia” application. They provide testing and detection of bugs and vulnerabilities by cybersecurity specialists, during which only found and confirmed bugs are rewarded. After the program release, only 2 minor errors were found which do not affect the security of user data in any way, and it proves the safety and reliability of the product.

## References:

1. Міністерство цифрової трансформації : вебсайт. [Електронний ресурс]. Режим доступу: <https://thedigital.gov.ua/>. Дата звернення: 17.03.2021.
2. Реформи онлайн: як Естонія зробила стрибок до цифрового лідерства. [Електронний ресурс]. Режим доступу:

- <https://www.eurointegration.com.ua/articles/2020/04/17/7108861/>. Дата звернення: 17.03.2021.
3. Державні послуги онлайн. *Дія* : website. [Електронний ресурс]. Режим доступу: <https://diia.gov.ua/> . Дата звернення: 17.03.2021.
  4. Презентація застосунку Дія та Дія. Цифрова освіта. [Електронний ресурс]. Режим доступу: <https://youtu.be/KfTqLamfQWw>. Дата звернення: 17.03.2021.

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## Top 10 programming languages 2020-2021

The popularity of programming languages is very difficult to evaluate, because there is no correct and reliable data for objective analysis, since it is impossible to find out the actual number of programmers in some specific programming language and determine their preferences. Therefore, the main source of information on this topic is the analysis of the number of search queries, materials and attendance of sites dedicated to any specific programming language.

*Tiobe Rating* is one of the most popular and reliable ratings of programming languages. The disadvantage of the rating is to use only the results of the issuance of search engines, which makes it almost impossible to determine the quality and volume of the written code in a specific programming language, that is, indirect data is used, the result of which is not always possible to be reliable, but it is possible to track the dynamics of popularity and make conclusions for the future to study which programming language should be paid attention to. A significant disadvantage of this rating is the analysis of a purely English-speaking network traffic that does not consider the search for Yandex, Mail.Ru and the Chinese search engine Baidu, so that there lost huge amounts of information.

*GitHub Rating*, published by GitHub, a dominant Hist of IT projects (analyzed the number of projects in a specific programming language and their popularity) and the *DOU rating*, published by the largest Ukrainian IT portal (analyzes the number of vacancies and articles on a certain programming language)

### ***GiHhub rating:***

1) *JavaScript*. It is a programming language which implements complex behaviour of a web page, mainly on the client side, but sometimes the server side is also used. Now it is the most popular programming language, because it's easy and expressive.

2) *Python*. It is a high-level programming language designed for creating web applications, games, desktop programs and working with databases, but it is most widespread in the field of machine learning and artificial intelligence, where he almost wins its competitor the R programming language.

3) *Java*. It is a universal programming language that can be used for various kinds of tasks, which combines various technologies used for all types of applications (from desktop to games and web portals). The main advantage of this programming language cross-platform implementation of the virtual machine and Just-In-Time compilation (the code compiles by parts as needed).

4) *Go*. It is a compiled statically typed programming language created by Google. It can be used to creation of any application, but its main function is web services and client-server applications.

5) *C ++*. It is a high-level compiled general-purpose programming language with statically typing, suitable for creating any type of applications. Despite its complexity and high threshold of entry, today it is one of the most popular and widespread languages.

6) *Ruby*. It is an interpreted, OOP programming language with dynamic typing. The cross-platform implementation is distributed as open-source software. The program code is understandable even for a person who has not dealt with programming.

7) *TypeScript*. It is a strongly typed and compiled language that compiles to JavaScript, which is executed by the browser. Strong typing reduces the number of errors that occur when developing in JavaScript.

8) *PHP*. Most sites and web services on the Internet are written using PHP. By some estimates, PHP is used by over 85% of sites such as facebook.com, vk.com, baidu.com, etc. The language is easy enough to create websites of varying complexity, but has many problems with security and error processing.

9) *C #*. It is an object-oriented compiled programming language with strong typing, executes in Microsoft .Net platform. It is one of the most powerful, fast IT services and in-demand languages in the industry.

10) *C*. It is a statically typed general-purpose compiled programming language, often referred to as low-level and cross-platform assembly language. Used primarily in system and low-level programming, where are necessary memory savings and saving processor cycles. Thanks to the growth of Internet of things, this language, developed in the distant 20th century received the second life and is one of the most popular again.

***Dou rating:***

1) *JavaScript*

2) *Java*

3) *C #*

4) *Python*

5) *PHP*

6) *TypeScript*

7) *C ++*

8) *Swift*. It is a compiled programming language used to create applications for IOS and macOS

9) *Ruby*

10) *Kotlin*. It is a young statically typed language created by the Russian company JetBrains. At the moment, it is the preferred programming language for Android. There is support for both an object-oriented approach and a procedural one.

***TIOBE rating:***

1) *C*

2) *Java*

3) *Python*

4) *C ++*

5) *C #*

6) *VB.Net*. It is an object-oriented programming language executed in the Microsoft .Net platform.

7) *JavaScript*

8) *PHP*

9) *SQL*. It is a human-like Structured Query Language designed to perform various manipulations with relational databases. The most well-known dialects of this language are t-sql and pl-sql, created by Microsoft and Oracle corporations or open-source DBMS MySQL.

10) *Assembly languages* - low-level programming languages designed for direct access to hardware resources of computer technology.

## **Results**

Despite the difficulty of assessing the rating of programming languages, it is certain that Python, JavaScript, C # and PHP are dominant programming languages that have magnificent communities, many tutorials, courses and a large number of vacancies.

C / C ++ have a huge amount of information on them and are basic programming languages for beginners, so that the positions of these languages are currently practically unshakable, although their rivals Rust and Go becomes more and more noticeable.

Regarding promising programming languages, the future of which can be light, then it is a TypeScript, which promises to partially replace the less secure and convenient JavaScript, Kotlin, the dominant programming language for Android, which displaces Java from its main niche, whose audience growth is simply impressive.

As for Java, this language secured by a huge amount of legacy code and will be in the list of the most popular and demanded for many more years, although the number of new projects and the general positive attitude towards the language are decreasing.

## **References:**

1. [https://madnight.github.io/github/#/pull\\_requests/2020/4](https://madnight.github.io/github/#/pull_requests/2020/4)
2. <https://dou.ua/lenta/articles/language-rating-jan-2021/>
3. <https://www.tiobe.com/tiobe-index/>
4. <https://metanit.com/sharp/>
5. <https://metanit.com/python/>
6. <https://tproger.com>
7. <https://habr.com>

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## Protection of information in computer networks based on network level technologies

Today, the task of protecting the information resources of computer networks from attacks by external and internal intruders is becoming increasingly important. The method of unauthorized access to computer networks is annually improved and new means of information protection are created, the most popular of which are: network shielding, access delimitation, encryption, identification, and authentication. But existing new technologies and software products stop attackers only for a while, as they have one significant drawback: they are based on one principle of operation. This leads to the creation and use of fundamentally new methods to improve the protection of information in computer networks [1].

The works of famous scientists W. Diffie, N. Ferguson, B. Forouzan, M. Hellman, B. Schneier, A. Shamir, C have made a significant contribution to solving issues related to the creation of theoretical and practical achievements in the construction of secure telecommunications systems.

A method of information protection in computer networks based on the mechanism of multiple asymmetric network layer encryption has been proposed and will be further discussed.

The stages of the proposed technique are presented in Fig.1:

1. Network monitoring and formation of a database of parameters (information transfer rate, delay time, etc.).

2. Based on the first point, the following is the formation of a routing table for each program of the multiservice network [3]:

$$M_{\varepsilon}^{(j)} = \left( \overline{\mu_{(\varepsilon)1}^{(j)}}, \dots, \overline{\mu_{(\varepsilon)l}^{(j)}}, \dots, \overline{\mu_{(\varepsilon)j-1}^{(j)}}, \overline{\mu_{(\varepsilon)j+1}^{(j)}}, \dots, \overline{\mu_{(\varepsilon)S}^{(j)}} \right); \varepsilon = \overline{1, E};$$

$$\overline{\mu_{(\varepsilon)l}^{(j)}} = \left( \langle \mu_{(\varepsilon)i1}^{(j)} \rangle, \dots, \langle \mu_{(\varepsilon)iv}^{(j)} \rangle, \dots, \langle \mu_{(\varepsilon)im_j}^{(j)} \rangle \right); i, j = \overline{1, S}; i \neq j; \varepsilon = \overline{1, E}.$$

$\overline{\mu_{(\varepsilon)l}^{(j)}}$  – ranked preferably the list of routes from the j-th host of the sender (XB) to the i-th host of the recipient (XO) when transmitting information of the  $\varepsilon$ -th application in the network;

$\langle \mu_{(\varepsilon)iv}^{(j)} \rangle$  – route (list of network elements)  $v$ -th on the preference of choice from the j-th host of the sender to the i-th host of the recipient when transmitting information of the  $\varepsilon$ -th application in the network;

$im_j$  – the number of routes in the ranked list from the j-host of the sender to the i-th host of the recipient.

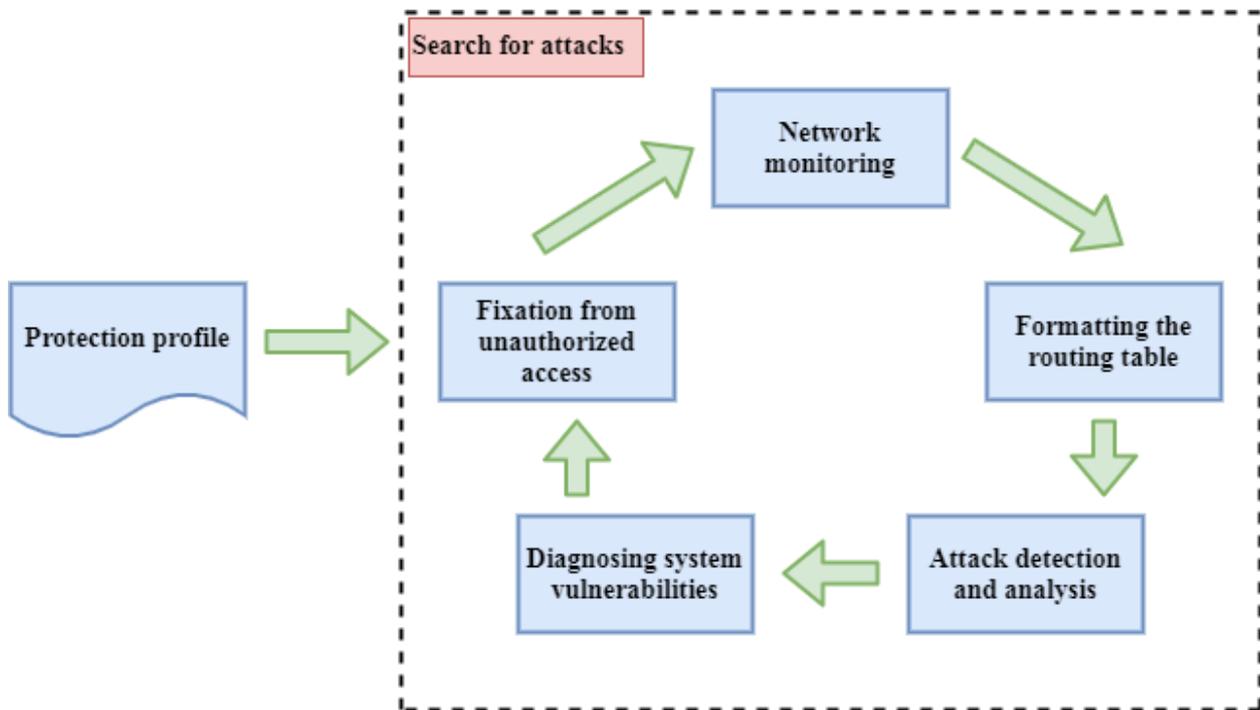


Figure 1 - The concept of information security techniques

3. The next step is to detect the attack. For each route we calculate the values:

$$a_i = \left| \frac{\ln(1 - p_i)}{c_i} \right|; i = \overline{1, m_j}.$$

Here as variables  $c_i$  and  $p_i$  can be used as follows.

For  $c_i$  - instead of the cost of the  $\langle \mu_{(\varepsilon)iv}^{(j)} \rangle$  route, you can use the number of transit switching nodes between XB and XO.

As  $p_i$  you can use:

-  $(1 - p_{\text{OIII}i})$  -, where  $p_{\text{OIII}i}$  - the probability of erroneous reception of a symbol, packet, message, etc. when transmitting information on the  $\langle \mu_{(\varepsilon)iv}^{(j)} \rangle$ -th route.

This allowed us to create a new ranked list of routes.

4. *Diagnosing system vulnerabilities.* We analyze the system and determine the required number of parallel connections between the source host and the recipient host in the computer network. This allowed to ensure the integrity of information when exchanging data packets.

5. The last step is to create a connection structure to protect information. This ensured its accessibility and integrity. The implementation is to generate independent pairs of public encrypted keys.

The proposed method was tested. As a result, the network resources involved in this communication session to protect and transmit information with guaranteed quality of service QoS are released, and at the end of the communication session, the structure of information protection between the host and the recipient host is disbanded.

It should be concluded that the proposed method of protection of computer networks based on network technologies, allowed to ensure the protection of information in multiservice networks without reducing the guaranteed quality of service QoS high-speed applications that run in real time. The proposed technique can

be used in the field of information security of telecommunications systems and in multiservice networks.

**References:**

1. S.V.Kavun, O.A.Smirnov, V.F.Stolbov “Fundamentals of information security”, Kirovograd, Ed. KNTU, 2012. - 414 p
2. X.Q. Su and Zh.H. Sheng, “Computer network security and firewall technology to explore the development of technology, Science and technology innovation Herald, 2012, pp. 34-37
3. Y.L. Sun, “Security and prevention of computer network technology”, Metallurgy Heilongjiang, 2013, pp.65-68.
4. Q.Y. Huang, “Based on Intranet information secure digital signature technology”, Computer knowledge and technology, 2014, pp.70-74.

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## Machine learning – security aspects

Machine learning is a class of artificial intelligence methods, a characteristic feature of which is not a direct solution to a problem, but learning in the process of applying solutions to many similar problems. To build such methods, the tools of mathematical statistics, numerical methods, mathematical analysis, optimization methods, probability theory, graph theory and various techniques for working with data in digital form are used.

The first neural network model that implemented machine learning algorithms similar to modern ones was proposed in 1975. Currently, a variety of machine learning systems are being developed for use in such future technologies as the Internet of Things, Industrial Internet of Things, in the concept of a "smart" city, when creating unmanned vehicles, as well as to protect our data from various fraudsters on the Internet and much more.

As shown in Figure 1, machine learning is the main building block of artificial intelligence.

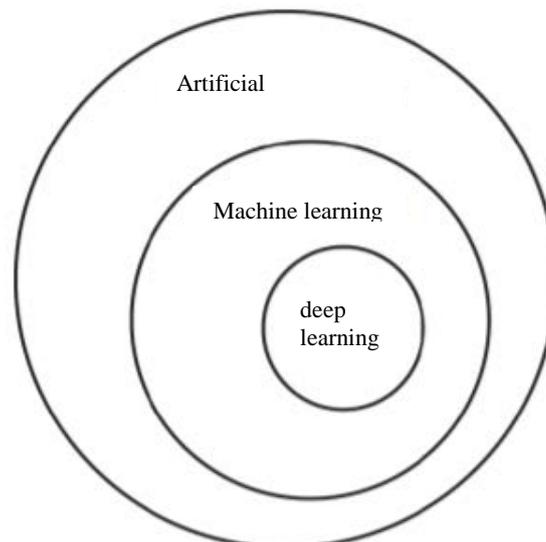


Figure 1

Practical use cases for machine learning in security can be classified into two main categories: pattern recognition and anomaly detection.

- Pattern Recognition is an attempt to discover the explicit or implicit characteristics hidden in the data. These characteristics, extracted and combined into feature sets, can be used to train the algorithm to recognize other forms of data with exactly the same set of characteristics.
- Identification of anomalies is the acquisition of knowledge with the opposite approach to the same task. Instead of examining the characteristic patterns that exist

in specific datasets, the main goal is to define the concept of normality, which describes most (for example, more than 95%) of the data in the studied dataset. After that, any deviations from the established normality will be defined as anomalies.

Fighting spam: an iterative approach.

Consider the case when it is proposed to solve the problem of eliminating the threat of spreading spam by e-mail that interferes with the work of employees in an organization. A person successfully recognizes spam, so we can start by implementing a simple solution that roughly mimics the process of human thinking when performing this task. The theoretical premise is that the presence or absence of certain known keywords in an email message is a clear indication that the message is spam or not spam. For example, it has been noticed that the word "lottery" is quite common in spam messages, but extremely rarely appears in ordinary business letters. You may end up with a list of such words and carry out a classification by checking whether the message text contains any word from this blacklist.

The main tasks in the design of security systems include:

1. Artificial intelligence should be able to distinguish between intentional deviations in the behavior of others, but at the same time not allow the influence of these deviations on their own mechanisms of interaction with people.
2. Machine learning algorithms must be able to distinguish malicious data from deliberately introduced anomalous events and reject training information that negatively affects the results. Otherwise, training models will always be vulnerable to attack by intruders and trolls.
3. Artificial intelligence should contain built-in analytical expertise. This will allow companies to guarantee their clients the transparency and controllability of AI mechanisms. At any time, you can make sure that the actions of the Artificial Intelligence were correct and legally justified.

I believe that this technology will develop even more in the future, and will perfectly cope with various threats from the Internet, viruses and spam. Over time, AI will save people from many problems and will be able to independently and perfectly protect our personal data.

## References

1. <https://docs.microsoft.com/ru-ru/security/engineering/securing-artificial-intelligence-machine-learning>
2. <https://dmkpress.com/files/PDF/978-5-97060-713-8.pdf>
3. <https://www.bigdataschool.ru/wiki/machine-learning>

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## **The use of Python for the development of artificial neural networks**

For millennia, humanity has been trying to unravel the mystery of how the brain works and create devices that are able to think. Nowadays, we want to automate tasks such as grouping similar photos, separating diseased cells from healthy and even playing chess. Apparently, solving such problems requires human intelligence. Therefore, scientists came up with the idea to create a digital prototype of a biological brain.

The idea of designing intelligent computing devices in the image and likeness of biological systems led to the creation of the theory of neural networks, that became one of the most powerful and useful approaches to the development of AI (artificial intelligence) [1].

Neural networks are mathematical models that use the principle of networks of nerve cells in a living organism. For the ease of perception, a neuron can be imagined as a kind of a cell which has many input holes and one output. Effective values are supplied to each neuron input, and then propagated along interneuron connections. These connections have one parameter – weight, due to which the input information changes while moving from one neuron to another. The information of that neuron, which weight is bigger, will be dominant in the next neuron.

So, a neural network is a system containing a big number of such neurons. The main property of a neural network is its ability to learn. Therefore, neural networks are able to work with incomplete, incorrect and partially missed data and draw conclusions based on the previous knowledge [2].

If we talk about actual achievements, then, for example, neural networks are the main activity of the Deepmind company (now the property of Google), which has achieved such fantastic success as creating a neural network being able to learn to play video games, and another network that has won an incredibly challenging game of the world-class go grandmaster.

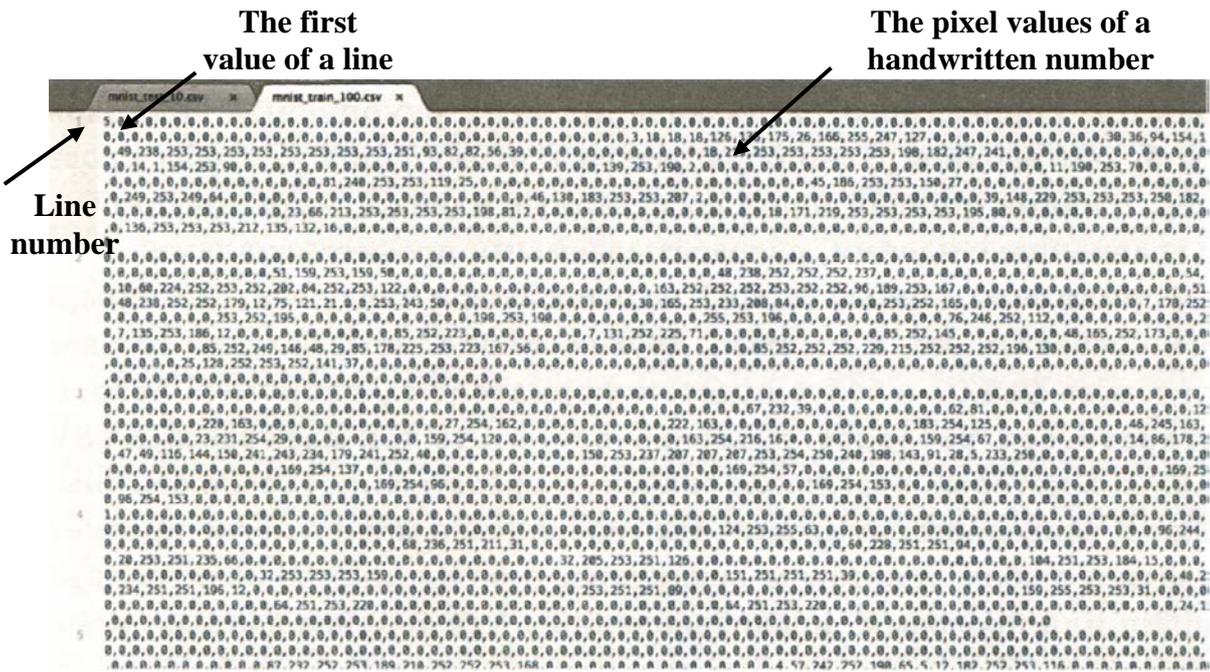
Neural networks are created and taught mainly in Python. Because it has an excellent data processing performance. Python is the best high-level and easy-to-understand language to work with. Its conciseness and ease of reading make it well suited for teaching software development. Besides, it is well suited for the development of artificial neural networks because machine learning algorithms are difficult to understand. Python's simple syntax helps to test complex algorithms with a minimum amount of time to implement them. Also, this programming language has many frameworks that simplify the coding process and reduce the time of development [4].

Based on the knowledge gained from the literature about this topic, I have decided to create my own neural network that is able to recognize which number is shown in the picture.

My neural network class contains three functions:

- initialization – setting the number of input, hidden and output nodes;
- training – elaboration of weight coefficients in the process of handling the training provided for the network examples;
- query – receiving signal values from output nodes after providing the values of incoming signals.

As for training data for my neural network, I have decided to choose a database of handwritten numbers called “MNIST”. This collection of images is very popular among AI researchers for testing ideas and algorithms [1].

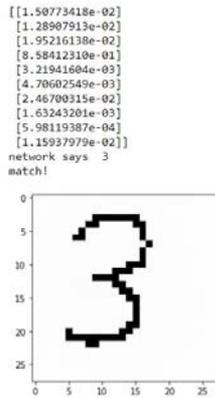


**Fig. 1.** Database “MNIST”

This database contains long lines of numbers separated by commas. The first value is the actual number that this handwritten copy should represent. This is the answer that the neural network must learn to correctly receive. Other numbers are the pixel values of a handwritten digit, which make it possible to represent this unit graphically.

Then my neural network analyzes the received pixel arrays and can further work with test data. As test data, I have chosen pictures that show numbers from 0 to 9. Having analyzed the training data, my neural network is able to recognize these images and output a correct answer.

So, my project contains 10 output nodes, each of which is a prototype of numbers from 0 to 9 accordingly. The result will be an array of 10 values where each is the probability with which my artificial neural network thinks the same node is the correct answer. Therefore, where the probability is higher, that node number will be the result of my project.



**Fig. 2.** The final result using the example of the number 3

All in all, a significant progress in the field of image recognition, as well as in other problem areas, has been achieved through the use of neural networks. Using the main idea of my project, people can create a huge number of bots for different programs, sites and games. Besides, this technology can be used at a checkpoint to determine the vehicle license plate. It will also help develop programs that use the phone's camera to recognize mathematical equations and display step-by-step solutions. So, the use of neural networks is a key factor in the success of AI projects.

### References:

1. Tariq Rashid, Make Your Own Neural Network / Authorized translation of the English edition (ISBN 978-1530826605), 2016.
2. Простыми словами о сложном: что такое нейронные сети? [Электронный ресурс]. Режим доступа: <https://gagadget.com/another/27575-prostyimi-slovami-o-slozhnom-cto-takoe-nejronnyie-seti/>. Дата обращения: Март 19, 2021.
3. Нейронные сети для школьника: просто о сложном [Электронный ресурс]. Режим доступа: <https://ucvt.org/nejronnye-seti-dlya-shkolnika>. Дата обращения: Февраль 21, 2021.
4. Нейросети. Почему Python? [Электронный ресурс]. Режим доступа: <https://qna.habr.com/q/555987>. Дата обращения: Февраль 21, 2021.
5. Почему Python используют для написания нейронных сетей, а Ruby/Php/Perl нет? [Электронный ресурс]. Режим доступа: <https://qna.habr.com/q/440146>. Дата обращения: Февраль 21, 2021.
6. Почему Python используется для машинного обучения? [Электронный ресурс]. Режим доступа: <https://medium.com/nuances-of-programming/%D0%BF%D0%BE%D1%87%D0%B5%D0%BC%D1%83-%D0%B8%D1%81%D0%BF%D0%BE%D0%BB%D1%8C%D0%B7%D1%83%D0%B5%D1%82%D1%81%D1%8F-%D0%B4%D0%BB%D1%8F-%D0%BC%D0%B0%D1%88%D0%B8%D0%BD%D0%BD%D0%BE%D0%B3%D0%BE-%D0%BE%D0%B1%D1%83%D1%87%D0%B5%D0%BD%D0%B8%D1%8F-bc1a2d8f5963>. Дата обращения: Февраль 21, 2021.

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## 11 Important Differences between Windows 10 and Windows 8

In terms of the number of negative reviews, Windows 8 can only be compared with Windows Vista. Therefore, everyone was looking forward to the new Windows 10. Everyone wanted something new and innovative. Externally, Windows 10 and Windows 8 are very similar, but this is only at first glance. Let's try to find the differences between the two systems.

1. Browser Microsoft Edge. Microsoft's new browser is the main difference. Fast, modern, with a minimalist user interface. As soon as a new web tab is created, the user is shown a search bar, frequently visited web resources, news, weather, stock and sports widgets, as well as recommended applications from the Windows Store. All information is dynamic and relevant to previous actions. Hovering over a tab title displays a thumbnail image of the contents of the open web page. The browser still needs improvement, but it has rightfully taken the place of the much criticized and dissatisfied Internet Explorer.

2. Creation of virtual tables. For a long time, I have looked with envy at Mac OS and Linux users in terms of virtual tables. It is also very convenient to have one desktop for home, and the second, for example, for work. Finally, my dreams have come true. Microsoft, albeit belatedly, still made it possible for users to create virtual tables. On each of them, you can open different applications, which is very convenient. Switching between tables is done with the Win + Tab buttons.

3. Analysis of disk space. Windows 10 has a tool that allows you to analyze the availability of free disk space, as well as how much is occupied and for what type of content (games, applications, programs, system files, etc.). It is very convenient and practical.

4. Notification Center. On a PC, the Action Center performs all the same functions as on smartphones. This is a single area in which the user will find all messages displayed by applications. No more flipping through "live" tiles, looking at what's new on them. In the system settings, you can specify which applications can send you a notification, and which applications are prohibited. I was also pleased with the presence of buttons for quick access to the settings of some functions.

5. Fast placement of windows on  $\frac{1}{2}$  and  $\frac{1}{4}$  part of the screen. In Windows 10, it is very easy to move the application window to any corner, as well as to the left or right edge of the screen. In this case, it will be expanded by  $\frac{1}{2}$  or  $\frac{1}{4}$  part of the screen. For tablet owners, this will provide an opportunity to rationally use screen space. Also, applications can be moved, folded and unfolded with the "hot" keys Win + cursor buttons.

6. Tablet mode. Windows 10 supports the Continuum feature, designed to automatically adapt the look of the OS to the type of device you are using. Users of

hybrid devices and tablets are faced with the problem of optimizing applications. "Tablet Mode" solves this problem. It's easy to enable it in the Action Center and configure it in Settings.

7. Metro applications in desktop mode. In Windows 8, I very rarely used Modern UI style applications. They folded to full screen, and closing them was generally a problem. And their functionality was much less. In Windows 10, this problem was partially resolved. Now applications can be placed on half the screen, minimized and maximized, that is, like desktop applications. It is very comfortable. The functionality, however, still remains the same.

8. Application "Phone Manager". The appearance in Windows 10 of the "Phone Companion" application is the most delightful. Many users have expressed a lot of criticism against Microsoft regarding the synchronization of the OS with phones and tablets on IOS and Android. They were heard. The app is very nice and user-friendly.

9. Launch Xbox One games. Games for many people are becoming more and more like a way of cultural pastime. Windows 10 brought support for cross-platform play from the Xbox One. Now you can easily play Xbox One games right on your PC and tablet. To play the game, you need a high-speed Wi-Fi connection, a computer, a properly configured Xbox One app, and a game console.

10. Windows Hello. Windows Hello is a more personalized way to sign in to Windows 10 devices with a glance or touch. You get enterprise-grade security without entering a password. Not all users will be able to benefit from Microsoft's innovation. This requires your computer to be equipped with a fingerprint scanner or camera that supports this feature. One of the few devices that is compatible with Windows Hello is Intel RealSense, a sensor that needs to be positioned above the monitor and includes two different cameras: standard Full HD and infrared. By combining images from these two cameras, RealSense is able to reconstruct the user's face and confirm their identity.

11. Cart in the start menu. For many, this innovation will not seem interesting. I am one of those people who do not really like to litter the "Desktop". Now I can easily free it from the Trash. None of the OS versions had this.

According to various estimates, about 50 million have been updated to Windows 10 now. This is quite good for a recently released operating system. There are still many problems in it, but it is clear that Microsoft is working tirelessly.

**Reference:**

<https://gadget.com/windows/17578-11-vazhnyih-otlichij-windows-10-ot-windows-8/>

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## **Information systems design: problems and solutions**

Computers have fundamentally changed the way that not only individuals but businesses and government bodies operate. Information systems (IS), which supports all major business processes, are the backbone of any organization today. Companies and government agencies rely on information systems to manage their operations, interact with their customers and suppliers, and compete in the marketplace. Never again will business and enterprise revert to a pre-computing existence. Indeed, using computing power effectively requires creative design, skilful implementation, and necessary education acquirement. Therefore, designing information systems is very complicated and painstaking work that requires maximum concentration. Project development requires the interaction of the customer and the contractor, but people are not perfect, so it is not surprising that there are some misunderstandings.

Information systems are the academic study of systems with specific references to information and networks of hardware and software that people and organizations use to collect, filter, process, create and disseminate data. The information system functions as a single unit. It consists of many components or subsystems in different states and may be changed depending on changes in other parts. Information systems belong to the class of dynamically complex. They differ in data type, scale, level of management, architecture, depending on the nature of data processing and the degree of process automation.

Information systems design is a cyclical process aimed at improving or creating a unique product for business process management. It involves the creation and implementation of integrated solutions to economic problems using modern electronic computers and hardware. During the design, the most effective ways of developing a project and using resources are selected. The basis of IS design is the modelling of the subject area. The purpose of modelling is to avoid errors that lead to economic losses and costs for further redesigning the system. There are the following phases in the designing process:

- divergence - expanding the boundaries of the project situation to provide a wider space for finding a solution;
- transformation - the stage of creating principles and concepts (the study of the structure of the problem);
- convergence - a combination of traditional design phases (coding, debugging, machining of parts).

The main features of the source data for IP design are the following:

- multifunctionality (it is necessary to implement a large number of actions);
- the significant volume and complexity of interactions between the designed system and the environment; the complexity of their formal description;

- distributed and asynchronous data processing mode;
- variety of information objects and their properties;
- vagueness of requirements, their subjective nature;
- incomplete requirements, their expansion in the design process, the need to consider a system development.

A distinctive feature of the information system design is collective design. Organizing the designing process involves finding the right methods of interaction between designers and customers in the process of creating an IP project and a relevant set of specific tools.

Information systems differ in the properties and purpose of their use. The developer must also consider the conditions in which the IC will operate. Therefore, the participants of the development process have to coordinate their actions before the start. The customer should clearly understand the purpose and functions of the system to convey wishes to the contractor. Thus, after receiving the necessary information, the executor determines the methodology for the IC creation.

The methodology is a set of principles, methods and practices to achieve goals and results.

Thus, the main objectives of the methodology are:

- ensuring the creation of an information system that meet the proposed requirements;
- designing of a system with a given quality, in a given time and within the budget;
- support for maintenance, modification and extension of IS;
- creation of IS that meet the requirements of openness, portability and scalability.

The methodology should reduce the complexity of the process of information systems design due to a complete and accurate description of this process and the use of modern methods and technologies. But during the implementation of complex information systems, it is sometimes difficult to understand the consolidated requirements of a client. If they formulate requirements incorrectly, the process of analyzing specific business processes may change too.

However, each problem has a solution. Thus, the concept of organizing the technological process of software development - RAD (Rapid Application Development) was created. RAD methodology is a set of special tools that allow you to operate with graphical objects and reflect the separate information components of applications. If you study the basic principles of this methodology, it is clear that it is ideal in case of ambiguity of the ordered information system.

Firstly, the tools of RAD allow implementing a completely different technique of application creation. Information objects are formed as existing models (prototypes), and their functioning is agreed with the user. Then the developer can proceed directly to the formation of complete applications without losing the overall picture of the designed system. The technology allows demonstrating to the customer a working model of the prototype system in the process of creation. It helps a customer better understand the type of final product and formulate specific requirements.

Secondly, this methodology has several other advantages:

- use of iterative (spiral) development model;

- full completion of work at each stage of the life cycle is not required;
- in the process of information system design the interaction between the customer and future users are provided;
- use of CASE-tools and tools for rapid application development;
- facilitates changes to the project using the configuration management tool;
- testing and project development are carried out simultaneously with the design;
- a small and well-managed team of professionals carries out software engineering;
- Competent management and control as well as careful scheduling are guaranteed.

Thus, visual RAD tools allow you to create complex graphical user interfaces without writing program code at all. The developer and the customer can observe any stage of the accepted decisions that allows forming quickly a product individually for the needs of the customer.

### References

1. [https://studme.org/266561/informatika/metodologii\\_tehnologii\\_proektirovaniya\\_informatsionnyh\\_sistem](https://studme.org/266561/informatika/metodologii_tehnologii_proektirovaniya_informatsionnyh_sistem)
2. <https://studme.org/205621/informatika/metodologiya>
3. [http://en.wikipedia.org/wiki/Rapid\\_application\\_development](http://en.wikipedia.org/wiki/Rapid_application_development)
4. Инюшкина О. Г. Проектирование информационных систем (на примере методов структурного системного анализа). [https://elar.urfu.ru/bitstream/10995/28812/1/978-5-91128-072-7\\_2014.pdf](https://elar.urfu.ru/bitstream/10995/28812/1/978-5-91128-072-7_2014.pdf)
5. Коцюба И. Ю., Чунаев А. В., Шиков А. Н. Основы проектирования информационных систем <https://books.ifmo.ru/file/pdf/1705.pdf>
6. Авраменко В. С., Авраменко А. С. Проектування інформаційних систем <http://eprints.cdu.edu.ua/1481/1/pro.pdf>
7. [https://ela.kpi.ua/bitstream/123456789/33651/1/PIS\\_KL.pdf](https://ela.kpi.ua/bitstream/123456789/33651/1/PIS_KL.pdf)

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## **Modern distance learning platforms: goals, objectives, and development prospects**

Distance learning systems have long been known to university teachers. With the help of distance learning technologies, it is possible not only to shift a number of routine tasks to the computer, but also organize a truly high-quality training during the period of quarantine.

Proper organization of distance learning is a necessary thing not only in the period of quarantine restrictions. The relevance of the extracurricular form of classes remains constant, as a number of students cannot attend classes for various reasons and have to study remotely. However, in the era of technology, the Internet access is available to almost everyone and any smartphone can be used for learning purposes, thus making a teaching process less a difficult task.

Several of the most convenient platforms and services focused on organizing distance learning have been analyzed and some specific features are provided.

### **Moodle distance learning system**

Moodle is a completely free platform that can be easily downloaded, installed, and modified. It belongs to the open-source systems that allows many programmers to create additional and very useful extensions or modules.

Moodle is suitable for distance learning at any level, starting from a personal training base to the e-learning system of a large educational institution. Even if you are a private tutor, you can use Moodle.

Moodle allows you to implement a variety of pedagogical distance learning scenarios. Thanks to this platform, the teacher can divide students into separate groups, and each group is provided by its own content and learning material. It is also possible to set a sequence of access to a particular learning element after completing a previous task. For example, if a student does not complete a quiz on topic 1, they will not be able to access a lecture on topic 2. In this way it is possible to program not only access to individual learning activities, but also to a whole group of learning elements.

Since Moodle is an open-source program, the platform has a large number of plugins and add-ons for the system. Such add-ons are usually free and can simply be downloaded and installed for the system.

### **Google Classroom Platform**

Google used to have a large number of educational tools in its arsenal, but later the company decided to combine all these tools into a single platform, and so Google Classroom has been designed. Therefore, Classroom can hardly be called a classic distance learning system, as it is more of a collaborative environment - the same Google for education, only put together in one place. Google Classroom is a great tool to create an online school. Moreover, Google Classroom is a really spectacular tool. Previously,

Google Classroom had a relatively complicated system of registration and user access to the course, but Google has opened up free registration and now access to Classroom is as easy as Facebook.

Among the features of Google Classroom are:

- the use of Google tools (Google Drive, Google Docs);
- participants in the educational process in Google Drive create a common folder "class";
- the "class" folder is available both for an individual student and for the class as a whole.

### **Office 365 Platform**

Office 365 makes it easy to work and share Office files anywhere with an Internet connection from virtually any device. Microsoft Office 365 users can apply such useful programmes as Word, Excel, OneNote or PowerPoint to view, create and edit files anywhere.

The introduction of Office 365 into the classroom most often begins with Microsoft Teams, an online teamwork service that provides the functions of communication, task management, content exchange, and applications in one workspace. It combines conversation, content exchange and applications in one place, streamlining workflow for administrators and allowing educators to create vibrant, personalized learning environments. Teams (groups) can be used to create collaborative classrooms, personalize learning with tasks, connect with colleagues in professional learning communities, and optimize communication with staff. As a virtual video meeting platform, Teams contains features and tools that can enable productive collaboration in online classes using video conferencing.

It should be concluded that Learning Management Systems and Virtual Learning Environments have become increasingly common in education. It does not mean that traditional means of education are disappearing, but academic institutions have identified that blended education is on its way of fast development. The presence of many educational platforms will satisfy the needs of various users, taking into account their tasks and qualifications.

### **References:**

1. <https://moodle.org/?lang=ru>
2. <https://classroom.google.com/h>
3. <https://www.office.com/?auth=2>
4. <https://www.microsoft.com/uk-ua/microsoft-teams/log-in>
5. <https://mobilemind.io/distance-learning-essentials-google-classroom/>
6. <https://support.microsoft.com/en-us/topic/remote-learning-with-office-365-for-students-eea3ee92-ba42-4217-90d4-155f9a5477e4>
7. <https://www.distancelearningportal.com/articles/161/what-is-moodle-what-are-online-learning-managements-systems.html>

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## **Analysis of hack attacks. History and perspective**

Hacking as a phenomenon has gone from teenage fun to a multi-billion dollar business with a developed criminal infrastructure.

Observing the world news of recent years it is not difficult to conclude that hacker attacks occur more often, the volume of damage and stolen information is greater, and the authorities of countries around the world have less and less answers. Based on statistical data, let us analyze the evolution of hacker “achievements”, from the first cyberattack in history to the present time.

The history of hacker dates back to 1988. The Morris worm was the first example of malicious software in the history of computing. It practically paralyzed computers on the ARPANET for up to five days. Structurally, the worm consisted of three parts - a “head” and two “tails”. The "head" was C source code (99 lines) and was compiled directly on the remote machine. The tails were identical, in terms of source code and algorithms, binaries, but compiled for different types of architectures. The "head" was thrown using the following methods: using the debug mode in sendmail, exploiting a buffer overflow vulnerability in the fingerd network service, brute force login and password for remote program execution (rexec), invoking a remote command interpreter (rsh) by brute force login, and password or using a trust mechanism. To exploit the fingerd service vulnerability, the worm transmitted a specially prepared 536 byte string, which ultimately called the execve function ("/ bin / sh", 0, 0). This only worked for VAX computers with 4.3BSD installed. To use the distribution method via rexec and rsh, a list of users on the local machine was collected. On its basis, the selection of the most frequently used passwords was made, in the hope that many users have the same names and passwords on all machines on the network, which, however, turned out to be not far from the truth.

After the loud appearance of the Morris Worm, the next minor attacks occurred only 18 years later, from 2006 to 2010, in different countries of the world.

The next biggest attack is the 2010 Stuxnet attack. Virus software of the same name was discovered in Iran in July 2010, but experts believe the virus has been spreading since January 2009. Stuxnet contains several modules, written using several development environments and programming languages, and it also has several distribution methods - via USB-Flash drives and over the network. The virus does not have the ability to spread through the Internet, which means that it was designed, to be introduced into a closed system that does not have a direct connection to public networks. Stuxnet organizes its own peer-to-peer (P2P) network to synchronize and update its copies, which allows information found on the computer to be sent to remote control servers. To ensure the work, the privileges were increased to the level of the

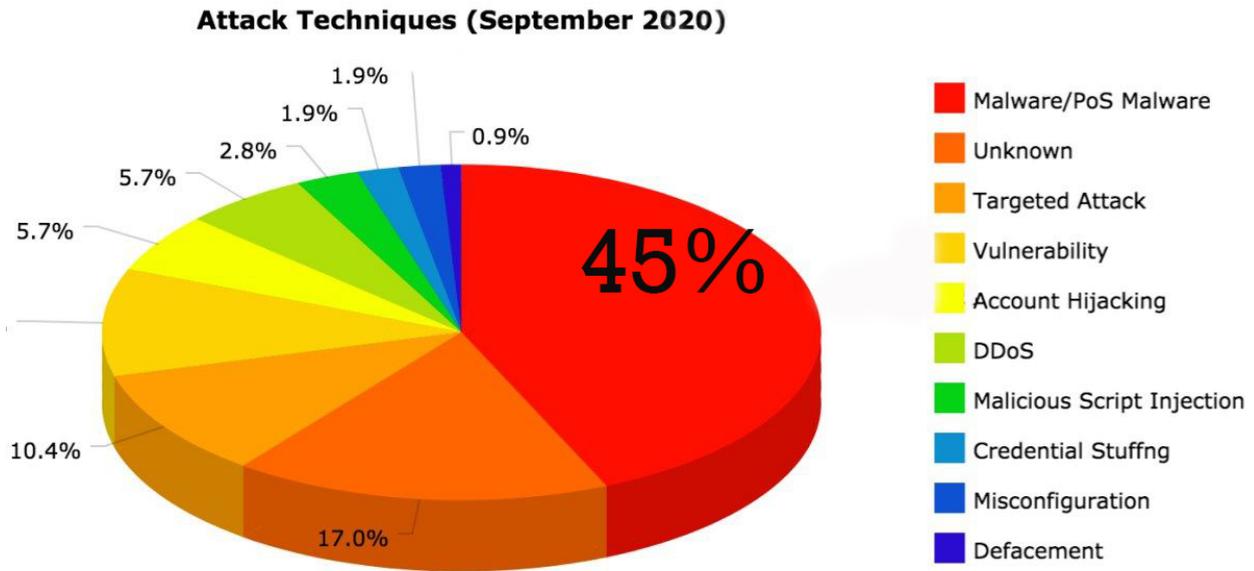
system administrator, using two local vulnerabilities, which allowed the normal launch of malware from under limited accounts.

In October 2012, the Russian firm Kaspersky detected a global cyberattack called Red October that had been launched at least since 2007. The hackers collected information through vulnerabilities in Microsoft's Word and Excel programs. Red October is modular (30 components in total) and highly complex in architecture (1000 files with 115 creation dates spanning over two years). In addition, it targets many operating environments (multiple mobile platforms besides PCs) and also has a control network that spanned 60 domains. The management server infrastructure is a chain of proxies and hides the location of the real final server where the data is collected. Red October made some use of the Java exploit, although it was not a zero-day exploit.

On June 27, 2017, companies around the world were attacked by a modified version of the Petya virus. In the future, he will receive several names - NotPetya, Petya.A, ExPetr and several others. The malware was initially ranked among the ransomware ransomware family - it allegedly encrypted data on computers, demanding a ransom in bitcoins for unlocking documents. The threat later turned out to be more serious than expected - NotPetya turned out to be a eraser virus that simply cleared the hard drive, leaving no possibility of recovery. This virus spreads inside the local network (by default, secure environment). The attack by this virus was shocking, because there had never been such a global ransomware virus before. A radical change in the method of attack literally crippled the entire IT sector.

To summarize my list, I would like to one of the most devastating attacks of 2020, which happened in the last month. Attackers managed to remotely download the software update to 18,000 SolarWinds customers, after which they were able to steal, destroy and modify data. Sunburst is a sophisticated backdoor that gives an attacker almost complete control over the affected system. However, there are several peculiarities in his behavior. Before running, it checks to see if the process name hash and registry key have been set to specific values. It will also only run if the execution time is twelve or more days after the first infection of the system; it will also only work on systems that have been joined to a domain. This particular set of circumstances complicates the analysis carried out by the researchers, but also limits the range of victims to some extent. There is no detailed information about the technical characteristics of this malware yet, because the Sunburst attack is not over yet.

Consider the global statistics for 2020 hacker attacks on a pie chart



By analyzing the data of the cyber attack, we can draw the following conclusions: with the development of technology, software and technologies, methods of attack and theft of information are also developing, which is quite logical. The Stuxnet virus and Red October, which appeared 22 and 24 years after the pioneer of the Morris Worm, differ significantly from their predecessor in the way they log in, the propagation environment, the method of virus control and the complexity of writing. After these three attacks, a ransomware virus and a complex backdoor appear - relatively new malware, which shows that effective fight against cyberattacks requires not only the latest technologies, resources, and a thorough study of past attacks, but also the readiness for the emergence of completely new ways and methods of cyber attackers.

### References

1. Once again, briefly about the latest epidemic. *Habr. Community of IT professionals, web-site*. URL: <https://habr.com/ru/>
2. Overview of Recent Sunburst Targeted Attacks. *Trend Micro Vision One, web-site*. URL: [https://www.trendmicro.com/en\\_us/research/20/1/overview-of-recent-sunburst-targeted-attacks.html](https://www.trendmicro.com/en_us/research/20/1/overview-of-recent-sunburst-targeted-attacks.html)
3. 5 of the most prominent cyberattacks. *Kaspersky daily, web-site*. URL: <https://www.kaspersky.ru/blog/five-most-notorious-cyberattacks/21607/>

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## Programming languages in game development

Many people dream of developing games. The first question that comes to their head is *what programming language to choose for work?* With learning languages for game development you can go two ways. Either learn a language first and then go towards game development, or just learn the ‘Game Development language’.

Why learn a language before going into game development? When talking about game development there is no specific or defined language that is the standard per se—however, there are programs which do have standard languages and ultimately depend on the program you wish to use to develop your game. Learning a language can be really helpful before going into game development, as it allows you to learn the next language quickly and use 3rd party tools if needed. In this case I would recommend learning JAVA for Android and using Android Studio or Eclipse while learning it. This will allow you to make Android Apps and maybe even rudimentary video games.

What you should do first in game development is to pick an engine. There are many options. However, I would recommend Unity 3D for Mobile Development and even PC Development if you are a smaller sized team.

If you have picked Unity 3D, you really need to learn one language and this is C#, but not quite the C# that is commonly used for iOS development and making Apple Apps. It is the Unity’s version of C# which is a bit different but possible to master quite easily as well. All you have to do is to search Unity Tutorials on Youtube, and you will be barraged with hundreds, if not thousands, of hours of quality content for absolutely free.

Within Unity you also have a choice to use JavaScript, it is again not quite the same JavaScript that you would use if you developed apps on Android. In this case it is also a specialized version. However, the industry has switched to C# and you can learn it as well.

Should you not choose the path of Unity 3D and go towards Unreal Engine, you would need to look at more advanced languages. I am not pretty sure about Unreal Engine but I think it also allows you to program the game without coding but rather do it visually.

If you want to go above and beyond, then I would recommend C++ but only after learning a few other simpler languages. C++ is a complex and advanced language and it is really necessary to master your programming skills with other languages before tackling C++. An engine that requires C++ for programming would be Cry Engine.



Fig.1 Ranking of programming languages in game development

Do the majority of game developers still use C++? In AAA (an informal term for a class of high-budget computer games), it is mostly the language of choice. C++ is used because it gives unparalleled performance and control of the hardware while still providing the developers with very high level constructs such as classes.

Different platforms require different languages. For example, Unity's scripting language may be C#, but when it actually gets compiled, it turns into some form of a native code depending on what you are compiling for. But Unity is barely used by the AAA industry as it has bad collaboration tools. It does not allow to work with a team of 50 people on one project, as there will be so many merging conflicts that straight up cannot be solved. On the other hand, it is excellent for small teams looking to make small games, hence it is used so extensively by indie developers all around the world.

Unreal is an actual AAA-grade engine with excellent architecture and good collaboration tools. It enables designers to "code" the parts of the game via blueprints, which is just a form of visual scripting. Programmers can do whatever they want as Unreal is an open source. The programmer workflow is excellent for Unreal. Artists have some amazing instruments as well, the most significant one is the material editor. It basically allows creating shades, which means they can make all kinds of crazy effects. And it is not a coincidence that Unreal is written in C++. It was chosen because it offers excellent performance and control. Other languages just do not have that.

### References:

1. Какие языки программирования изучать, чтобы найти работу в 2018 году? [Электронный ресурс]. Режим доступа: <https://www.kv.by/post/1052468-kakie-yazyki-programmirovaniya-izuchat-chtoby-nayti-rabotu-v-2018-godu>
2. Do the majority of game developers still use C++? What's the percentage that use it now vs. other languages? [Online]. Available: <https://www.quora.com/Do-the-majority-of-game-developers-still-use-C++-What%E2%80%99s-the-percentage-that-use-it-now-vs-other-languages?q=Dothe-majority-of-game-developers-still-use-C>

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## **The use of programming languages to create helpful bots**

An Internet bot, also known as a network robot, is a computer program performing automatic scripts on the Internet or locally [1]. It is typically used to complete basic, repetitive tasks much faster than humans. Such programs are commonly used for web crawling, which involves an automated script fetching, analyzing, and filing information from web servers [2].

Undoubtedly, in 2021, bots are vital to feel comfortable on the Internet. Some time ago they were not that useful because there were no big databases of information, but nowadays we cannot imagine our life without these programs. Even Google Search works like a bot and, without it we will not be able to find any information.

Nowadays, bots account for more than half of all the web traffic and can be classified according to their functionality and tasks performed into IM (Instant Messaging) and IRC (Internet Relay Chat) bots, social bots, commercial, malicious, and helpful bots. So, let us look at these categories in more detail.

Some bots use Instant Messaging (IM), Internet Relay Chat (IRC) or other online interfaces. For instance, Facebook and Twitter Bots can easily communicate with the users of Internet-based services. People can ask questions in a natural language, like English or Chinese, and then get an answer from a chat bot in the same language. Instant Messaging bots usually provide weather reports, notify about important events or help people to find a solution to simple questions.

Another group is social networking bots that perform repetitive tasks in order to provide a service or create a link between social networking users. Chat bots, which are designed to converse with a human user, and social bots, designed to replicate human habits to converse with patterns identical to those of a human user, are the most popular examples of networking bots. Social bots are usually made for Telegram, Discord, Facebook, and other services. These messengers also provide an application programming interface documentation.

Commercial bots can be used in electronic trading. However, their usage in this sphere has provoked a lot of debate. For example, eBay even went to court in an effort to prevent a third-party firm from using bots to scour their market for bargains. But this strategy failed as it resulted in the raise of interest to bots. Betfair, a bet exchange located in the UK, had so much bot traffic that it introduced a WebService application programming interface targeted at bot programmers, from which it would effectively handle bot interactions.

Bot farms are believed to be used to exploit positions or raise favorable ratings in online app stores such as the Apple App Store and Google Play [3].

Malicious bots are aimed at the coordination and execution of an automated attack on networked machines, for example, a botnet's denial-of-service attack. Internet

or web bots can be used to commit click fraud and, more recently, have emerged as video game bots in MMORPG titles. However, these bots are often used to spam messages, but if there is a CAPTCHA, it makes bots' mission impossible [2].

As human-social robot contact is very common in everyday life, and using bots has a number of benefits in classrooms, offices, video games, and social media [4]. Helpful programs are available any time, allowing for fast and easy customer service. Bots may be used for a variety of tasks, including talking and answering questions, as well as ads. They often lower labor costs, resulting in higher profits for the organization.

People, who are interested in IT, can ask what programming languages are used for creating a bot. In fact, it can be written in any modern programming language: C, C++, C#, JavaScript, Java, Python, etc. Less frequently they are made by special apps which do not require any programming skills from a creator, but these bots can rarely do something extraordinary, because these apps have standard patterns which cannot be modified in order to implement some creative idea in the way you want it to.

Development of more sophisticated bots require not only knowledge of programming language, but also something like extension to it. It is called application programming interface (API). It is a computing interface that describes interactions between multiple software intermediaries. It specifies the types of calls or requests that can be made, how they should be made, what data formats should be used, and what conventions should be followed among other things. It can also have extension mechanisms, allowing users to expand existing features in a variety of ways and to different degrees [5]. To ensure interoperability, an API can be completely customized, unique to a component, or built by an industry standard.

Web APIs are specific interfaces by which an organization and the applications that use its assets communicate. Service Level Agreement specifies the functional provider and creates the route or URL for API users. The API approach focuses on offering a program interface to a number of services to various applications that serve customers.

API is generally described as a collection of requirements, such as Hypertext Transfer Protocol request messages, and also as a description of the layout of response messages, usually in an Extensible Markup Language or JavaScript Object Notation format, when used in the context of web development [6].

API documentation explains what resources it provides and how to use them, and it is aimed to cover all the practical needs of a client. If the privacy policy allows, you can create any bot using API.

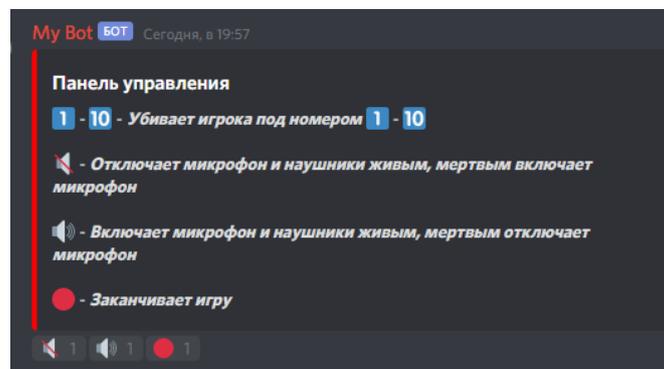
As an IT student, I am trying to develop professionally creating various useful programs. That is why I decided to write a bot in order to improve one of my favourite computer games called Among Us. This bot has been developed in JavaScript and uses the Discord messenger as an API. This bot can be used to help people organize tournaments in the game Among Us.

The problem of this game is that you can communicate there only with the help of a chat and, therefore, you cannot have extended experience using voice chat in Discord. However, voice chat makes the game more interesting, because you can hear

the speech intonation of the game players and it makes you feel really excited. Moreover, tournaments make the game more interesting to participate in, so you will not get bored for a long time.

The bot has a list which contains 10 empty spaces for players. Everyone can be added to this list using reaction, which appears in a specific message, and can also leave this list using another reaction. Also, there is an option to clear the list. When the players are ready, you can press another reaction, which stands for starting a game and the control panel will be shown. There are 11 participants in this tournament: 10 players and 1 person who controls the panel. Using the panel, a controlling person can mark dead players, using 10 buttons (reactions) which stand for players 1-10, and it will influence the bot behavior.

There are also three other buttons. The first one – mute - should be used at the start of a round in order to make people not talk during it. Players marked as “alive” would be muted and deafen would be set, and players with a marker “dead” would be unmuted and can talk about this game. The second button refers to voting which is activated if someone presses the vote button, or a participant finds a “dead” player. The organizer also controls another button — unmute: this command will unmute and remove deafen from “alive” players and mute players marked as “dead”. When the game ends, the organizer should press the third button — stop. It will mark all the players as “alive” and hide the control panel.



**Fig. 1.** Bot control panel during the game

To sum up, we should admit that bots have become an integral part of our life making our work easier, and every year more and more technologies become automated by bots. My example of a bot helps analyze data, as well as improve the quality of competitive processes in the game. But it is just used for entertainment. While being developed by professionals, bots can simplify and fasten many business processes.

### References:

1. Dunham, Ken; Melnick, Jim (2009). *Malicious Bots: An Inside Look into the Cyber-Criminal Underground of the Internet*. CRC Press. ISBN 9781420069068 (accessed: 23.02.21).
2. Bot Traffic Report 2016. *Imperva*: website. URL: <https://www.imperva.com/blog/bot-traffic-report-2016/> (accessed: 25.02.21).

3. [App Store fake reviews: Here's how they encourage your favourite developers to cheat.](https://web.archive.org/web/20171018180436/http://www.electricpig.co.uk/2012/02/07/app-store-fake-reviews-heres-how-they-encourage-your-favourite-developers-to-cheat/) *Electricpig the only tech you need:* website. URL: <https://web.archive.org/web/20171018180436/http://www.electricpig.co.uk/2012/02/07/app-store-fake-reviews-heres-how-they-encourage-your-favourite-developers-to-cheat/> (accessed: 26.02.21).
4. The effects of multiculturalism and mechanistic disdain for robots in human-to-robot communication scenarios. *ResearchGate:* website. URL: [https://www.researchgate.net/publication/263242683\\_The\\_effects\\_of\\_multiculturalism\\_and\\_mechanistic\\_disdain\\_for\\_robots\\_in\\_human-to-robot\\_communication\\_scenarios](https://www.researchgate.net/publication/263242683_The_effects_of_multiculturalism_and_mechanistic_disdain_for_robots_in_human-to-robot_communication_scenarios) (accessed: 29.02.21).
5. Fisher, Sharon. OS/2 EE to Get 3270 Interface Early: magazine. San Francisco: InfoWorld, 1988. 78 p. URL: <https://books.google.com.ua/books?id=YToEAAAAMBAJ&printsec=frontcover&hl=ru&rview=1&lr=#v=onepage&q&f=false> (accessed: 03.03.21)
6. Charu Rudrakshi, Amit Varshney, Bharath Yadla, Dr. Rama Kanneganti, Kiran Somalwar. API-fication: book. Noida: HCL, 2014. 14 p. URL: [https://www.hcltech.com/sites/default/files/apis\\_for\\_dsi.pdf](https://www.hcltech.com/sites/default/files/apis_for_dsi.pdf) (accessed: 06.03.21)

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## **IT in Foreign Language Teaching in pandemic period**

2020 became a turning point for many countries of the world, including Ukraine. A lot of people started to work remotely using IT and internet. This trend is especially obvious in distance teaching/learning process. The use of information and communication technologies (ICT) in foreign language teaching reveals its enormous potential as effective teaching tools. To improve foreign language teaching skills by means of IT use is one of primary educational objectives.

There is a number of differences in the use of technology compared to other teaching methods.

Benefits of Information Technology use:

- focus on modern learning goals,
- the efficiency and quality of education,
- student motivation increase,
- memorable and emotional classes,
- individual approach,
- strengthening student's independence,
- improving the quality of visual aids,
- round-the-clock availability of the course (the ability to use it wherever there is Internet),
- facilitating teachers work.

Disadvantages of Information Technology use:

- insufficient provision of the educational institution (lack of equipment, poor internet),
- many students do not have computer and Internet skills,
- many teachers do not have computer and Internet skills,
- most students only have access to the Internet at home,
- many teachers only have Internet access at home.

According to the results of a survey that was conducted in March 2021 on students of NTU "DP", 89% of those being interviewed support the process of self-study and combining English and IT, respectively, 11% do not support this option as efficient one.

The advantages of computer training are numerous. Criteria for the usefulness of computers in the classroom should be developed for every specific age group of students in accordance with the curriculum and discipline content.

As for the criteria for the usefulness of a particular technology in education, it can be defined as follows: one or another educational computer technology is advisable

when it allows students to obtain such learning outcomes that cannot be obtained without the use of this technology.

The use of Information Technologies and Internet resources in English teaching provides the opportunity to more fully implement a whole range of methodological, didactic, pedagogical and psychological principles. The use of computer educational programs in English teaching increases the efficiency of solving communication problems, develops different types of speech activity of students, forms a stable motivation for foreign language activities of students in the classroom.

Application of IT allows students to practically apply their knowledge, skills and abilities, and therefore it is one of the forms of organizing research and cognitive activities, in which cooperative collective activities are successfully implemented. ICT makes it possible to increase the motivation for learning a foreign language. Application of Information Technologies and Internet resources in English learning makes it possible to achieve stable positive results and has different levels: Basic User, Independent User, Proficient User.

The use of Information Technologies and Internet resources in the English teaching is relevant today, since the teacher must be interesting for his students, keep up with the times, improve his pedagogical skills and the level of intelligence.

ICT provides a unique opportunity to quickly acquire new learning skills, to form elasticity of thinking, and also gives the effect of novelty. Students can easily gain new knowledge, develop language skills independently, as well as master critical thinking on their own.

**References:**

1. Benefits and drawbacks of controlled laboratory studies of second language acquisition. Yang L. R. Cambridge: Cambridge University Press, 2001. — 173–193 pp.
2. Problems of application of multimedia technologies in higher education // High technology in pedagogical process: abstracts Interuniversity Scientific Conference of university teachers, researchers and specialists. Frolova NH — Nizhni Novgorod, VSPI, 2000. — 96–98pp.
3. New pedagogical and information technologies in the education system. Polat ES — Moscow, education, 2000–45–46pp.

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### **Virtual Reality opens the new era for museums**

The prototype of a modern museum was founded in Alexandria in 290 BC. Being the cultural heritage of every country for centuries, museums still retain their relevance. And this fact cannot but amaze. However, our world is intensely developing these days due to the technological evolution which also helps to popularize such spheres as art, history, science, and these directions actively interact with IT. So, museums are no exception and they start to cooperate with modern technologies to attract more visitors. One of the most perspective technologies is Virtual Reality. According to the experts, this direction is giving museums a new flow of visitors and helping to build the new era of their cultural activities [1].

The increasing use of VR in museums includes 3D tours around the halls filled with exhibits. Everyone can just sit on their sofa and walk through showpiece expositions with the help of a computer. You can independently choose which hall to visit and which object to approach. Every detail is created using virtual reality modeling and is a complete copy of real objects. Therefore, you will hardly feel the difference between a real tour and a virtual one. Such tours are available on the websites of the most famous museums in the world.

Besides, the need for remote access to exhibitions has increased because of the Covid-19 pandemic and the worldwide quarantine. So VR tours give a great opportunity to keep people interest in masterpieces. For example, the Parisian Louvre has scored 10.5 million online visits during the quarantine thanks to free tours on its website. This confirms that VR expands the boundaries for every connoisseur of art making current information technologies useful and necessary.

Another VR technology used in art galleries puts a person inside a painting with virtual reality glasses. Now only three museums in the world can partly provide such a tour. However, it is gaining momentum in the development of such virtual programs. So at an early date, a lot of museums will give a possibility to get into loved pictorial art in many galleries. It is a new way to learn about famous paintings with the help of IT, because it promotes more understanding of what the painter wanted to say or what he felt while drawing.

Actually, it is not easy to create the right atmosphere of masterpieces, it is a huge work of specialists that use various software to implement the idea [3]. These VR technologies are created by a combination of moving images, sound and interactive design. Moreover, developers need to conduct an in-depth analysis of the painting history, create detailed 3D models of objects and program them into a single space transmitting a picture. It costs a lot of money. Thus, only museums with large funding can afford it. For instance, Louvre Museum started to test such a technology in 2019. “Mona Lisa: Beyond the Glass” is the first such VR experience presented to the public

[4]. It was made by the Louvre Museum specialists. This project gives a chance to visitors to understand what is behind the curtains. So we already can “touch the greatness”.

Another case of VR application includes enlivening exhibits. Historical museums contain a lot of ancient artifacts and long-dead species, and VR can help bring these elements to life. Creating 3D patterns of rare specimens is a potential trend in science. It is a great example of VR that can be used for paleontological museums. Virtual paleontology consists of a wide variety of computational techniques and methods enabling to add life to static objects. Because of their great potential and increasing availability, these methods have become immensely popular in the last few years.

A huge number of museums are currently working on many projects with VR enlivening. The most popular example is “Hold The World” development of the Natural History Museum in cooperation with the Sky broadcaster. It offers the audience one-on-one meeting with Sir David Attenborough and his world-famous collection of sparse species for only 4\$ [5].

Also, VR making extinct species alive gave impetus to the creation of Jurassic Flight. It is a project of the Cincinnati Museum of Natural History and Science which allows the visitors to explore prehistoric skies and interact with dinosaurs using virtual technology. The creators of the project developed a detailed model of dinosaurs thanks to the high development of 3D visualization and deep computer analytics [7]. Now many museums are creating similar VR experiences as Jurassic Flight has shown how many visitors are interested in trying the potential of interacting with extinct species.

As we know, one of the main purposes of museums is educational function. In this case, VR technologies are the best tools to present useful knowledge to a wide public. There are many academic projects based on the use of virtual elements. Because when a person is in such a reality, he is focused on certain visual information and nothing distracts him. So he understands the content of the project better. Another advantage is the ability to follow your own path of choice thanks to the independence of VR. The example is the famous educational project “Journey into the heart of Evolution” created by the French National Museum of Natural History and the Orange Foundation. Due to this development, visitors have a great chance to explore the connection between living species and study them in detail [9]. A participant of this VR experience falls into the reality with a moving replica of the “tree of life” - a model and research tool used to map the evolution of life and describe the relationships between organisms both living and extinct. People are more interested in such a way of learning than the usual way. Thus, it is an amazing example how modern IT can help to learn about the past.

Finally, the newest use of VR is the creation of virtual theaters in museums. This is to employ the full immersion of the audience in a virtual environment using a special headset in combination with live voice accompaniment. It contributes to a complete immersion of a person in a new reality and creates a complete feeling of being in a certain place. Such a project offers much entertainment as well as a visit to a familiar theater.

Such experience was started by the National Geographic Museum in Washington in 2020. The attraction consists of a completely unique interaction of live performances and breathtaking photographs [4]. This is also accompanied by a guided virtual exploration where guests can go beyond the photographs on the screen and travel to the most impressive locations in the world. That means that different museums may show more information and visualization on their exhibitions.

So, it is obvious that nowadays Virtual Reality is recharging popularity for museums. It expands their services and opportunities making museums even more attractive and popular in the 21<sup>st</sup> century. VR technologies expand museum borders. Therefore, we can make sure that IT industry evolves not only the computer sphere but also the cultural world that benefits all of the humanity.

### References:

1. Virtual Reality is a big trend in museums. *MuseumNext*: web-site. URL: <https://www.museumnext.com/article/how-museums-are-using-virtual-reality/>
2. Augmented Reality takes museum-goers inside Rembrandt painting. *MuseumNext*: web-site. URL: <https://www.museumnext.com/article/augmented-reality-takes-museum-goers-inside-rembrandt-painting/>
3. Mona Lisa: Beyond the Glass. *VIVE Arts*: web-site. URL: [https://arts.vive.com/us/articles/projects/art-photography/mona\\_lisa\\_beyond\\_the\\_glass/](https://arts.vive.com/us/articles/projects/art-photography/mona_lisa_beyond_the_glass/)
4. The National Geographic Museum Releases a Virtual Tour. *National Geographic*: web-site. URL: <https://blog.nationalgeographic.org/2020/04/03/the-national-geographic-museum-releases-a-virtual-tour-of-its-current-exhibition-becoming-jane-the-evolution-of-dr-jane-goodall/>
5. Sky VR: Hold the World. *Oculus*: web-site. URL: <https://www.oculus.com/experiences/rift/2331434793563555/?locale=ru>
6. How Virtual Reality & Augmented Reality Transform Museums. *Versoteo*: web-site. URL: <http://versoteq.com/blog/how-virtual-reality-augmented-reality-transform-museums>
7. Jurassic Flight VR experience draws crowds at Cincinnati museum. *Bloolooop*: web-site. URL: <https://bloolooop.com/technology/news/jurassic-flight-birdly-vr-cincinnati/>
8. Museum of Natural History & Science today. *Cincymuseum*: web-site. URL: <https://www.cincymuseum.org/sciencemuseum/>
9. Journey Into The Heart Of Evolution. *MNHN*: web-site. URL: <https://www.mnhn.fr/en/explore/virtual-reality/journey-into-the-heart-of-evolution>

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## **Modern trends in the field of creating animation using information technology**

Thoughts about the invention of a moving picture appeared when it became apparent that only one or two images is not enough to capture an event. The first attempts to capture movement in drawings are attributed to Paleolithic cave drawings, where animals were depicted with many legs overlapping each other. An earthen vessel was found in Shahr-i Sokhta (Iran), the age of which is estimated at 5000 years. 5 images of a goat in motion were made on the walls of the vessel.

For the first time, the principle of inertia of visual perception, which underlies animation, was demonstrated in 1828 by a Frenchman Paul Roget. The object of the demonstration was a disc, on one side of which there was an image of a bird, and on the other - a cage. During the rotation of the disc, the audience saw the illusion of a bird in a cage.

George Mellis accidentally invented a shooting technique called "stop-motion". The essence of this technique was as follows: Melis shot a shot, then changed something in the scene being shot, then shot the next shot, and so on. Then, quickly changing these frames, he achieved an animation effect.

Walt Disney was the first to use sound in animation. Disney was also one of the pioneers in the use of color in animation. One of the most significant innovations of the Disney studio was the invention of the multi-plane camera, which made it possible to obtain the effects of parallax, elongated shapes, depth and fuzziness.

The earliest computer animations of the late 60s and early 70s were produced jointly by researchers in university laboratories and individual artists. The first studies in computer graphics and animation took place in 1963 at Massachusetts Institute of Technology, when Ivan Sutherland developed a constrained interactive problem solving system on a vector display.

A very important direction in computer animation is the creation of an artificial person, indistinguishable from the real one. In these films, the quality of human animation was so poor that it was obvious to moviegoers that the character was unreal, and in these films, computer actors played secondary roles.

At the end of the 20th century, a new technology for the production of animation called motion capture appeared. A motion capture object is usually equipped with some kind of measuring equipment so that the position of key points on it is easy to detect and fix at any time. After that, you can place a 3D computer model in these positions and animate it so that it will repeat the movements of the calculated positions. Such iconic animated characters as Davy Jones from "The Pirates of the Caribbean", Hulk from Marvel films and Gollum from "The Lord of the Rings" were created by applying this technology and Autodesk Maya as well.

With the development of computer technologies, the process of creating animations was also digitized and with the help of various animation programs it became possible to draw characters and backgrounds directly on a computer with their subsequent animation, so, nowadays, anyone can start doing it.

Adobe Animate and Flash are both popular for hobbyist animation. They provide a huge number of tools to bring any fantasy to life in the form of traditional or 2D vector animation. You can also use such software as Pencil 2D, Synfig Studio, Creatoon, Blender, etc. Stop Motion Studio is the perfect choice for the absolute beginner in video production. The program is indecently easy to learn, even a fifth grader will figure it out. With its help, you can create funny videos in the style of stop motion, when the animation and movement of objects is built from successive frames that can be used both on a computer and on a phone or a tablet. Toon Boom Harmony will help you a lot if you want to create artwork, showcase a story with a 2D image, or create a unique message for your audience. If you cannot find the right software, you can try online tools that are easy to use and do not require design skills or technical knowledge.

Particularly popular is 3D animation, which has developed significantly over the past few years. Some might be interested in it as a hobby, while others see it as an excellent source of income. However, only a few can master this art and not only because of the complexity. Most programs are expensive, and it is not reasonable to buy if people are not professionals in this field.

Simple programs offer users sets of premade elements. You can slightly edit the model and get your own unique object. These programs are mostly often used for interior visualization and other concepts. With their help, it is quite easy to make animation, although they do not give so much room for creativity. Such programs allow even beginners to quickly join the world of 3D animation.

DAZ Studio is very convenient for animation because it practically performs only one operation and does not have tools for independent modeling. Unlike many 3D animation software, iClone allows you to see your work immediately. Instant rendering speeds up your work a lot.

Unlike Autodesk Maya, 3ds Max provides more tools for artists to create animation. It has a great utility called Particle Systems that allows you to simulate fire, smoke, rain, etc. Hair & Fur allows you to create realistic hair, fur, grass, and more. 3ds Max was used to create such films as "X-Men", "The Day After Tomorrow" and "Jurassic Park".

LightWave 3D is a full-fledged 3D graphics editor that is mostly often used in the film industry and with the help of which such masterpieces as «Alice in Wonderland», «Avatar» and «Iron Man» have been created.

In addition to entertainment purposes, computer animation is known to be widely used in the advertising of goods and services to attract more buyers. It is also used for educational purposes - to show visually a particular process or structure in a particular field of study.

**References:**

1. Dave Kehr. Animation motion picture. Access mode: <https://www.britannica.com/art/animation>
2. Renderforest. Top 55+ Best Animation Software in 2021. Access mode: <https://www.renderforest.com/blog/best-animation-software>
3. Akbar Ali. The Future Of Computer Animation. Access mode: <https://www.designingcrossing.com/article/780040/The-Future-of-Computer-Animation/>
4. Hive studio. The uses of animation. Access mode: <https://hivestudio.net/the-uses-of-animation/>

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## Grover algorithm as an effective solution to SAT problem

In this article, the first NP-full problem - SAT problem and its possible solution with the quantum algorithm will be analyzed. One of the most outstanding quantum algorithms - Grover's algorithm – will be used to undertake this task. There is no known classical algorithm that would solve an NP-complete problem in less than exponential time, and this algorithm allows it to be checked in polynomial time. Also, the article considers the comparative analysis of the implemented Grover algorithm on the Q# and IBM realization.

Besides the Internet surfing and playing computer games, any computer is designed to facilitate or even solve certain problems that arise to the user of this device. Some of these problems go beyond ordinary use and represent complex computer science tasks. Thanks to computer power a lot of them are easy to beat in a very small amount of time. Nevertheless, there are some standalone problems, which take thousands of years to solve even for the most powerful computer. These problems are called NP or non-deterministic polynomial time problems. They require a brand new type of solving algorithms, that is why quantum computers have been developed. To demonstrate the power of quantum computing it has been decided to find the effective solution to the SAT problem, the first of the known NP problems.

So, what is the SAT problem? Boolean satisfiability problem (SAT) is the problem of determining whether there is an interpretation that satisfies a given Boolean formula. In other words, it asks if the variables of a given Boolean formula can be sequentially replaced with TRUE or FALSE values so that the formula will be TRUE. If this is the case, the formula is called satisfiable. On the other hand, if such equality does not exist, the function expressed by the CNF formula has FALSE for all possible assignments of variables and the formula is unsatisfiable. For instance, the following formula has three literals ( $\neg$  indicates a false literal,  $\vee$  is a Boolean "OR"):

$$(x_0 \vee x_1 \vee \neg x_3)$$

$$x_0 = 1 \text{ OR } x_1 = 1 \text{ OR } x_3 = 0$$

Fig. 1.1 - General view of the clause

The only state that does not satisfy this disjunctive monomial (or simple clause) is:

$$x_0 = 0 \text{ AND } x_1 = 0 \text{ AND } x_3 = 1$$

Fig. 1.2 - A condition that does not satisfy the clause shown in Fig.1.1

If at least one of these criteria is met, the clause is satisfiable, so each clause can be considered as including specific combinations of variables. The solution to the SAT

problem is to assign  $n$  variables that satisfy each clause. Finding these variables takes polynomial time, that means it is solvable in  $2^{O(\log n)}$  time.

Before leapfrogging to the effective solution, let us inquire about some classical algorithms that try to solve this problem in the most efficient non-polynomial time.

The Davis-Putnam-Logemann-Loveland or DPLL procedure is a complete, systematic process of finding a solution to the SAT problem for a given CNF or proving its unsatisfiability. The algorithm is performed by selecting a literal, assigning a truth value to it, simplifying the formula, and then recursively checking the feasibility of the simplified formula; in this case, the original formula is satisfiable; otherwise, the same recursive test is performed, assuming the opposite truth value. The DPLL algorithm depends on the choice of a branch literal. Efficiency is greatly affected by this choice: there are instances for which the runtime is constant or exponential, depending on the choice of the branch literals. But on the other flip of a coin, the worst-case performance is  $O(2^n)$ . That is why it could not be called an efficient and stable solution for the SAT problem.

Another one is the CDCL algorithm. CDCL solvers implement DPLL, but it has drastic differences: CDCL uses back jumping on the clause and it is non-chronological. Memorizing a clause through the conflict analysis does not affect reliability or completeness. Conflict analysis identifies new clauses using a resolution operation. That approach increases efficiency significantly, but still faces the problem of choosing an initial literal.

Unfortunately, classic solvers have a solution to the problem in a non-polynomial amount of time, so for cases when there are large amounts of data, these algorithms have very little value and leave the SAT problem unsolved. But there is a ray of light in a new type of computation: quantum calculation. In classic computers, a traditional brute force search requires an average of  $N/2$  comparisons in a database of  $N$  elements. However, quantum Grover's algorithm can identify a target in an unordered database only in  $O(\sqrt{N})$  time. Concerning it, the Grover algorithm could stand as a SAT solver that can solve this problem in polynomial time.

How is this efficiency being reached? In short view, the Grover algorithm consists of the following steps:

- Choose the qubit initialized as  $|0\rangle$ (Qubit zero);
- Use superposition on the qubits:

$$\sum_{x \in \{0,1\}^n} \frac{1}{\sqrt{N}} |x\rangle.$$

Formula 1.1. Superposition function

- Use Oracle function, that inverts the amplitude chosen qubit of the component and leaves everything else unchanged;
- Apply Grover 's diffusion gate to amplify the qubit`s amplitude;
- Iterate steps 3 and 4 until the probability amplitude reaches at least  $2/3$ ;
- Perform the measurement  $\Omega$ , that converts the value of qubits to a probability scale;
- The variants with the high probabilities are the solutions of SAT problem.

The algorithm is shown more clearly in the diagram below:

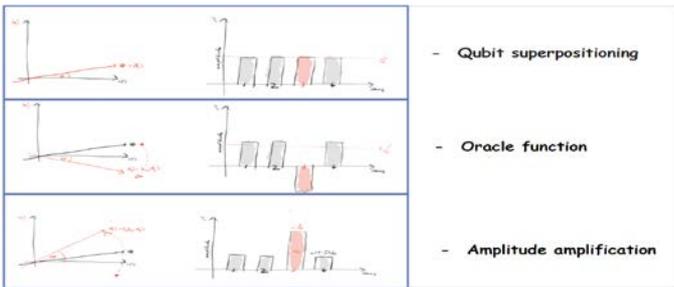


Fig. 1.3 - Grover algorithm schema

For a deeper algorithm investigation, it was implemented with the Q# language and compared with the existing implementation by IBM:

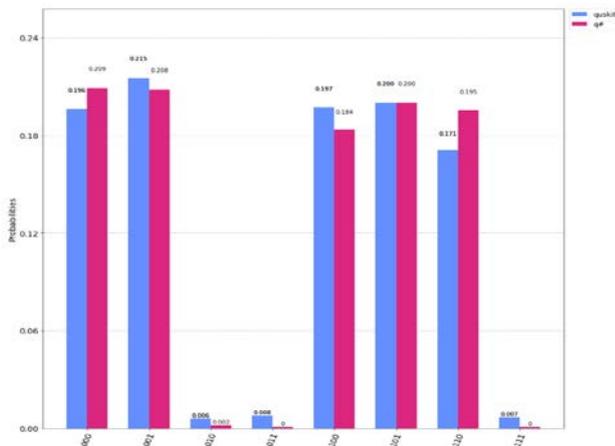


Fig. 1.4 - Histogram of 3 literals and 3 clauses

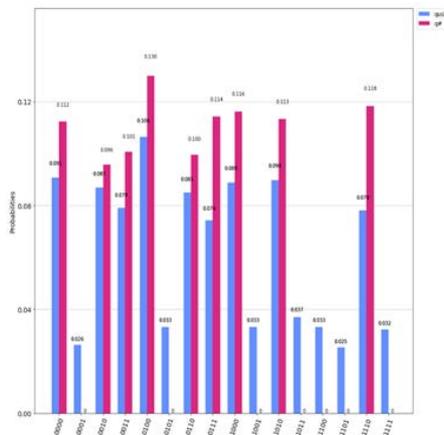


Fig. 1.5 - Histogram of 4 literals and 4 clauses

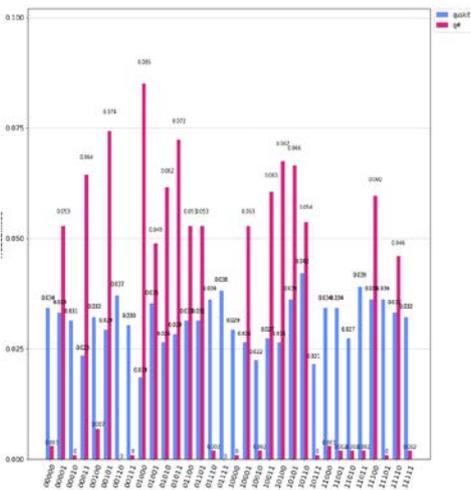


Fig. 1.6 - Histogram of 5 literals and 5 clauses CNF benchmark

So, according to the histograms, we can see that the algorithm, implemented by such a big company as IBM, fails and the solution cannot be determined unambiguously. This implies an unambiguous disadvantage of this approach: using a very large number of qubits leads to unstable calculations. It is because of the very complex construction of a quantum computer.

So, we have found that there is a possible solution for the SAT problem, that takes polynomial or even less time. The topicality of solving the SAT problem in polynomial time is extremely high for the further development of the theory of algorithms. Therefore, a comparison on a large number of qubits does not make sense. Hence the Grover algorithm is not a silver bullet for the SAT problem solution. But even having such a problem, we can see that in the future we will have a way of solving not only the SAT problem, as a prominent representative of NP-problems, but all scope of non-polynomial problems.

### References:

1. Emma Strubell. Grover`s algorithm // An Introduction to Quantum Algorithms. COS498 – Chawathe, 20 – 28, Spring 2011.
2. "The Complexity of Theorem-Proving Procedures". *Proceedings of the 3rd Annual ACM Symposium on Theory of Computing*: 151–158. [Online]. Available: <http://www.cs.toronto.edu/~sacook/homepage/1971.pdf>
3. M. Davis and H. Putnam. A computing procedure for quantification theory. *CACM*, 7:201–215, 1960.
4. Armin Biere, Marijn Heule, Hans van Maaren and Toby Walsh (Eds.). *Handbook of Satisfiability*. IOS Press, 131 – 153, 2009.
5. Qiskit. Multiple qubits and entangled states. [Online]. Available: <https://qiskit.org/textbook/ch-gates/multiple-qubits-entangled-states.html>
6. John Wright. Lecture 4: Grover`s Algorithm // Quantum Computation. CMU 15-859BB, Fall 2015.
7. F. van Harmelen, V. Lifschitz and B. Porter. *Handbook of Knowledge Representation*. Elsevier B.V., 89 – 134, 2008.
8. Abraham Asfaw, Luciano Bello, Yael Ben-Haim, Sergey Bravyi etc. *Learn Quantum Computation using Qiskit*. Github, 2019. [Online]. Available: <https://github.com/Qiskit/qiskit-textbook>.

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## **Technology and methods of automatic facial identification and recognition**

Nowadays, information technology has taken a big step forward in its development. People found out how to use neural networks and artificial intelligence and came up with idea of face recognition. This technology comes from the pattern recognition. We are going to find out how this invention works and what is its application.

Face recognition can be used to identify people in photos, video or in real time by companies and government for smartphone safety, law enforcement, and facial biometrics. Manufacturers of mobile phones use this technology as an additional type of protection of their products, for example, Face ID. Face identification helps law enforcement to define and catch lawbreakers with high precision. And facial biometrics is commonly used in airports for secure boarding instead of fingerprints like a more convenient and more advanced way of security measures.

Let us analyze how face recognition technology works. As it is known, a pattern recognition is a cognitive process that happens in our brain when we match some information that we encounter with data stored in our memory. For example, when we see an object, we compare the pattern of the object with the information in our mind to figure out what we see. Speaking about machines, we can teach them to think the same way as we do. For this task people created artificial neural networks.

Neural network is an attempt to reproduce the work of the human brain using mathematical methods to create machines with artificial intelligence. Furthermore, we need to teach it to distinguish patterns with high precision to identify the class that the object belongs to. Artificial neural network is usually trained by a teacher. This means the presence of a training set (data set) that contains examples with true values: tags, classes, indicators.

These networks comprise such three components as input layer, hidden layer, and output layer. The input layer is the first layer in the neural network to take incoming data and then pass on to subsequent layers. The hidden (computational) layer applies various transformations to the input data and all the neurons in the hidden layer are connected to each neuron in the next layer. The output layer is the last layer on the network to receive data from the last hidden layer. With its help, we will be able to get the required number of values in the desired range. Input pattern comes to each layer and being divided into separate elements is compared by neural networks with every tag and other values to realize what kind of object it is. Network does not really work with actual patterns and its attributes; they are getting assigned with numeral values. The set of all attributes is called a vector.

Now we can superficially understand how neural network works and how to use them for pattern recognition technology. It is aimed at the automated discovery of patterns in all kinds of data and visuals as well.

So, the face recognition works in the following order:

1. finding a face in the image, video or in real time.
2. analyzing specific facial features.
3. comparing known faces with the data base.
4. making a conclusion in terms what a person it is.

People teach the convolutional neural network (CNN) for each step before loading it into computer systems. This long process is called a deep learning that trains network to compare people using a huge data set containing different faces. Each feature is a certain number associated with a particular eye, nose or distance between the eyes, and this set of features is known as a vector. A neural network collects many features, and accordingly, the dimension of the vector is large. It is impossible to imagine a point in such space since our brain is limited to only three dimensions. But this is not the point, the main thing is that artificial intelligence works with such vectors without the slightest problem.

When the convolutional neural network has learned to distinguish features using two images, we collect several identical neural networks into one block and continue training. Next, we give three photos where two of them show the same person but with little differences (different haircut, makeup), and the third photo of another person. The task of our new neural network is not just to highlight some attributes of each face, but to choose them in a way, so we display these vectors in space, where the distance between first and second images (of the same person) was minimal, and the third vector was as far away as possible. We continue training by giving thousands of examples until it compares images with high precision. Besides, artificial neural networks are not learning when you are using the device.

Facial biometric system is looking for faces in image, usually taken by camera, processing each detail, and comparing them with details in photos from database. Phone's Face ID technology trained to highlight some specific features of the face (shape, size, distance) and distinguish one from the other. Phones do not save the photos of the customer, because it does not make any sense. It saves only facial features as vectors and compares them every time you try to unlock your phone.

Therefore, three main face recognition technologies should be emphasized:

**1. Recognition only with a camera.** That is the mostly common method using a pre-trained neural network and comparing the distance between feature vectors. The main disadvantage of this method is its dependence on lightning. Due to that fact a face recognition works extremely poorly in the dark.

**2. Use of additional IR-illumination.** The only difference with the first method is that there is absolutely no need for external lightning for recognition.

**3. Depth map construction.** This method uses the same neural networks but analyzes a 3D face image instead of a flat one. Although, it should be mentioned that this technology is extremely rarely applied.

To conclude, a face recognition technology is improving and becoming more sophisticated as face definition requires more accuracy. This progressive and convenient technology is widely used in many countries as it is one of the most user-friendliness or non-intrusive biometric techniques. It provides a more efficient code scheme and makes hackers virtually impossible to steal any sensitive information thus increasing personal protection in human -computer interaction.

**References:**

1. О. Сало, “Как работает Face ID и распознавание лица на Андроид смартфонах”. [Electronic resource] Available at:

<https://deep-review.com/articles/face-id-and-face-unlock-explain/>

2. S. Isakov, “Как работает нейронная сеть: алгоритмы, обучение, функции активации и потери”, [Electronic resource] Available at:

<https://neurohive.io/ru/osnovy-data-science/osnovy-nejronnyh-setej-algoritmy-obuchenie-funkcii-aktivacii-i-poteri/>

3. EFF, “Face recognition”. [Electronic resource] Available at:

<https://www.eff.org/pages/face-recognition#:~:text=Face%20recognition%20systems%20can%20be,crimes%20they%20haven%27t%20committed.>

4. Z. Gimon, “What is Pattern Recognition in Machine Learning”. [Electronic resource] Available at:

<https://huspi.com/blog-open/pattern-recognition-in-machine-learning>

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## **Information War and Information Weapon**

**Information War** is the presentation of information in a way that forms in a society or a group of people the desired point of view, public opinion, the course of complementary logical thoughts, an exhaustive system of views on certain issues in favor of the organizer of information propaganda. As a result, there is an awareness of individual facts or events in the light necessary for the manipulator, the formation of the necessary worldview or life position on issues in which there were previously contradictions or misunderstanding. In the absence of contradictions and the existing constant system of views, the task of an information war is to generate doubts. A person is arranged in such a way that he is always looking for answers to questions that bother him, controversial questions, which is an integral feature of continuous processes of cognition.

The relevance of the topic is due to the fact that the rapid development, the conduct of information wars, and its widespread use has led to the emergence of propaganda tools in our daily life. The XXI century can be characterized as the century of the emergence of new methods of warfare, we are now talking about the concept of "information war". Of course, people used to be able to influence each other, but only during direct communication with the interlocutor with the help of their oratorical qualities. But right now, having accumulated the necessary experience, in the modern world, "permeated" by means of mass communications, where every second person has access to TV and the Internet - this has reached its apogee. The information component has become indispensable in any political conflict. We live in a digital age, the global network and new technologies have made it easier for the media to convey the information they need to people.

Information war, in comparison with the usual one, affects all aspects of society and affects everyone, its consequences are unpredictable, therefore, the consideration of this topic aroused interest. And although such a term as information war is very common in our time, most people do not have a clear idea of what it means. And all because this term appeared relatively recently, therefore this topic is new for our society and requires deeper study.

### ***Information weapons, its types, objectives of information wars***

- Information weapons are:

- computer viruses;
- logical bombs (software bookmarks);
- means of suppressing information exchange in telecommunication

networks,

- Falsification of information in the channels of state and military management;
- Means of neutralization of test programs;
- Miscellaneous mistakes that are deliberately introduced into the object software.

- Information weapons are used as:

- a means of destruction, distortion or collapse of information;
- method of overcoming protection systems;
- means of limiting the admission of legitimate users;
- means of disorganization of work of technical means, computer systems.

The strategy of using information weapons is exclusively offensive in nature. The register of modern technologies of network wars and new types of weapons contains weapons that are used in the field of ideology, media, education, upbringing, culture, and propaganda. This weapon is carefully selected and dosed information, repeated the right number of times through the right information channels. If the weapon is used, then there is an enemy at whom it is aimed. According to the research results, there are three main objects of information damage:

- Civil society of the country;
- The governing body of the state;
- Material objects and infrastructure

Information impact is indeed a weapon of mass destruction and has a lot in common with nuclear weapons. Despite the fact that often an information attack is of an implicit, covert nature, this weapon has a permanent effect on a huge number of people. In addition, it is characterized by both immediate and delayed effect of defeat, the effect of consolidation and reproduction of the damaging effect.

The effects of information weapons include a complete analogue of infection and mental and social mutations. This contamination with subversive ideology can cause the spread of many consequences, a lost generation, a generation of unfulfilled hopes, changes in the mentality of the population. The offensive nature of information weapons largely determines the face of information war and makes it possible to identify a potential information aggressor. This means that the amount of information is purposefully moving from one country to another, and is a measure of information aggressiveness. In this case, it does not matter what kind of information the transmitted information has. When comprehending this statement, one must proceed from the fact that in the era of information technology, the security of a system is already beginning to be determined not only by the knowledge that the given system receives from the enemy, but by the knowledge that it managed to avoid perceiving.

Let's dwell on the capabilities of information weapons. Some unanimously consider it more powerful than nuclear, others prefer not to speak out on this topic, citing the absence of precedents. However, since the spectrum of information weapons is wide (this includes not only the cyber weapons listed above, but also the media, works of mass culture or culture for the masses and art for the masses), the capabilities of all these means are, of course, different. One of the means of information weapon is peaceful propaganda of the advantages of one's own way of life. In particular, the

promotion of the benefits of Western civilization and the Western way of life, as an example.

***Examples of "Information Attacks"***

- China hit the reputation of the Taiwan government.

Taiwan is an independent state, but China considers it its territory. The information campaign of the Chinese bots dealt with a number of domestic political issues in Taiwan. The search for content sources led to a "bots farm" in China. The aim was probably to discredit the opponents of unification with China. Activists were "exposed", political tensions and disagreements between leading military and political figures intensified. China has a powerful army of bots and trolls, who receive 0.5 yuan for each post (about 1.8 UAH on the day of writing).

- Someone obviously tried to influence the US elections.

In 2018, before and during the midterm elections in the United States, unverified information about the elections was actively published on sites with servers in Macedonia. Websites were launched that supported racism, spoke out against immigrants, and talked about conspiracy theories. True, in this case it is not clear whether they were created with political goals to finance foreign customers or simply made money on advertising, luring users interested in politics.

- RF supported a Brexit.

Thousands of Russian bots in Twitter published posts in support of Britain's exit from the EU for several weeks before referendum. More than 13,000 accounts were written in Twitter post with racist and antiimmigrant statements.

- Brexit campaign lasted after a referendum.

As with the 2016 presidential elections in the United States, Russian trolls distorted real events to promote their beliefs. For example, after a terrorist attack on London Bridge, the pro-Russian site has published a photograph of a Muslim woman walking along the bridge and looks into the phone. The article argued that she was supposed to ignore the wounded.

So, in conclusion, I want to say that information war is undoubtedly one of the biggest threats to our society. Society is constantly evolving, and a person acquires new needs for information. The principle of propaganda is based on this. Teaching the younger generation to analyze all the information received is one of the most important tasks for parents and educational and educational organizations. Having analyzed the term "information war", we can conclude that this is an information and psychological attack on various spheres of state life, from civil society to infrastructure. Sources of this can be both computer viruses and television programs.

**References:**

1. <https://businessviews.com.ua/>
2. <http://surl.li/ijha>
3. <https://bit.ly/2KS9E8T>
4. <https://is.gd/EOifw4>

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## Development of a secure web-application using JWT

Since web applications are made up of multiple layers, each layer needs protection. In this article, we will analyze the Browser layer, or rather, how to protect the client side of the application from unauthorized access.

Attacks against web-applications range from targeted database manipulation to large-scale network disruption. Most common type of attack today is cross-site request forgery (CSRF) attack that involves tricking a victim into making a request that utilizes their authentication or authorization. By leveraging the account privileges of a user, an attacker is able to send a request masquerading as the user. For most sites, browser requests automatically include any credentials associated with the site, such as the user's session cookie, IP address, Windows domain credentials, and so forth (Fig 1) [1].

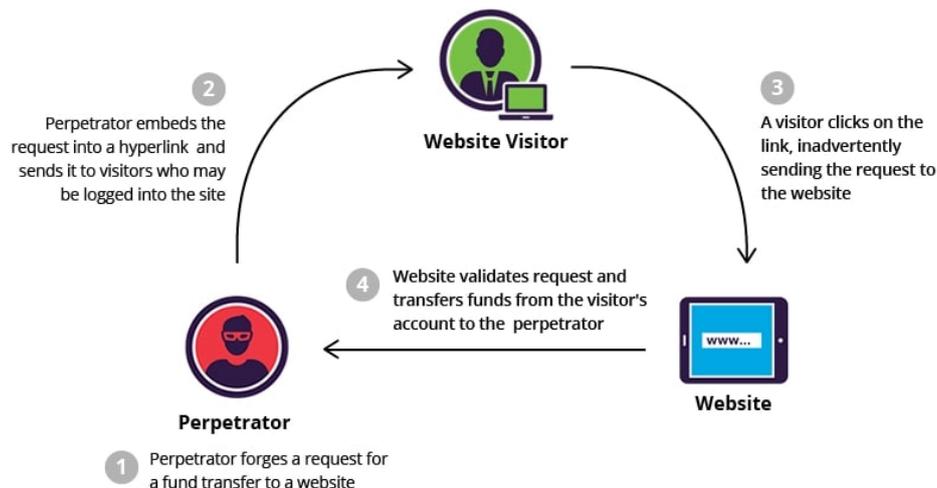


Fig. 1.1 CSRF attack diagram

JSON Web Token (JWT) is an open standard for creating and transmitting data. It can be used to minimize CSRF threat. It provides a way to cryptographically sign a JSON payload to verify its authenticity and integrity, and / or to encrypt the JSON payload to provide confidentiality [2].

HTTPS (HyperText Transfer Protocol Secure) is an encrypted version of the HTTP protocol. It generally uses SSL or TLS to encrypt the connection between the client and the server. An encrypted connection allows the client to securely send sensitive data to the server, such as passwords, personal information, bank details, and more.

Along with HTTPS protocol JWT can provide secure authorization of user and so how it works in practice:

1. The user registers in the application using his own data and the generated Fingerprint, which is encrypted during the request to the server.
2. The server decrypts the data and writes it to the database.
3. The server responds to the client with the Access-Refresh token (JWT) pair.
4. When new requests are made to the server, an Access Token (has a short lifetime and is checked on the Client) and a Fingerprint will be sent.
5. If the Access Token runs out of time, a special request is sent from the Refresh Token (it has a long lifespan) to create a new Access-Refresh Token pair and mash the old ones in the database.
6. If the hacker intercepts the Access-Refresh Token pair and starts using them, during the Fingerprint check, the server will automatically run out of time for the stolen tokens and will not allow the attacker to access the data.
7. During the new login, the real user will receive a new pair of tokens.

As we can see, JWT contains lots of different data (Fig. 2) and consists of three parts called Header, Payload and Signature [3]. But it can be stolen by a hacker, if Internet connection is not private. That is why JWT always has small time of lifecycle. Additional validation on server side, like checking browser time zone, user geolocation, browser version, screen resolution, etc can help to reject hacker requests with stolen tokens [4].

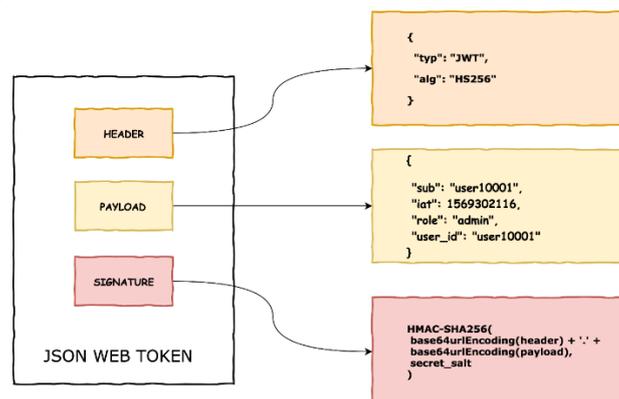


Fig 2. JWT structure

To sum up, JWT is a great way to secure a web application, but without using additional security measures, such as protocols and server-side validation, it becomes useless.

### References:

1. What is web application security? [Online]. Available: <https://www.cloudflare.com/learning/security/what-is-web-application-security/>
2. Demystifying JWT: How to secure your next web app. [Online]. Available: <https://dev.to/kmistele/demystifying-jwt-how-to-secure-your-next-web-app-9h0>
3. JWT Signature Verification and Beyond. [Online]. Available: <https://medium.com/@ahsan.shamsudeen/jwt-signature-verification-and-beyond-2dc3143a81e5>

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## Transaction management using pattern Saga

Developers have been building systems and improving their proficiency in development for a long time. Over the years, various technologies, architectural patterns, and most suitable practices have appeared. Microservices are one of those architectural patterns. It is an accelerating trend these days. The Microservice way offers real advantages including an improvement in scalability, adaptability, agility, and other important services. Nevertheless, this method has some disadvantages, and one of them is transaction management. There are some solutions to that problem. The one that I would love to talk about today is called the Saga pattern.

So why is transaction management difficult in microservice architecture? To understand it we need to know what microservices are and how they differ from monolithic architecture.

It is a common strategy for software development in which the whole system capacity is based on an individual application as a single, independent unit. In software development, this individual block would stand for a particular platform.

In a monolithic application, complete functionality is operated and managed in one place. Of course, an application has an internal composition consisting of a database, client-side interface, business logic, but it continues to be an unbreakable unit.

In a microservice architecture, business logic is split into a lightweight, single-purpose services. In that system, the infrastructure is comparable to collection modules. All services in this kind of architecture are qualified for a particular business purpose. Naturally, a microservice architecture seems similar to a Lego construction that is able to disintegrate into various modules. Typically, each microservice works with its database.

Before diving into a problem I want to explain what a transaction is in simple words. It is a collection of operations that should be executed as if they were a single operation. It means that each transaction must succeed or fail as a whole block. It can never be just partially finished.

If you are using a monolithic architecture with one database everything is pretty easy in the context of managing transactions. There are lots of tools for doing that. For example, if you are using the spring framework you can just stick a `@Transactional` annotation on a method. Though, when you are using microservice architecture, things get more complicated. This is due to using different frameworks or even different programming languages for microservices. And that is where the Saga mechanism comes into.

The saga pattern gives transaction control applying a sequence of local transactions. Every local transaction modernizes the database and distributes a message

or event to begin the following local transaction. If the local transaction declines, the saga executes a set of counterbalancing transactions that invalidate the modifications performed by preceding local transactions.

There are two common ways to performing sagas: choreography and orchestration. Every approach has its advantages and disadvantages.

Choreography is a method to organize sagas in which members transfer events without a centralized authority. With choreography, every local transaction distributes domain events that trigger local transactions in other services.

Orchestration is a method to organize sagas where a centralized authority reports the saga members which local transactions to complete. The saga orchestrator prepares all transactions and informs the members what action to execute based on the circumstances. The orchestrator performs saga calls, stores and represents the states of any task, and manages failure recovery with counterbalancing transactions.

Hence, the Saga pattern gives a strong and adaptable solution for performing long transactions that demand many separate services to accommodate the application or rollback of a collection of data modifications. It can be challenging at the beginning, as it expects a new way of thinking on how to organize a transaction and manage data consistency for a business process that crosses various microservices.

**References:**

1. Chris Richardson, What are microservices? [Online]. Available: <https://microservices.io/> Accessed on: March 12, 2021
2. Wikipedia, Microservices. [Online]. Available: <https://en.wikipedia.org/wiki/Microservices>. Accessed on: March 14, 2021
3. Microsoft, Saga distributed transactions. [Online]. Available: <https://docs.microsoft.com/en-us/azure/architecture/reference-architectures/saga/saga> Accessed on: March 15, 2021
4. Isuru Jayakantha, Microservices : The SAGA Pattern for distributed transactions. [Online]. Available: <https://medium.com/@ijayakantha/microservices-the-saga-pattern-for-distributed-transactions-c489d0ac0247> Accessed on: March 18, 2021
5. Wikipedia, Long-running transaction. [Online]. Available: [https://en.wikipedia.org/wiki/Long-running\\_transaction](https://en.wikipedia.org/wiki/Long-running_transaction) Accessed on: March 19, 2021.

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## **Artificial intelligence and the arts**

Nowadays, many problems can be solved with the help of technology because this area is progressing the fastest. Artificial intelligence (AI) is now being used in many fields, from medicine to engineering. But AI is also very well used in art. Many people fear that AI will deprive people of the opportunity to create and invent, and some believe that machines can never replace humans, because they have formulaic thinking, and they cannot think creatively. But before making a decision, you should look at what results the technologies have achieved in art.

Human creative activity, by definition, is not amenable to automation. However, modern art, in contrast to classical art, has long been worked out as a basic rule - the absence of any rules, and as a basic skill - the ability to develop new skills. Therefore, today it is unlikely to be surprised by the fact that paintings created with the help of artificial intelligence are evaluated in the world art market at the level of hand-made works by a person.

To date, one of the most promising areas for the development of creative skills in artificial intelligence is literature. However, the very idea of automatically writing texts using machines is not new. So, back in 2014, the Associated Press announced that starting from now, most of the news related to company revenues will be created using robots. The use of automated technology has allowed the Associated Press to increase the number of quarterly news on company earnings from 300 to 4400. Later, the news portal YAHOO NEWS used a similar service. In 2016, robotic reporters from the Associated Press expanded their coverage somewhat. They came to be trusted with small news items related to the United States Minor League. It uses robotic journalists and Forbes magazine, for which Narrative Science has created an appropriate specialized platform.

Obviously, the idea of using robots in journalism is gaining momentum. Articles written by artificial intelligence are still very simple, but the co-founder of Narrative Science, Christian Hammond, believes in great prospects for this direction, arguing that by 2025 90% of all texts in the world will be written by artificial intelligence. This is certainly a bold assumption, but some experts partly agree with this. [1]

Also, artificial intelligence became famous in painting. The eDavid robot was designed by the Computer Science Department of the University of Constance in Germany to weld car parts. But as it often happens with natural-born artists, fate decided otherwise, and now eDavid is painting. Its creators, Oliver Deussen and Thomas Lindemeier, equipped the robot with a camera, sensors and software that allow it to process, recreate images in different techniques and even sign the works.

The Painting Fool is the brainchild of Simon Colton, professor at Goldsmith College London. In July 2013, the robot artist had a full-fledged exhibition at the

Parisian gallery Oberkampf. Since then, its work has been exhibited more than once online and offline. The creator of the "fool" was the first to suggest evaluating the creative abilities of artificial intelligence in a way different from the Turing test: a robot artist must have "skill" and "imaginative thinking", as well as be "susceptible" to the surrounding world. Therefore, many of the "fool's" works are based on real events. [2]

Patrick Tresset does not paint anymore, but he still calls himself as an artist. His robot Paul has been one of the most successful creative robots for many years. The works, created together with Paul, have been exhibited in the best museums in the world, and have got the highest assessment by a lot of art connoisseurs and even critics. It seems that they indeed have achieved the status of "works of art" in the eyes of the public.

In 2012, Californian explorer and composer David Cope created a computer emulator that composed melodies in the spirit of Bach, Mozart and Cope himself. In 2014, François Pasche, head of the Sony Paris Computer Science Laboratory, introduced the Evans bot, which could create primitive piano melodies in the style of various composers, such as Bill Evans, Michel Legrand, or George Gershwin. [3]

The main brainchild of the Sony Paris laboratory is the Flow Machines algorithm. It studies the sheet music of various songs (by September 2016 it accounted around 13 thousand) and then gives out a melody on demand with compulsory indicating references and style. In 2016, Sony CSL asked Flow Machines to compose something similar to the style of the famous band "The Beatles" and French musician Benoit Carré was asked to create the lyrics and final arrangement. The result is the track "Dady's Car" that was announced by Sony as "the first pop song" written by AI. However, this cannot be fully true because without the help of a person only a simple melody is written. In December 2016, Pasche and his colleague Gaetan Hadiere presented DeepBach. This algorithm composed music in the style of chorales by Johann Sebastian Bach without the help of people: it was enough for it to listen to the works of the German composer. [4]

It should be concluded that Artificial Intelligence has achieved a great success in creating works of art and possible overtaking people in creating music and painting can be predicted. However, it should be emphasized that in most cases there is great dependence on whether people accept such art, because a lot of people refuse to accept the fact that robots can create art and be competitive with humans.

#### **References:**

1. Abebe, R. (2018, November 29). Why AI needs to reflect society. Forbes.
2. Colton, S. Halskov, J., Ventura, D., Gouldstone, I., Cook, M., and Pérez-Ferrer, B. 2015. "The Painting Fool sees! New projects with the automated painter." *International Conference on Computational Creativity 2015*: 189–196
3. McCormack, J., and d'Inverno, M. 2012. *Computers and Creativity*. Heidelberg: Springer.
4. Colombo, Florian, Alexander Seeholzer, and Wulfram Gerstner. "**Deep artificial composer: A creative neural network model for automated melody generation.**" *International Conference on Evolutionary and Biologically Inspired Music and Art*. Springer, Cham, 2017.

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## **Criticism of the Translation Results of Facebook’s “Transcoder” AI**

Traditionally transcompilers are translators that are designed to convert legacy codebase from one deprecated (dead) language to the most recent one. Thus, the main function of transcompiler is to parse a code in one language (source language), build AST (abstract syntax tree), and produce code in desired language (target language). Many new languages (e.g. CoffeeScript, TypeScript, Dart, Haxe) that are built upon popular languages appeared owing to transcompiler technology use. But this case does not cover all possible options of transcompilers use. This study is focused on one of common transcompilers use – migrating a codebase.

Recently Facebook published an article [1] on their new “Transcoder” AI. Facebook Research organization proposes the approach based on artificial intelligence for problems of programming language translations. Neural network models are very sufficient in the context of natural language translations, but application of these models to transcompilation has been limited due to lack of parallel data in the domain. Nevertheless, the authors found a way to train model in unsupervised approach and managed to get more accurate results than traditional rule-based transcompilers. This is in view of the fact that no parallel datasets were used. The authors' approach is simple, does not require expertise in source or target language, and also can properly align functions from standard libraries across the languages. Model is trained to work with C++, Java and Python but can be easily extended to the most of programming languages.

The problem is real and authors show this with the example of the Commonwealth Bank of Australia. They spent around \$750 million dollars and 5 years of work to convert its platform from COBOL to Java. Using AI that can translate source code to target language with some manual interventions could be much faster and cheaper solution than rewriting the entire codebase from scratch.

Next is the main contributions of the paper as stated by the authors:

- a new approach has been introduced to translate functions from a programming language to another, that is purely based on monolingual source code;
- transcoder successfully manages to grasp complex patterns specific to each language, and to translate them to other languages;
- fully unsupervised method can outperform commercial systems that leverage rule-based methods and advanced programming knowledge;
- validation and a test set composed of 852 parallel functions in 3 languages, along with unit tests to evaluate the correctness of generated translations;
- all code and pretrained models will be publicly available.

the following significant results were obtained using these three principles of unsupervised machine translation:

- **Namely initialization.** Initialization of model with cross-lingual masked language results to pieces of code that is the same for different languages being properly mapped regardless of programming language. Thanks to this principle, it is possible to implement a single neural model that is capable of translating code between many programming languages. It creates strong anchor points from common keywords (e.g. for, while, if, try), digits, mathematical operators, literals, etc. as well to be able to recognize and restore different language constructions in respect to context.
- **Denoising auto-encoding.** Decoder of the model is pretrained to denoise auto-encoded data by guessing correct result from corrupted version of that sequence. To corrupt a sequence authors randomly mask, remove and shuffle input tokens. This also trains decoder to always generate a valid function even if input was noisy.
- **Back-translation.** Source-to-target model is coupled with a backward target-to-source model trained in parallel. The main goal is convergence when input data from source-to-target model after translated to target language and backward will be the same. It is very powerful way to pretrain in unsupervised manner with only monolingual datasets.

For experiments the authors used the GitHub public dataset available on Google BigQuery which contains more than 2.8 million open source GitHub repositories. Ideally, a transcompiler should be able to translate whole project but in this work only function translation is performed. Mainly due to the simplicity of entities and unit testing. Also keeping comments in code increases the number of anchor points across languages.

As results authors show us translation from Python to C++:

Python input

```
def SumOfKsubArray(arr, n, k):
    Sum = 0
    S = deque()
    G = deque()
    for i in range(k):
        while (len(S) > 0 and arr[S[-1]] >= arr[i]):
            S.pop()
        while (len(G) > 0 and arr[G[-1]] <= arr[i]):
            G.pop()
        G.append(i)
        S.append(i)
    for i in range(k, n):
        Sum += arr[S[0]] + arr[G[0]]
        while (len(S) > 0 and S[0] <= i - k):
            S.popleft()
        while (len(G) > 0 and G[0] <= i - k):
            G.popleft()
        while (len(S) > 0 and arr[S[-1]] >= arr[i]):
            S.pop()
        while (len(G) > 0 and arr[G[-1]] <= arr[i]):
            G.pop()
        G.append(i)
        S.append(i)
    Sum += arr[S[0]] + arr[G[0]]
    return Sum
```

## C++ unsupervised translation

```

int SumOfKsubArray(int arr[], int n, int k){
    int Sum = 0;
    deque<int> S;
    deque<int> G;
    for(int i = 0; i < k; i++){
        while((int) S.size() > 0 && arr[S.back()] >= arr[i])
            S.pop_back();
        while((int) G.size() > 0 && arr[G.back()] <= arr[i])
            G.pop_back();
        G.push_back(i);
        S.push_back(i);
    }
    for(int i = k; i < n; i++){
        Sum += arr[S.front()] + arr[G.front()];
        while((int) S.size() > 0 && S.front() <= i - k)
            S.pop_front();
        while((int) G.size() > 0 && G.front() <= i - k)
            G.pop_front();
        while((int) S.size() > 0 && arr[S.back()] >= arr[i])
            S.pop_back();
        while((int) G.size() > 0 && arr[G.back()] <= arr[i])
            G.pop_back();
        G.push_back(i);
        S.push_back(i);
    }
    Sum += arr[S.front()] + arr[G.front()];
    return Sum;
}

```

As can be seen the authors compare output results to expert tools for many times and say that results are very close. But there are several major flaws in outputted C++ listing:

- There are C style arrays. Function itself takes a C array and its size as a separate argument. It considers to be a very bad practice in modern C++. Because size as a separate variable may vary over time with actual size of an array. Such libraries as GSL (Guidelines Support Library) was specifically developed for migration from legacy codebases (with such code) to modern C++. So here `std::array` or `std::span` should be used, at least, in modern C++ codebases. And in order not to be unfounded, there are links to C++ Core Guidelines[2] that was written by C++ language developer Bjarne Stroustrup and very professional people from C++ developers community. If such range error occurs it can lead to huge security flaws and poor application experience.
- In generated output exist a lot of C style casts. It's very bad to see something like that in modern C++. C++ has several special templated functions for casts: `static_cast`, `dynamic_cast`, `reinterpret_cast`, `const_cast`. All of them have "cast" suffix. It's important because it helps to find all casts easily with tools like `grep`. C style casts harder to find because it's just parentheses and type. Also we don't understand semantic of cast in case of C, but it is clearly understandable with C++ casts[3].

- Next huge problem in generated output is narrowing conversion from unsigned `std::deque::size_type` to signed `int` at casts such like `(int) S.size()`. If container possibly will contain a lot of elements such conversion will lead to logic errors and security flaws.
- Formatting problems like while loops without braces. Consider to be bad practice by a lot of guidelines because can lead to logical incorrect code in future.
- And as a minor flaw it's better to use preincrement `++i` than postincrement `i++` if you don't access a variable. Because preincrement version generates less assembly code and executes faster.

The research shows that some problems that are attributed to the spreading AI are partially exaggerated e.g. the fear of total replacement of developers by AI. I have good news. As you can see neural approach with the use of AI produces much worse result compared to the human programmer.

**References:**

1. "Deep learning to translate between programming languages" URL:  
<https://ai.facebook.com/blog/deep-learning-to-translate-between-programming-languages/>
2. Bjarne Stroustrup, Herb Sutter, *C++ Core Guidelines*, R.14: Avoid [ ] parameters, prefer span. URL:  
<https://isocpp.github.io/CppCoreGuidelines/CppCoreGuidelines#Rr-ap>
3. Bjarne Stroustrup, *What good is static\_cast?*, URL:  
[https://www.stroustrup.com/bs\\_faq2.html#static-cast](https://www.stroustrup.com/bs_faq2.html#static-cast)

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## Computer viruses and malware

Probably every user of a computer, smartphone, tablet or other gadgets has encountered viruses and malware. The threat from viruses is increasing every day, and it is very important to know both the types of malware and how to resist them. Let us consider the main types of malware and their threats.

Malware is any program that is installed without or with the user's permission. Such programs can reduce the performance of the computer, steal the user's personal data or destroy them, sometimes the consequences can be critical - turning off your gadget. As cybercriminals use more and more attack methods, the amount of malware is growing every day. There are many different types of malware, including viruses, Trojans, ransomware, and others.

*Viruses.* Viruses get their name from their ability to spread, infecting more and more files. According to Wikipedia, the first virus was created in 1981 by 15-year-old high school student Rich Skrenta and was named Elk Cloner. Apple computers were infected with a virus; when the computer was booted from an infected floppy disk, a copy of the virus was automatically launched. The virus did not affect the operation of the computer, except for disk access control.

*Worms.* Worm is a type of malicious software that spreads through network channels and is capable of autonomously overcoming the protection systems of automated and computer systems, as well as creating and further distributing copies of itself that do not always match the original, and carrying out other harmful effects. The first computer worm called the Morris Worm was created in 1988 by Robbert Morris. This worm has paralyzed the work of more than 6,000 APPANET host computers.

*Adware.* It is an unwanted program written to bombard the computer screen with advertisements. Adware is divided into two types: legal and illegal. Legitimate adware is an official advertisement that does not affect the operation of specific systems and is broadcast to the user within a specific program or site. Illegal adware, on the other hand, is installed by a user on the device without his permission. After installation, it opens the route for advertising content, including pop-ups, banners, links and other similar advertisements, which are supposed to increase the popularity of the respective third-party websites.

*Spyware.* Spyware is software installed without the user's consent, the purpose of which is to covertly track a user behavior on a device or network. This is one of the most dangerous types of malware, as it can steal user's personal information, such as logins, passwords, personal correspondence, bank numbers, etc.

*Ransomware.* Ransomware, as the name suggests, is malware that is installed on a user's device and extorts money from the victim in various ways. Most often, such programs block the operation of the device and require money in order to unlock the

gadget. The first ransomware appeared in 1989 and infected thousands of AIDS discs. The ransomware program, called the AIDS Trojan, encrypted the user data and required from \$180 to \$300 to be sent to a bank account in Panama in order to return the data.

*Rootkits.* Rootkits are viruses that secretly penetrate the victim's system, make their own edits to the registry, install additional software and gain remote access to the device. The main purpose of rootkits is similar to Trojans and worms - to gain control over a device or a user's personal data.

*Trojan.* A Trojan is malware that pretends to be legal and not harmful and enters the user's system, often disguised as something else. The Trojan differs from worms and viruses in its disability to multiply, but it is well disguised in the victim's system, stealing information.

The most harmful modern computer virus examples include Sality, a spyware virus; Virut, a malware that negatively affects the operating system; Styxnet, a dangerous virus that knocks out your computer; WannaCry, a program extorting money; Petya, a ransomware; SQL Slammer, which causes many servers on the Internet to crash; SynAck, a ransomware program.

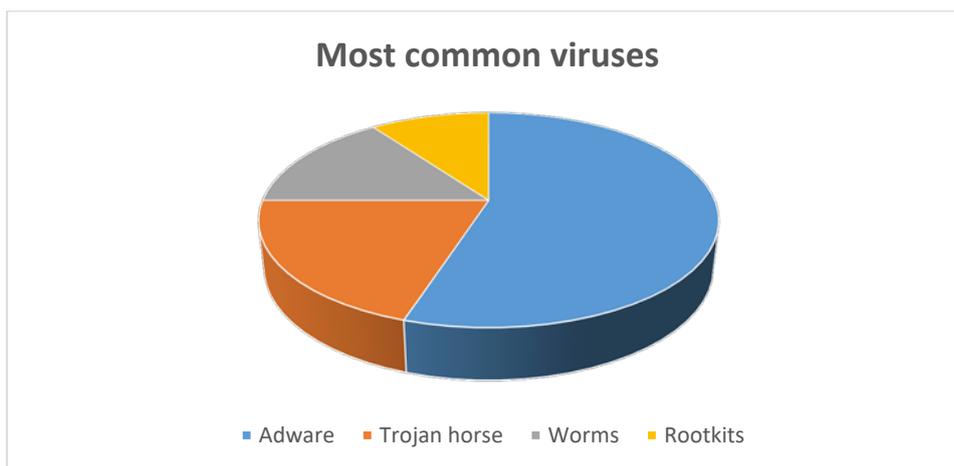


Fig. 1. The most common computer viruses.

In fact, there are a great many computer viruses that harm computer data and can lead to a global catastrophe. But you can protect your PC from them, you just need to be ready at any time by installing an anti-virus program.

In order to infect the devices of individual users or entire companies, cybercriminals use a variety of methods. The main ways of infection are: clicking on malicious links, using an infected hard drive or storage media, downloading files from unverified sites, and infected mails or private messages.

It is very common for cybercriminals to use social engineering for their attacks. The most popular method is phishing emails. They send letters on behalf of your bank, best friend, parent, or someone else to whom the victim has absolute trust. The main task of social engineering is to trick you into clicking on an infected link or downloading an infected file. They may write that they tried to change your password or that your bank card is blocked, and to unblock you need to follow the link.

The most common target of cybercriminals is to steal your personal data, mainly passwords. Criminals can use information from other already compromised devices or use a brute-force method. At the moment there are special programs that try millions of different passwords based on the statistics of standard passwords or known information about the user. For example, if a username is known, then such a program will automatically enumerate thousands of different combinations associated with this name. Most often, users use very simple passwords such as 123987, 123456, qwerty, etc. Therefore, it is very important to use complex and unique passwords for each resource on which you register, since by hacking your account on one of the resources, an attacker can easily gain access to any other, based on the information obtained.

Most often, malware leaves no traces and works invisibly, but sometimes you can notice traces of infection on your device. The most common sign of infection is a decrease in the performance of your gadget. Your device may take longer to run or download programs. Also, common signs of the presence of malware are changes in your browser home page, constant pop-up ads, unknown processes in the Windows Task Manager. The most critical signs are the inability to access device functions, which is usually the result of ransomware intrusion. If you notice any negative changes in the operation of your device, then it is highly advisable to check your device with an antivirus. If your antivirus does not show any results, and the device continues to work suspiciously, use another antivirus.

Here is the list of recommendations how to protect your digital devices from computer viruses:

- Use modern operation systems with a high level of protection against malware programs.
- Constantly update your operation system. Turn on the automatic mode of the operation system updating. If the system does not have such a mode, regularly install updates on your own. Download them from the official website of the developer.
- Work on a computer under the user right, not the administrator's. It will not let the majority of malware be automatically installed.
- Use antivirus software from trusted manufacturers with automatic database updates.
- Restrict access to your computer.
- Choose your sources carefully. Copy and download files only from trusted removable media or online resources. Do not open files that you got from untrustworthy sources, even those sent by your friends. Check if the information has been really sent by them.

So, security on the Internet is very important and plays a big role in the data security of a person and entire enterprises, therefore, it is necessary to be very careful on the Internet. You need to use antiviruses, anti-spyware, choose complex passwords and not to visit unsafe pages. You need to follow the standard rules of computer "hygiene" to keep your data safe. Computer viruses and malware act like common viruses and diseases: they infect unwary people who do not wash their hands or do not

check their gadgets with antiviruses, those who go to dangerous sites or dangerous alleys, etc. Following the standard rules, you can be almost 100% safe.

**References:**

1. Компьютерные вирусы и вредоносное ПО: факты и часто задаваемые вопросы. [Электронный ресурс]. Режим доступа: <https://www.kaspersky.ru/resource-center/threats/computer-viruses-and-malware-facts-and-faqs>. Дата обращения: 20.03.2021.
2. Компьютерные вирусы и методы борьбы с ними. [Электронный ресурс]. Режим доступа: <https://vamark.com/blog/66-ochistka-pk-ot-troyanov-i-chervej/>. Дата обращения: 20.03.2021.
3. Как защититься от компьютерных вирусов. [Электронный ресурс]. Режим доступа: [https://mrtk-edu.ru/media/sub/1535/documents/1\\_%D0%9A%D0%B0%D0%BA\\_%D0%B7%D0%B0%D1%89%D0%B8%D1%82%D0%B8%D1%82%D1%8C%D1%81%D1%8F\\_%D0%BE%D1%82\\_%D0%BA%D0%BE%D0%BC%D0%BF%D1%8C%D1%8E%D1%82%D0%B5%D1%80%D0%BD%D1%8B%D1%85\\_%D0%B2%D0%B8%D1%80%D1%83%D1%81%D0%BE%D0%B2.pdf](https://mrtk-edu.ru/media/sub/1535/documents/1_%D0%9A%D0%B0%D0%BA_%D0%B7%D0%B0%D1%89%D0%B8%D1%82%D0%B8%D1%82%D1%8C%D1%81%D1%8F_%D0%BE%D1%82_%D0%BA%D0%BE%D0%BC%D0%BF%D1%8C%D1%8E%D1%82%D0%B5%D1%80%D0%BD%D1%8B%D1%85_%D0%B2%D0%B8%D1%80%D1%83%D1%81%D0%BE%D0%B2.pdf). Дата обращения: 20.03.2021.
4. Сетевой червь. [Электронный ресурс]. Режим доступа: [https://www.tadviser.ru/index.php/%D0%A1%D1%82%D0%B0%D1%82%D1%8C%D1%8F:%D0%A1%D0%B5%D1%82%D0%B5%D0%B2%D0%BE%D0%B9\\_%D1%87%D0%B5%D1%80%D0%B2%D1%8C](https://www.tadviser.ru/index.php/%D0%A1%D1%82%D0%B0%D1%82%D1%8C%D1%8F:%D0%A1%D0%B5%D1%82%D0%B5%D0%B2%D0%BE%D0%B9_%D1%87%D0%B5%D1%80%D0%B2%D1%8C). Дата обращения: 20.03.2021.

**Section 05 Earth Sciences (Geology, Geodesy, Land Management, Geography, Archeology)**

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**Spectral analysis in open pit mining**

Spectroscopy is the study of the reaction and interaction of a substance with electromagnetic radiation, which is supplied by a spectrometer, depending on the wavelength or frequency of electromagnetic radiation. Simply put, it is an accurate study of the color reflected from visible light across all bands of the electromagnetic spectrum.

The atoms of any chemical element have specific resonant frequencies, as a result of which it is at these frequencies that they emit or absorb light. This leads to the fact that in the spectroscope, lines (dark or light) are visible in the spectra in certain places characteristic of each substance. The intensity of the lines depends on the amount of the substance and its state. In quantitative spectral analysis, the content of a substance is determined from the relative or absolute intensity of lines or bands in a spectral image.

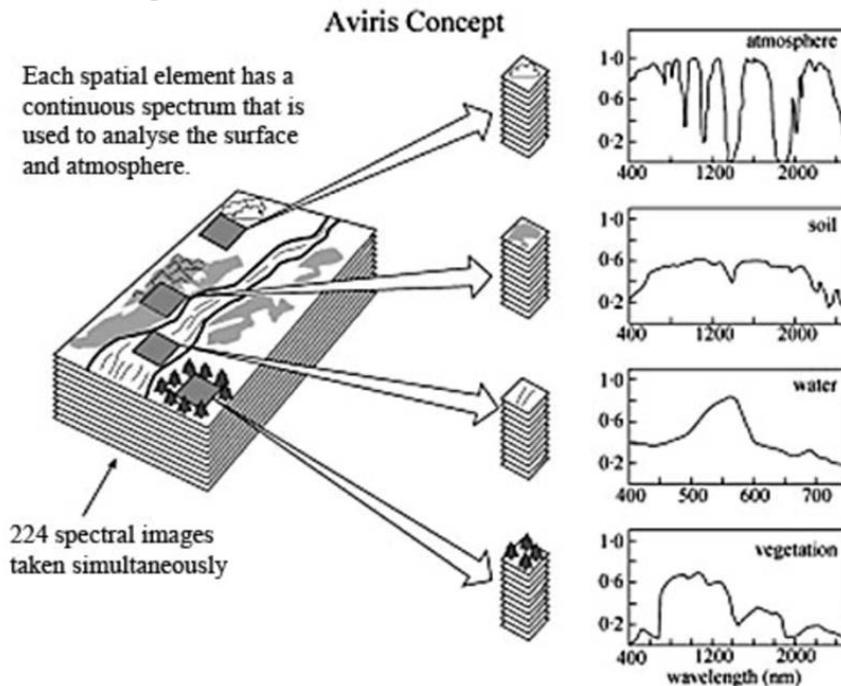


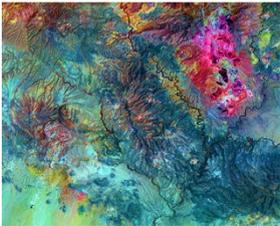
Figure 1: Schematic diagram of image spectrometry. At the same time, images of up to several hundred narrow spectral bands are obtained, the full reflection spectrum for each pixel on the spectrometer.

Spectral analysis is widely used in a number of industries, in particular, in metallurgy, geology, in the development of technologies for the concentration of minerals, etc. In mining and geology, it is used to establish the chemical composition of rocks, ores, minerals, technological samples in the geochemical research. For

example, spectral analysis is used at all stages of prospecting and exploration work, in the study of deposits, in mineralogical studies to determine more than 70 elements with their content in the substance from 5% to tens of% with the possibility of simultaneous determination of up to 40 elements in each sample.

Satellite imagery can also be useful to geologists, scientists and exploration leaders because satellites have multiple bands that allow them to interpret wavelengths that are invisible to the human eye.

**Infrared imaging** captures thermal radiation from the surface. The materials obtained by infrared imaging are used to establish the boundaries of rocks with different heat capacity, which is due to different lithological composition. Breaking faults, even watered ones, are also determined and clearly defined in the images in the form of dark stripes due to the evaporation of water and cooling of rocks in the fault zones. Oil and gas deposits are also accompanied by thermal anomalies as a result of the vital activity of bacteria.



**Ultraviolet imaging** allows the detection of hydrocarbons, due to their natural characteristic of emitting light when irradiated with ultraviolet light. Also, such a survey is used not only for the search for minerals, but also for the search for man-made pollution, such as bitumen lakes and oil puddles.

**Multispectral imagery** is used in satellite, unmanned and aviation systems to search for new deposits of minerals and minerals on our planet, and is also starting to be used to search for minerals in space!

Multispectral imaging and mapping can collect data on the reflection and absorption of light in soil, rocks and vegetation. These data can be used to interpret surface lithology, determine clays, oxides and soil types from satellite images.

Spectral data is measured using spectral sensors that register either solar or artificially generated radiation reflected from the surface of materials. Since many materials absorb radiation at specific wavelengths, they can be identified by their characteristic absorption characteristics, which appear as valleys in the spectral curve. The wavelength ranges most suitable for identifying geological materials and oil slicks include visible and near infrared (VNIR), short wave infrared (SWIR) and mid or thermal infrared (TIR), while the characteristic fluorescence of hydrocarbons occurs in the ultraviolet (UV) region of the spectrum.

The different variations in the spectrum in the photograph are the result of different composition, degree of ordering, mixtures and grain sizes of different rocks and minerals (Table 1 below). Since they have multiple valence states, transition elements such as iron (Fe), copper (Cu), nickel (Ni), chromium (Cr), cobalt (Co), manganese (Mn), vanadium (V), titanium (Ti) and scandium (Sc) exhibit the most prominent spectral characteristics in the VNIR wavelength range. The SWIR wavelength range from 2000 to 2500 nanometers is especially suitable for mineral mapping. In the 2000-2400 nm wavelength range, many absorptions feature characteristic of certain hydroxyl- and carbonate-containing minerals and groups of

minerals that are characteristic of hydrothermal alteration can be detected. These mineral groups can include pyrophyllite, kaolinite, micas.

Table 1. Geologically significant regions of the electromagnetic spectrum

Wavelength region	Wavelength (nm) range	Mineralogy	Associated molecular feature
VNIR	400-1100	Fe and Mn oxides, rare earths	Crystal field absorption, charge transfer absorption
SWIR	1100-2500	Hydroxyls, carbonates, sulfates, micas, amphiboles	Al(OH) <sub>2</sub> , Fe(OH) <sub>2</sub> , Mg(OH) <sub>2</sub> , NH <sub>4</sub> , SO <sub>4</sub> absorption, CO <sub>3</sub>
TIR	8000-14000	Carbonates, silicates	Si-O bond distortion

Hyperspectral analysis can identify specific types of iron and clay minerals, providing information on mineralization and hydrothermal alteration.

The current spectrometry uses such technologies:

- HyMap and ASTER - for mineralogical mapping and for the analysis of ore bodies at the surface
- laser microprobe RAMAN - for detecting small mineralogical changes associated with petrogenesis of ores
- ASTER, EO-1 Hyperion and ALI - for remote sensing from satellites
- HyMap - for detecting traces of hydrocarbons, both for production and for eliminating emissions after industrial accidents.

As a result, when we use spectroscopy, we can obtain accurate maps of the mineralogy of the surface, with clear boundaries of specific minerals. This saves time and resources for mining exploration, making it easier to extract in the future.

#### References:

- 1) Прикладна оптика. Спектральні прилади та методи спектральних вимірювань : навч. посіб. / О. В. Макаренко [та ін.] ; за заг. ред. проф. Л. В. Поперенка. - К. : Пульсари, 2013. - 254 с.
- 2) Retcofsky, H. L. Spectrum Analysis Discoverer, Spectroscopy Society of Pittsburgh, PA 80 (2003)
- 3) Spectral geology. [Online] Available : <https://www.ga.gov.au/scientific-topics/disciplines/spectral-geology#:~:text=Spectral%20geology%20is%20the%20measurement,mineralogy%20and%20their%20alteration%20signatures.>

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## **Problems of using personal protective equipment at Ukrainian enterprises**

For any business, productivity is a key factor to evaluate company efficiency. The faster, the better and more efficiently employees perform their duties, the higher productivity and profit are. If we examine the relationship between staff performance and personal protective equipment (PPE) to be used, it can be concluded that there are a number of factors affecting this and comfort and protection are the main ones. By focusing on these aspects, work safety can be improved, and PPE is sure to be considered as a compulsory tool for work, and not as an obstacle.

One of the other factors that affect worker's productivity is physical working environment and this condition will influence the comfort level for the staff. In the working place, comfort levels do not necessarily represent a state of relaxation, they reflect a painless and safe state. Important factors in the work environment that should be considered comprise building design and age, workplace layout, equipment design and quality, temperature, ventilation, lighting, noise, vibration, radiation, and air quality. Applying these ergonomic principles to the design, modification and maintenance of working place greatly enhance work performance, health, and safety.

### **Disregard for protection.**

Unfortunately, there is a problem with rejection and neglect of health threats from workers. Personnel should be aware in the case of alarm situation that PPE is designed to protect them and avoid this threat, but if protective equipment is uncomfortable or interfering, the employees will not use it.

In such cases, attitudinal and behavioral factors are important. Research shows that managers at all levels must recognize the need for PPE and exercise oversight and management functions, be aware of the hazards and consequences of exposure to hazards and recognize the importance of PPE to control risks.

Employees need to be intuitively aware of the dangers associated with what the protective equipment protects them from. Effective means to increase safety would be providing required information and comprehensive training.

### **Use of 2 or more PPE.**

With the simultaneous use of two or more personal protective equipment, it is necessary to think over which means will be used, and whether they will create discomfort and, as a result, reduce the employee's productivity.



For example, hearing protectors must only be applied with the brands of helmets for which they were designed and tested, otherwise it could cause problems for the user and reduce the effectiveness of the headphones due to the insufficient matching of protectors and a helmet.

The temples of the goggles can be used with hearing aids and headphones but may cause a loose fit. But in this case, you can use such an alternative as replacing the headphones with earplugs that meet the requirements for protection. In addition, glasses with temples can be replaced with glasses with elastic straps.

If there is a problem of simultaneous use of a respirator, glasses, and headphones at the same time, a respirator-mask bundle can be a good alternative. It provides the opportunity to wear glasses in a combination with headphones to preserve the safety of the employee with less discomfort.

#### **Use of PPE for a specific scenario.**

It is also necessary to consider the situation with the use of certain PPE for a specific situation that requires providing excessive protection. In such a case the workers often ignore this due to the fact that better protection can increase the weight of PPE (larger and heavier earcups) thus greatly decreasing their safety and special measures should be applied to avoid this challenge.

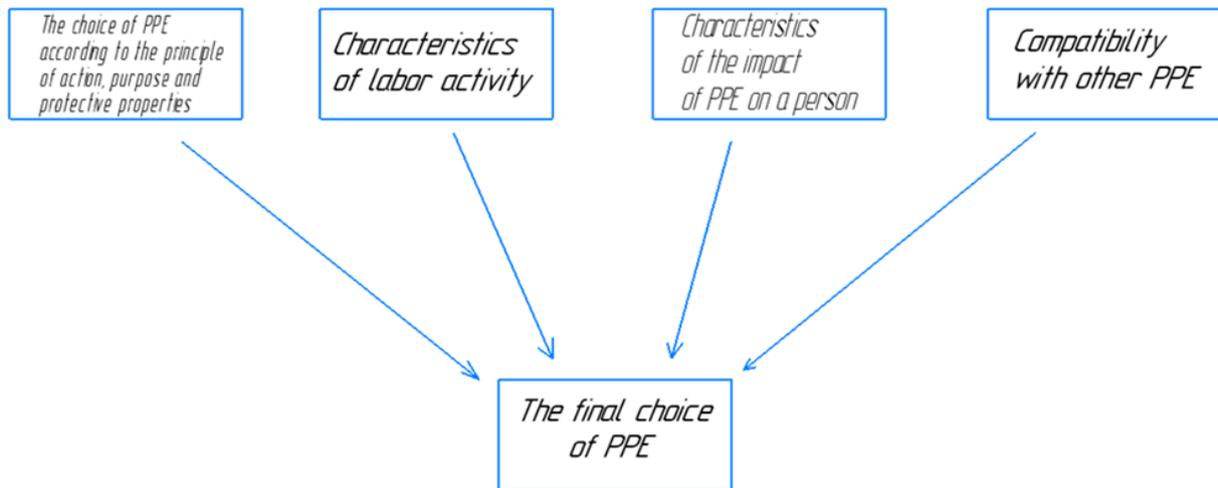
#### **The choice of personal protective equipment taking into account the requirements for ergonomic indicators.**

When choosing PPE based on an ergonomic approach, three stages are used:

The first is an assessment of the professional activity of workers using PPE, taking into account the intensity of work, the degree of its severity and the distribution of loads during the working day.

The second is PPE compatibility. In most cases, when using one, there are no difficulties. In the presence of two or more, a more detailed approach is needed that allows them to be used in combination with each other.

The third is the degree of influence on the working staff. The choice of PPE should take into account ergonomic indicators that do not interfere with work, and do not cause discomfort during working activities.



To sum up, an ergonomic approach applied while choosing personal protective equipment allows you to reduce stress and discomfort at the working place and ultimately makes it possible to maintain a high level of labor discipline and productivity without the need for forced breaks to reduce the load. It also increases morale and reduces the effects of fatigue, leading to greater job satisfaction.

#### **References:**

1. A.P.Sarode and M.Shirsath,"The factors affecting employee work environment and its relation with employee productivity", International Journal of Science and Research, Volume 3, Issue 11, November 2014.[Online]. Available : <https://www.semanticscholar.org/paper/The-Factors-Affecting-Employee-Work-Environment-%26-Sarode-Shirsath/5fa252fb8503d565b5a550a1cf00d3cbd1c7fcb8>
2. Challenges of PPE. Health and Safety International, The Journal for Employee Protection. [Online]. Available: <https://www.hsimagazine.com/article/challenges-of-ppe-39/>
3. Ergonomics of PPE. Health and Safety International. The Journal for Employee Protection. [Online]. Available: <https://www.hsimagazine.com/article/ergonomics-of-ppe-ensuring-acceptable-above-the-neck-protection-203/>
4. Understanding how PPE influences productivity, Health and Safety International, The Journal for Employee Protection. [Online]. Available: <https://www.hsimagazine.com/press-release/understanding-how-ppe-influences-productivity/>

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### **Spherical tomography and 3D modelling of mineral component distribution**

The representation of geological information in bulk form contributes to the effectiveness of visualization of a mineral and its useful component distribution in space. In the world practice, the attempts of volumetric visualization with X-rays have been made since 2015. GTK company registered by the Academic State Grant Finland in 2015 developed its first Host Device, and in June 2017 the first X-Ray Tomographic: Ge Phoenix V | Tome | XS 240, was presented by this company. The operating principle of this equipment is based on X-ray use: the rays when passing through the mineral rock change the speed of their passing. These changes are fixed in the original computer program developed by the company, and the algorithm introduced in the computer operation compares the signals and sorts them in groups in accordance with the speed, and as a result, reflects a volumetric model of a separate component. To implement the valid result, X-ray installation should make from 1000 to 2000 screenings.

However, according to the developers, this technology has many disadvantages. Thus, for qualitative analysis it is necessary to lay dense crystalline tectonically stable coarse-grained rocks in the form of a core. The equipment fixes the ore component of rocks well but reflects the breed with a large indicator of "noise" and does not reproduce each of the components separately that makes it impossible to characterize the thickening without additional testing.

The aim of the research described in this paper was to appropiate the described above methodology of spherical tomography and to create a computer 3D model of proliferation of minerals in a spherical stucco. The research is related to the proceeding of the method of spherographic tomography used to study mineral composition, tectonic disorders as well as, when necessary, to detail the geological structure of ore bodies of mineral deposits and determination of ore distribution in them.

The main benefit of the methodology spherographic tomography is despite of the fact that it is not computerized and automated absolutely; it provides much wider opportunities for study. In the process of preparing a laboratory preparation, it is possible to obtain anchlifests, thin-polished sections, materials for manufacturing grinds. The most important thing is that all laboratory preparations received during these processes are oriented in space. The only disadvantage of this technique can be considered impossibility of its use in searching scattered deposits.

The main task of the research is to obtain a volumetric 3D visualization of the station with the combination of methods of manufacturing bulk fold forms and their mechanical treatment on stones processing machines as well as methods of volumetric 3D visualization using the 3DS MAX 2020 software complex,

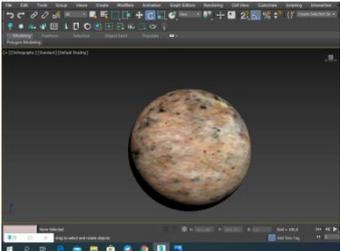
characterize the distribution of minerals in a sample with the possibility of a layer demonstration. constituent sample.

As a result of testing of the method of spherical tomography, a computer 3D model of distribution of minerals of Pegmatite Pegmatchi Field of the Middle Pridneprovsky Megablock of the Ukrainian crystalline board of the laboratory preparation has been created. It was manufactured on the basis of the laboratory for assessing the quality of natural materials in Dnipro University of Technology. This digital model was created, using the 3DS MAX 2020 software complex. Adobe Photoshop CC 2017 software complex has also been used for photo quality correction. Using the digital detail of mineral aggregates and tectonic microprots, there is an opportunity to track their propagation in the middle of the laboratory preparation, specify the geological structure of the sample, to detect certain patterns in the sample.

The height of the sample plane for creating a computer model was 27 cm, the cutting of the surface was performed every 3 mm. The accuracy of the cut off surface was checked by a mathematical method because of a trigonometric relationship between the diameter of the stone sphere and the height of its cutting.

Geological structure and comparative characteristics of the qualitative description of samples of non-treated structure, laboratory preparation (rock ball) and digitized laboratory preparation are shown in Table 1.

Table 1 Geological structure and comparative characteristics of the quality description of samples

	<b>Stuff is not processed</b>	<b>Laboratory preparation (stone sphere)</b>	<b>Digitized laboratory preparation</b>
<b>Photo</b>			
<b>Texture</b>	Pegmatoid	Pegmatoid	Pegmatoid
<b>Structure</b>		Giant crystalline	Giant crystalline

Mineral warehouse, %	Microcline 90%, Quartz 8%, Ferruginization 1%,  Accrete minerals 1%	Microcline 75%, Quartz 15%, Ferruginization 2.5%, Albite 6%, Accrete minerals 1.5%	Microcline 75%, Quartz 15%, Ferruginization 2.5%, Albite 6%, Accrete minerals 1.5%  There are impurities of epoxy resin which are difficult to reproduce in digital form 1% in the surface zone of the sample.
Tectonic disturbance	Small cracks (not significant disturbance) present	Cracks are not dense because the sample is intensively destroyed and requires additional strengthening through an epoxy application.	A significant number of small dense violations that are developing are not dense.

As you see, the results of the description of the same sample in the camera description after mechanical processing and digitization are different. The most informative in terms of completeness of information in a geological description is a digitized sample.

Moreover, there is a possibility of a layer consideration of mineral aggregates in the sample by separate revision of the propagation of components, namely: quartz, field spare, accessory minerals, stalizations, and tectonic disorders. Each component can be viewed, separately within the digital model. An example of the prevalence of tectonic disorders is shown in Figure 1.

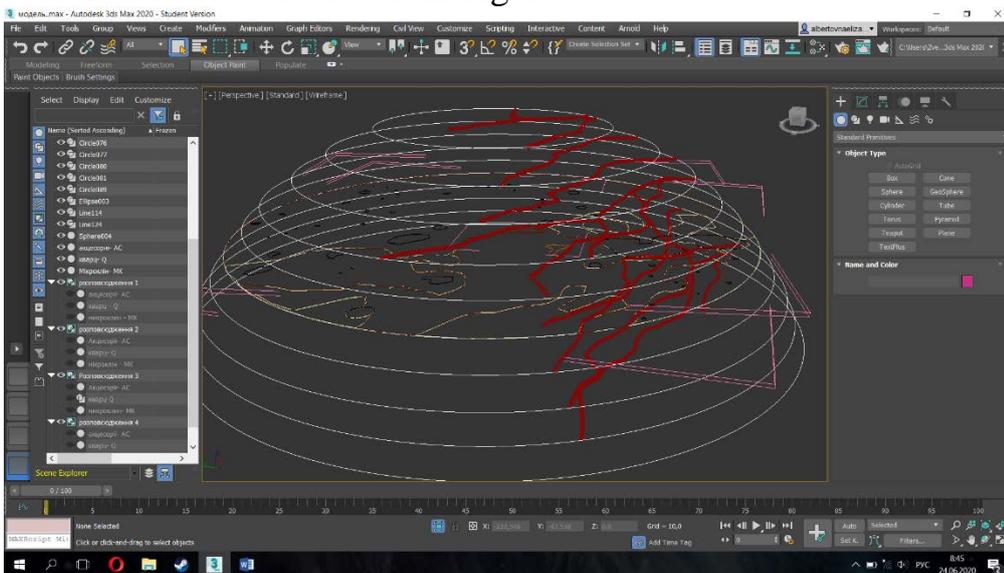


Figure 1 Distribution of tectonic violations

During the geological exploration of any mineral deposits, it is also possible to carry out a forecast of the prevalence of tectonic disorders of masses, distribution and spatial orientation of minerals and destructions studied. Subsequently, these data can be used to compile layered distribution cards of breach of masses, distribution and spatial orientation of minerals and drafts, their 3D modeling.

The practical value of these findings is to use the described methods in predicting the prospects of roads by creating and describing the internal structure of the sample(s) digitally.

**References:**

1. Khomenko Yu.T., Khomenko D.Yu., Khomenko N.V. To the question of the methodology of spherical tomography in geological studies. Young:
2. Science and Innovation: Abstracts of the reports on April 26, 2020 NTU "DP".P.1-2.  
<http://ir.nmu.org.ua/bitstream/handle/123456789/156201/Бодряго.pdf?sequence=3&isAllowed=y>

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### Use of 3D seismographs in the mining industry

For modern production, mankind needs minerals and minerals. To obtain them, it is necessary to go through several stages of work: exploration, drilling, development, and transportation. That is, to begin with, a mineral must be found. Seismic exploration is mainly used to search for it.

Seismic exploration is a set of geophysical exploration methods based on the excitation and registration of seismic waves of various types in order to study the structure, material composition and stress state of the earth's interior. Basically, seismic exploration uses the principle of reflected and refracted waves, as well as vertical seismic profiling. The method of reflected waves consists in the selection of waves, once reflected from the target geological boundary. The method of refracted waves is oriented towards bent (sliding) waves, which are formed when a wave falls on the boundary of two layers at a certain angle.

Vertical seismic profiling is a form of seismic in which seismic sources are located at the surface and receivers are placed in a drilled hole.

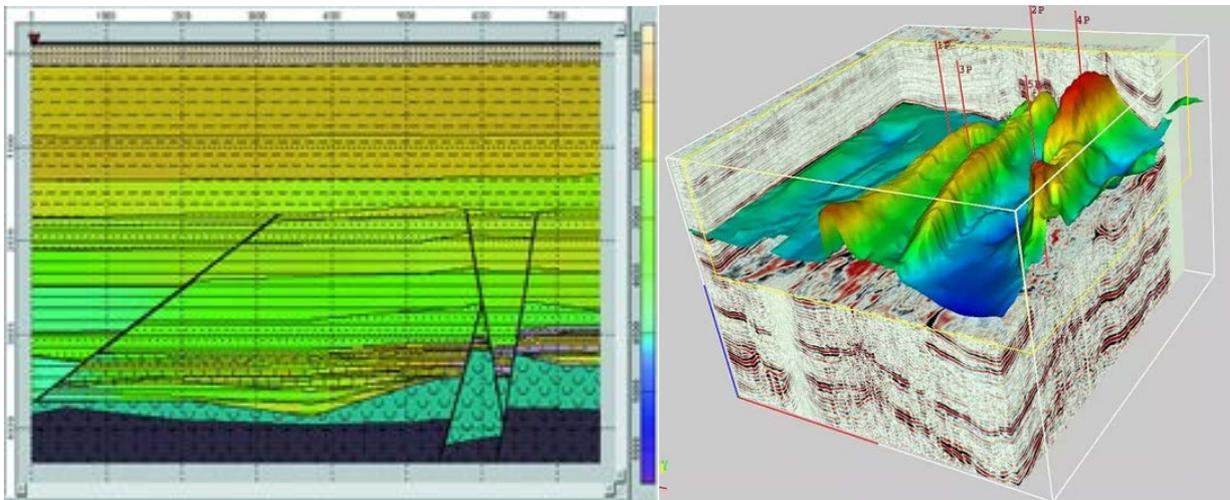


Figure 1: An example of a signal from seismographs and a 3D field model.

Seismic survey is performed by using seismographs used for automatic recording of oscillations of the earth's surface due to seismic waves (earthquakes and seismic). Seismological station is a complex with spaced seismological receivers and registers a station that records seismic activity. It should be outlined that it is a single information and measurement system designed to combine data from seismic receivers, its processing, visual analysis, and storage of data on a memory device. The main measuring device in seismic is a seismic receiver that converts mechanical oscillations of elastic waves into an electric current of alternating voltage. When moving rock particles near the receiver housing, electrical pulses are produced in it,

which are then deposited on the time axis. The data obtained are called oscillation graphs or seismic paths.

Seismic tracks are combined into a seismogram which is the primary field material of seismic. Signals from receivers are processed: amplified, filtered unwanted oscillations and converted into digital form. Through information channels, data from observation points are sent to a single center - a seismic station, where they are presented in a form convenient for the operator.

Obtained in the process of field work seismogram contains a significant proportion of unwanted interference waves and interfere with oscillations, and useful waves are inconvenient to interpret. Therefore, the primary seismogram is processed using the latest computer technology.

As a result, seismogram processing procedures are transformed into a temporary or deep section - material for geological interpretation. According to the known signs on the received sections abnormal sites to which accumulations of minerals are connected are allocated.

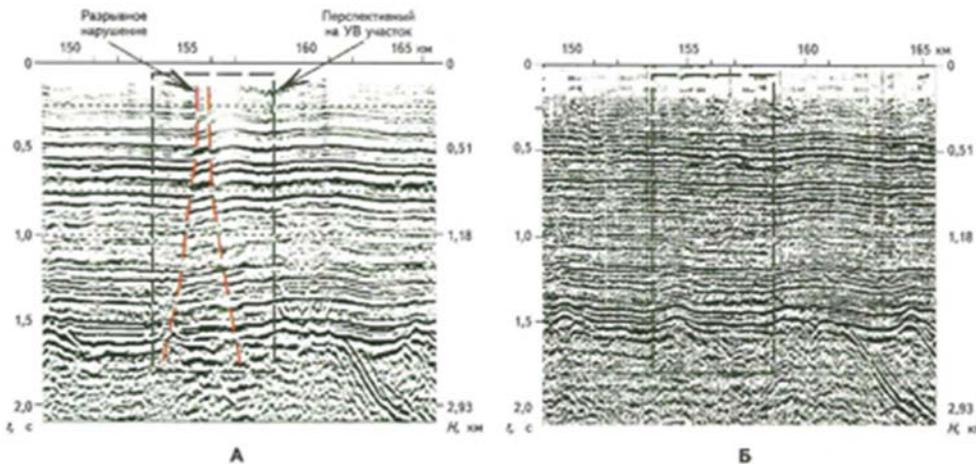


Figure 2: The original data without processing a seismogram.

The main methods that are used in the search and exploration of minerals can be divided into 3 main ones:

- geophysical surveys of wells (GIS),
- seismic survey on the surface (2D and 3D)
- seismic exploration in wells (VSP, NVSP).

The well logging method has high resolution data at depth, but only studies a certain area around the well. Surface seismic surveys provide a clear image of large objects but cannot provide good detail and data accuracy. Borehole seismic surveys provide a high level of detail around the borehole, but in a limited range.

As a result, it is possible to combine a certain number of wells at distances of up to 1.5-2 km and drill them deep enough thus increasing the accuracy of the indicators. A full 3D model of the field with precise boundaries and shape can be created by combining different exploration methods.

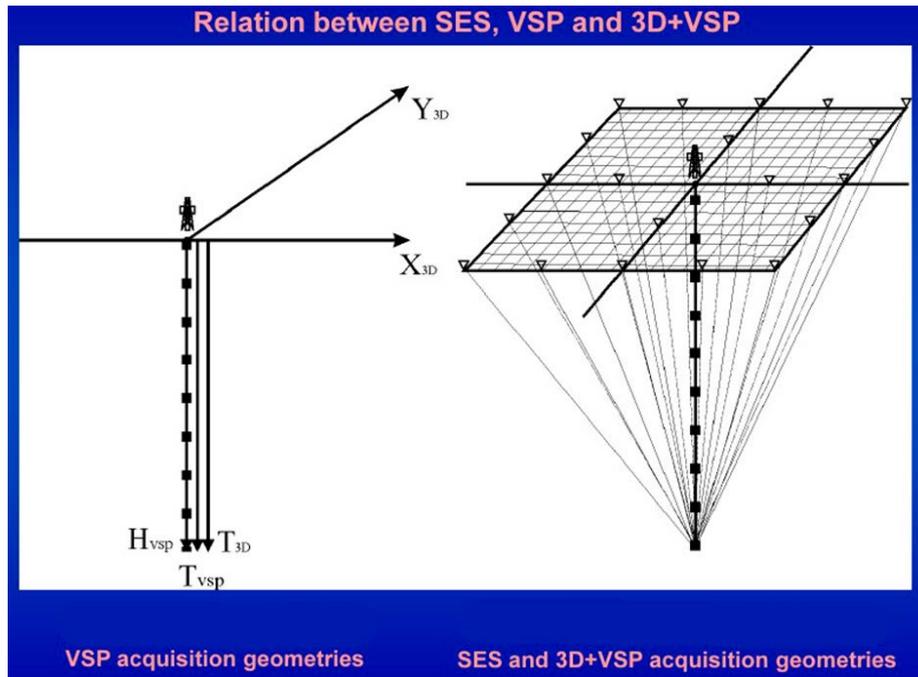


Figure 3: Differences between using a single seismic method and a combination of methods.

It should be outlined that there are some drawbacks in applying seismic exploration: the uncertainty of the velocity model and the waveform and the asymmetry of the geometric parameters of minerals. However, when combining the methods of broken and reflected waves, as well as correcting them using the vertical profiling method, it is possible to obtain a 3D model of the mineral, which solves such problems as: refinement of the speed model, assessment of the true form of the deposit and full implementation of the based migration model.

The modern realities of the extraction of mineral resources, as well as the rate of their consumption, makes it necessary to fully exploit each deposit, for the maximum possible extraction of minerals without residual reserves. In addition, the need to develop fields of complex occurrence can be avoided.

The proposed 3D seismography system allows not only to solve the problems listed above but to increase the information content of exploration and obtain high accuracy in determining the boundaries of a mineral.

**References:**

1. «Disadvantages of surface seismic (SP)», [Online], <https://www.amasenergy.com/product/1344>
2. A. A. Tabakov, A. S. Kashik, G. N. Gogonenkov, K. V. Baranov «2D,3D+VSP acquisition geometries combining surface and downhole measurements», 2017
3. Qing-Zhong Li, «High resolution seismic exploration.», Society of Exploration Geophysicists, 2017, [Online], <https://library.seg.org/doi/book/10.1190/1.9781560803508>

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### Using a risk matrix at Ukrainian enterprises

In Ukraine, there is a problem with injuries at workplaces, especially at workplaces with an increased share of danger, when there are a huge number of harmful and dangerous factors. Hundreds of workers across the country are injured every year, of varying degrees of severity.

But how can this problem be solved? First, you need to measure the data and study the risks, thanks to which it is possible to understand what specific factors cause injuries, and where improvements are needed, from organizational (by reducing the contact of workers with any dangerous or harmful factor) to technical (working out and using collective and personal protective equipment).

So, we learned that it is necessary to measure risks, to assess the hazards and subsequent decision-making, to reduce the impact or eliminate harmful and dangerous factors, but what is the best way to measure, calculate and classify these risks into categories? I believe, the risk assessment matrix can help us with this question.

The Risk Assessment Matrix (RMP) is a system that is used to assess risk and determine the different levels of these occupational injury risks, as a combination of the likelihood and consequence categories.

The following figure, derived from the ISO 17776 standard, shows a typical example of an MPA, a tool that improves risk visibility and facilitates decision making.

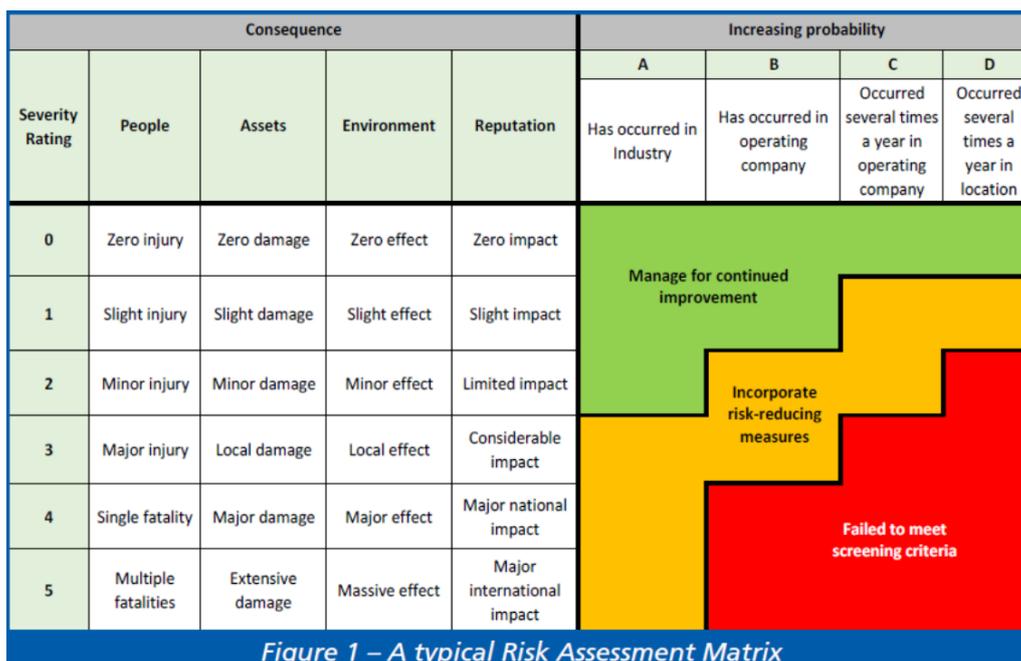


Figure 1 – A typical Risk Assessment Matrix

The main advantage of the matrix is the rapid and consistent assessment of risk levels and the creation of a common understanding of how severe events with severe consequences can be in the case of injury, occupational disease or death, as well as their frequency in the enterprise.

Assessing risk levels helps to make an informed decision about the acceptability of a given risk.

How is the risk matrix compiled:

1. Basic information is selected; all possible risks and their causes are emphasized.

2. All possible risks are assessed according to the degree of probability of their occurrence: low, medium, high or extremely high. All risks are presented in the risk assessment section. Such a system allows you to classify risks, as well as to determine which risks are insignificant and they can be neglected.

3. Classify risks by severity and compare them with a classification by likelihood. So, we can understand what risks may be unlikely, but serious (natural disasters, man-made disasters, etc.).

4. After that, we will have a diagram that can be used for discussion and planning in the enterprise.

5. Now, we need to decide in what way, we can reduce the consequences, or, at best, completely remove this risk. In enterprises, such solutions can be the reduction of harmful and hazardous factors.

Protection against hazards can be accomplished using the following methods:

1. Technical methods:

A) improving the design of mechanisms and technological processes

B) replacing mechanisms with more advanced analogues that are less harmful to the health and well-being of personnel

2. Organizational methods:

A) protection by time (limiting the time an employee spends next to a dangerous factor)

B) protection by distance (removal of a person at a safe distance from a dangerous factor, use of remote control, if possible)

C) replacement of toxic substances - less toxic and hazardous

D) the use of collective protective equipment (sound absorption, ventilation, air conditioning, irrigation (with a high concentration of dust), lighting, installation of protective screens, fences and structures)

E) use of personal protective equipment (helmets, masks, goggles, overalls, etc.)

Also, when using the matrix, there is a problem of residual risk assessment. Residual risk, when combined with the initial unvalued risk scores, can show a floating score in the matrix.

Part of the problem lies in the difficulty of determining the residual risk, that is, "with the observance of control," is this risk quite insignificant and the situation can be considered safe, or not? " The solution to this question is to determine from the outset how exactly to interpret the concepts of unadjusted or residual risk.

The matrix provides estimates for specific scenarios, therefore, in general cases, a heat map is compiled that displays the relative distribution of risks and events in enterprises.

As a conclusion, it can be said that the risk assessment matrix provides a simple, well-implemented approach to assessing risk levels, and provides room for debate and discussion about workplace safety and achieving a common understanding of the risk problem. But, in addition to this, there is still room for twisting the information received and substituting concepts based on residual and non-mitigated risks.

**References:**

1. <https://risk-academy.ru/download/risk-matrix/>
2. <https://www.atlassian.com/ru/software/confluence/templates/risk-assessment>
3. [https://studref.com/456791/bzhd/osnovnye\\_metody\\_zaschity\\_cheloveka\\_vrednyh\\_proizvodstvennyh\\_faktorov](https://studref.com/456791/bzhd/osnovnye_metody_zaschity_cheloveka_vrednyh_proizvodstvennyh_faktorov)
4. <https://www.risktec.tuv.com/wp-content/uploads/2018/09/the-matrix-reloaded.pdf>

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### **Chromium in the coal seams of the Chervonoarmiiskyi geological and industrial area of Donbas**

Chervonoarmiiskyi geological and industrial area is located on the monoclinic slope of the south-western wing of the Kalmius-Toretsk hollow.

The object of research is the main coal seams of the Chervonoarmiiskyi geological and industrial area of Donbas.

The purpose of research is to establish the regularities of chromium distribution in the coal of the main working seams of the Chervonoarmiiskyi geological and industrial area.

The collected material characterizes the content of chromium in 56 coal seams, which belong to the suite  $C_1^4$  (seam  $d_4$ ),  $C_2^1$  (seams  $f_0^5$ ,  $f_0^7$ ,  $f_1$ ),  $C_2^2$  (seams  $g_1$ ,  $g_1^{2H}$ ,  $g_1^2$ ,  $g_1^3$ ,  $g_1^4$ ),  $C_2^3$  (seams  $h_1^H$ ,  $h_1$ ,  $h_4$ ,  $h_5$ ,  $h_6$ ,  $h_8$ ,  $h_{10}$ ,  $h_{10}^1$ ),  $C_2^5$  (seams  $k_3$ ,  $k_5^H$ ,  $k_5$ ,  $k_5^B$ ,  $k_6$ ,  $k_7$ ,  $k_7^1$ ,  $k_7^{1+2}$ ,  $k_7^2$ ,  $k_8^H$ ,  $k_8$ ),  $C_2^6$  (seams  $l_1$ ,  $l_1^B$ ,  $l_2^1$ ,  $l_3$ ,  $l_3^{B+H}$ ,  $l_3^B$ ,  $l_4$ ,  $l_4^B$ ,  $l_5$ ,  $l_5^1$ ,  $l_6$ ,  $l_7^H$ ,  $l_7$ ,  $l_7^{B+H}$ ,  $l_7^B$ ,  $l_8^H$ ,  $l_8$ ,  $l_8^1$ ) and  $C_2^7$  (seams  $m_2$ ,  $m_3^H$ ,  $m_3$ ,  $m_3^1$ ,  $m_4^0$ ,  $m_4^2$ ,  $m_4^{2+2B}$ ,  $m_5^{1B}$ ,  $m_6^1$  and  $m_6^2$ ) lower and middle parts of the coal period. 2814 occurrences of chromium in coal seams of the area were used in the research. The most representative (more than 33 analyzes satisfy the requirements of accuracy and reproducibility [1-2] and relatively evenly distributed over the area) results were obtained in 38 seams.

On the clusterization dendrogram of seams by chromium content (Fig. 1), the first cluster is composed by seams with a low content (from 7 to 22 g / t, with a cluster average of 16 g / t), the second cluster – seams with the middle content (from 24 to 30 g / t, with a cluster average of 25 g / t), the third cluster – with abnormally high concentrations (from 37 to 73 g / t, with a cluster average of 46 g / t).

In the structure of the first cluster there are three nested clusters: 1.1 – formed by seams with abnormally low chromium concentrations in coal (from 7 to 12 g / t, with a weighted average of 9 g / t in the cluster); 1.2 – combines seams with chromium content from 14 to 17 g / t, with a cluster weighted average of 16 g / t; 1.3 – formed by seams with chromium concentrations in coal from 19 to 22 g / t, with a cluster weighted average of 21 g / t.

To identify the main factors controlling the chromium accumulation in the coal seams of the area, correlation and regression analyzes of its concentration with the main technological indicators and petrographic composition of coal were performed. In the area as a whole, there is a statistically significant relationship between the chromium content in the coal of the area and ash content.

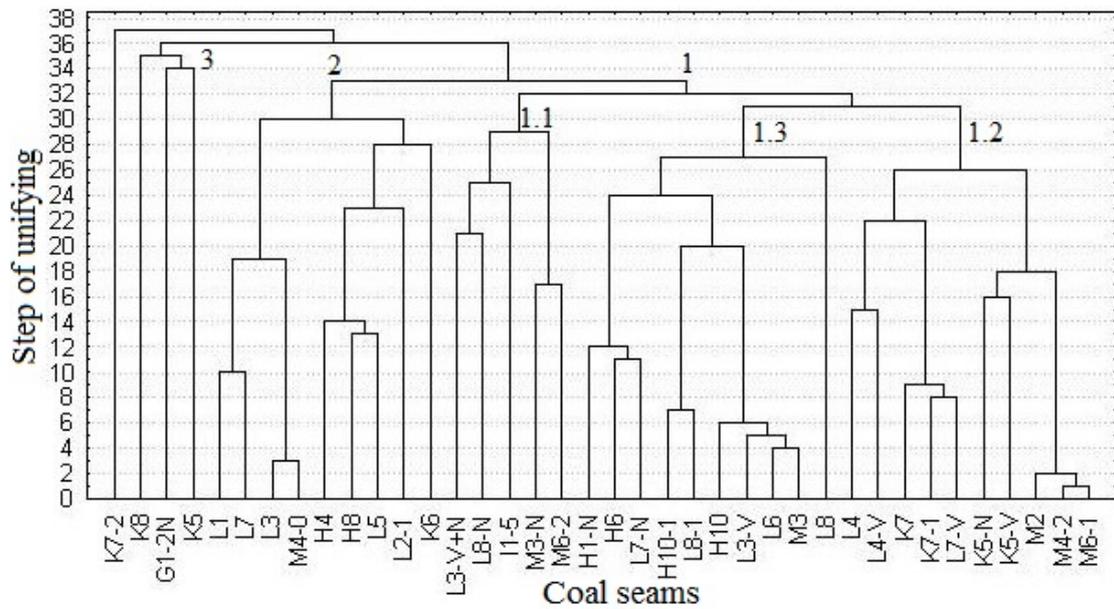


Fig. 1. Clusterization dendrogram by the weighted centroid method of coal seams of the Chervonoarmiyskiy geological and industrial area of Donbas by chromium content

Also in the whole area in all studied seams there is a slight increase in the concentration of this element with increasing degree of coal carbonization, complicating the structure of the seams and reducing their thickness, increasing the number of intraformational mineralized seams and the content of lipid components. There is no statistically significant association between chromium concentrations and total sulfur content and epigenetic mineralization, as well as roof and soil lithology.

For the purpose of visualizing the qualitative analysis of the general form of distribution of the values of chromium concentrations in the coal seams, histograms of the distribution of the normalized content of these elements were constructed (Fig. 2).

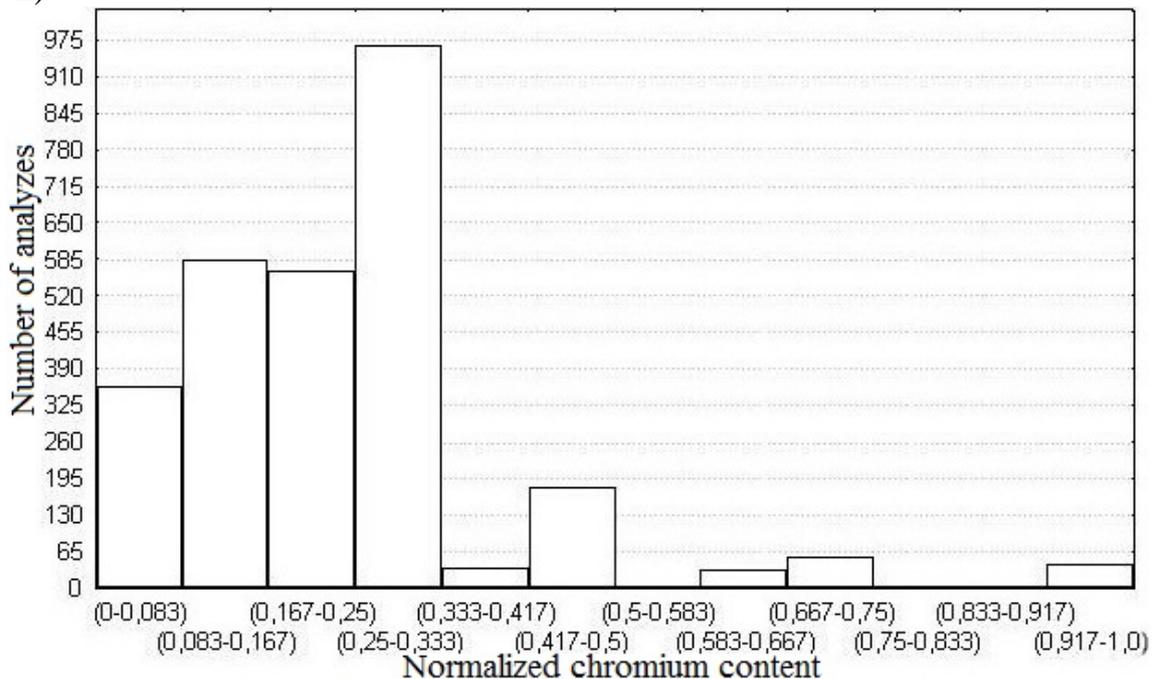


Fig. 2. Histograms of the distribution of the normalized chromium content in the coal seams of the Chervonoarmiiskyi geological and industrial area of Donbas

For convenience of their visual comparison with histograms of distributions of other toxic and potentially toxic elements, the basic technological parameters, petrographic structure and other characteristics of coal all values of concentrations are normalized.

Analysis of the constructed histogram of the distribution of normalized chromium content allows to establish: the distribution of the main part (87% of all results) of the sample is close to the lognormal distribution law and placed in the range of 0,0-0,417 with a mode in the range of 0,25-0,333, which corresponds to chromium content in coal seams: 23-28 g / t; there are two clearly expressed abnormally high intervals of values: 0.583-0.75 and 0.917-1.0, which correspond to the concentrations of chromium in the coal seams: 44-56; 67-73 g / t. 97% of their occurrence is due to the influence of the values of chromium content in the coal seams:  $g_1^{2H}$ ,  $k_5$ ,  $k_7^2$  i  $k_8$ .

The significance of the differences between the sample's mean concentrations of chromium in the coal of the nearest stratigraphic sections of seams and suites was established using the program STATISTICA 7 [3] by calculating the t- criteria and U- criteria of Mann-Whitney (as the most powerful nonparametric alternative of t- criteria) with significance level  $p \leq 0.05$ .

As a result of the study, the following conclusions can be made:

– The accumulation of chromium in the coal seams of the area is polygenic and polychronic. The main form of these elements is sorbed (on clay minerals and fusened microcomponents).

– The distribution of the main part of 87% of the sampling population of chromium concentrations in the coal of the area is described by the lognormal law, with a mode in the range of 23-28 g / t. The entire sample size is characterized by an average value of  $23 \pm 1$ , with a variance of 118, a standard deviation of 11, an asymmetry factor of  $1.95 \pm 0.05$  and an excess coefficient of  $6.31 \pm 0.09$ .

– The average values of chromium content in the main working coal seams of the area are significantly lower than the maximum concentration limit in coal.

– The calculated sample mean values of chromium content can be used to correlate the main coal seams of the area.

## References

1. Beus A.A. 1981. Geochemistry of lithosphere. Nedra, Moscow, 335 p.
2. Havryshyn A.I. 1980. Assessment and quality control of geochemical information. Nedra, Moscow, 287 p.
3. Borovykov V.P. 2001. STATISTICA: Art of data analysis on a computer. For professionals. St. Petersburg, 658 p.

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**Substantiation of the parameters of the experiment to predict the magnitude of convergence in the longwall in the area of the primary landing of the main roof**

Coal is one of the energy sources that Ukraine can meet almost entirely at the expense of its natural reserves. Western Donbass has significant geological reserves of coal, which will be enough for decades. In the current economic conditions, the coal industry, in particular the Pavlograd-Petropavlovsk coal-bearing district, is tasked with increasing coal production. However, in a more detailed analysis of the state of the industry, the situation is not very optimistic. One of the main factors complicating the effective development of coal deposits is the presence of powerful sandstones in the roofs of the development layers, which lead to an increase in accidents related to the landing of mechanized fastening "on a hard base", increasing the depth of development, which increases the load on mechanized fastening.

Therefore, the solution of an important issue for the coal mining industry to optimize the parameters of treatment extraction of columns based on the results of forecasting the patterns of convergence in the ranks taking into account the powerful sandstones in the roofs, changes in the depth of development and length rocks.

The study was based on the work of O.A. Sidelnikov [1], from which we will start, changing the combination of new features.

First of all, table 1 presents a comparison of similarities and differences in the study of O.A. Sidelnikov with an ongoing study.

Table 1

Comparison of computer simulation parameters for the experiment

№	Parameters	A. Sidelnikov	Y. Moldavanov
1	2	3	4
1	Research method	Mathematical modeling	
2	Application of mathematical apparatus	Finite element method, (FEM)	
3	Application of the software package	SolidWorks Simulation 2009	SolidWorks Simulation 2019
4	Physical and mechanical properties of rocks	Joint	

Continuation of Table 1

1	2	3	4
5	Modeling of fastening of cleaning and preparatory workings	KD-80/KHPU-13,2	KD-80/KHPU-14,4
6	The length of the cleaning face, m	190	215, 260, 305
7	The depth of development, m	445	150, 300, 450
8	The distance of the cleaning face from the mounting chamber, m	5 – 285 m, with a step 10 m	10, 20, 30, 40, 50
9	Extraction capacity of the formation, m	0,95 – 1,05	1,0
10	The thickness of the sandstone in the roof of the formation, m	According to the stratigraphic column of the mine "Western Donbass"	0, 5, 30
11	The distance of sandstone above the roof of the formation, m	According to the stratigraphic column of the mine "Western Donbass"	0, 5, 30
12	Number of computer models, experiments	29	225
13	Taking into account the force of gravity, m/s <sup>2</sup>	9,81	
14	Model of a rock massif	Anisotropic	
15	Strength criterion	Mohr–Coulomb	
15	Finite element grid	8-node tetrahedra according to the Delano-Voronov scheme	Standard
16	The maximum linear size of the finite element, m	10 × 10	5 × 0,5

According to Table 1, the choice of the length of the treatment face, the depth of development, the distance of the waste face from the mounting chamber, the value of the capacity of sandstones, as well as their distance above the roof of the formation was justified.

One of the many factors that affect the amount of convergence is the length of the clearing face, the depth of development, the distance of the clearing face from the

mounting chamber, the value of the capacity of sandstones, as well as their distance above the roof. As a result of data collection on mining enterprises of Pavlograd-Petropavlovsk coal-bearing district, their statistical analysis was performed, which reflects the predominant indicators of the above parameters in this area.

Based on the analysis, the values of these parameters were chosen. The choice of values was performed by prevalence, ie as the most common, the values should be equidistant from each other, and they should be the optimal number, in order to reduce the number of experiments.

According to statistical analysis, it was decided to choose the following values of the length of the clearing faces for the experiment - 215, 260, and 305 meters. Next, it was decided to choose the following values of the depth of development for the experiment - 150, 300 and 450 meters.

Also, it was decided to choose the value of the distance of the waste face from the mounting chamber for the experiment - 10, 20, 30, 40, and 50 meters. After that, the values of the value of the thickness of sandstones lying in the roof of the formation for the experiment were selected - 5, 30, as well as taking into account their absence in the roof. The value of the value of the distance of sandstones above the roof of the formation - 5, 30, as well as in the immediate roof was chosen.

To conduct the experiment, it is also necessary to substantiate the geometric parameters of the model. Geometric parameters depend, first of all, on the sizes of a zone of influence of clearing works on an array of rocks. To correctly determine these parameters, it is necessary to be guided by legal documents governing the procedure for determining this zone. Currently, in Ukraine, the "Rules of underworking of buildings, structures and natural objects in the extraction of coal by underground" have legal force [2], according to which the limits of the impact of treatment on the earth's surface (shifts) are determined by the boundary angles.

Guided by [2], you can determine the geometric dimensions of the model in the plan. The vertical dimensions of the model are taken under the condition of modeling the entire rock thickness, which is directly involved in the formation of SSS of the rock around the treatment, ie all lithological differences from the formation to the earth's surface and at least 50 times the thickness of the extraction layer. According to [2], the zone of influence of the treatment work on the rocks of the bottom of the formation extends to no more than 50 extraction capacities of the coal seam.

To simplify the mathematical calculations, it was decided to reduce the height of the model above the roof of the reservoir to 100 meters, for reasons of slight departure of the clearing face from the mounting chamber (10 - 50 m), secondly - the paper does not aim to study the stress-strain state depth, from the earth's surface to the immediate roof.

To simplify the mathematical processing and sampling of the simulated area of the mountain massif as a three-dimensional geometric figure, in which it is necessary to invest the study area, a cylinder was chosen.

Given that the model had one plane of symmetry, which passed normally to the middle of the clearing face, the mathematical calculation was performed for only one

symmetrical part. Also, the necessary boundary conditions were observed on the edge parts of the model and on the plane of symmetry.

The thickness of the rock layer, which was simplified, was replaced by the applied load, depending on the depth of development, which is calculated by formula 1

$$\sigma = \gamma \cdot H, \text{ MPa} \quad (1)$$

where:  $\gamma$  - the proportion of rocks;  $H$  - depth of development.

According to the plan of the experiment (Figure 1), the study will use twenty-seven sizes of models of rock mass, as the plan of the experiment provides for consideration of three values of the length of the face - 215, 260 and 305 m, three values of depth - 150, 300 and 450 meters, as well as three values of the distance of the clearing face from the mounting chamber - 10, 20, 30, 40 and 50 meters, respectively.

As a result of substantiation of the above parameters, a plan was drawn up to conduct experiments to determine the amount of convergence in the clearing face in the area of primary landing of the main roof, during the movement of the face from the mounting chamber (Figure 1).

№	Length of longwall, m	Depth of development, m	Departure from the mounting chamber, m	The thickness of the sandstone, m	The distance of sandstone above the roof of the formation, m
1			10	0	0
2	215		20	5	0
3	260	150	30	5	30
...	305		40	30	0
...			50	30	30
...			10	0	0
...	215		20	5	0
...	260	300	30	5	30
...	305		40	30	0
...			50	30	30
...			10	0	0
...	215		20	5	0
223	260	450	30	5	30
224	305		40	30	0
225			50	30	30

Figure 1 - Experimental plan

## References

1. Власов, С.Ф. Пространственное моделирование геомеханических процессов при подземной разработке месторождений: моногр. / С.Ф. Власов, А.А. Сидельников. – Д.: Национальный горный университет, 2012. – 223 с.

2. ДСТУ 101.00159226.001-2003 Правила підробки будівель, споруд і природних об'єктів при видобуванні вугілля підземним способом (НПАОН 10.0-1.01-03)

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### **Metamorphism as the main geological process of genesis of ore and rocks: case of the Northern iron-ore district of Kryvyi Rih basin**

Hannivske and Pervomayske deposits are being developed by Hannivske and Pervomayske pits and located in the Northern iron ore district. Its raw material base is composed of the fifth and sixth iron horizons of the Saksagan series. In the section of the series there are ten stratigraphic horizons. All of them are composed of non-condition magnetite-silicate quartzites and quartz-silicate schists.

Such geological processes as sedimentogenesis, dynamothermal metamorphism, sodium metasomatism and hypergenesis composed the productive strata of deposits. Influence of hypergenesis on the quality of ore and concentration of ore is minimal. It's connected with the conducting of mining operations at the level of hypsometric horizons in the open pits which are located much lower than the crust of weathering of ferruginous-siliceous formation. It is difficult to assess the direct influence of sedimentation on ore dressing, because iron ore sedimentary formations were exposed to dynamothermal metamorphism. As a result, their mineral composition, structural and textural features, physical properties have been changed.

Different mineralogical, geochemical orientation of processes caused the variability of physical and technical characteristics of ores and rocks, thus, in turn, - different stability of rock massifs in the process of drilling and blasting and mining operations. Geological, geophysical, technical research are the basis of zoning of deposits, development of geological and technical horizon plans and sections.

The rocks of the Kryvyi Rih series exposed metamorphism in several stages due to the manifestation of such geological processes [1-3, 5, 6]. Dynamothermal metamorphism had the greatest influence on the composition and structure of ferruginous quartzites and schists of both deposits, and dynamic, thermal, and shocks had the least significance.

Dynamothermal metamorphism accompanied the post-Gdantsivka stage of tectogenesis. Sedimentary formations of iron-silica and underlying formations have undergone metamorphic changes. The age of the metamorphism is about 2200 million years. The degree of metamorphism corresponded to the intermediate between the conditions of the green shale and epidote-amphibolite facies (southern part of the Pervomayske deposit) and the epidote-amphibolite facies (northern part of the Pervomayske deposit and Hannivske deposit). The first corresponds to the paragenetic mineral association in silicate-containing ferruginous rocks siderite + chlorite + sericite; the second - cummingtonite + almandine + biotite. Iron quartzites of the central parts of the fifth and sixth iron horizons of the Pervomaysky deposit and

the lying pack of the first iron horizon of the Hannivsky deposit are characterized by the same composition of mineral paragenesis: magnetite + quartz + hematite.

In addition to the mineral composition, dynamothermal metamorphism significantly influenced the structure of ferruginous quartzites and schists, determining the size and shape of minerals, the peculiarities of their spatial relationships. The layered texture of ores and rocks, which was formed due to sedimentation and diagenesis, has not changed.

Contact-reaction interactions of thermodynamically nonequilibrium strata of shale and iron horizons in accordance with the laws of the bimetasomatic process were associated with dynamothermal metamorphism. Bimetasomatism caused an increase in the capacity of the transition zones between the shale and iron horizons.

In conclusion, we would like to note that metamorphism is the main geological process that determined the mineral composition, structure, texture of ores and rocks and, as a consequence, - their physical, technical, technological properties. The most important is the quantitative ratio of ore or rock-forming and secondary minerals formed, as a result, of metamorphism. Ores of the central parts of the productive strata of both deposits are among the strongest, determine the maximum stability of rock massifs. Occurrence and gradual growth in the direction from the central to the peripheral zones of productive strata cause decrease of strength of silicates ore massifs.

#### **References:**

1. Akimenko N.M., Belevtsev Ya.N., Horoshnikov B.I. and others. Geological composition and iron-ores of Kryvoy Rog basin. Moscow: Gosgeoltechizdat, 1957, 280 p.
2. Anikeeva N.F. Evolution of several metamorphic ores of Krivoy Rog. Petrographic edition VSEGEI, Moscow: Gosgeoltechizdat, 1955, #1, p. 91-130
3. Evtexhov V.D. Stages of formation of a complex mineral-raw base of iron-ore deposits of Kryvyi Rih-Krimenchuk lineament. Bulletin of the Academy of mining sciences of Ukraine, 1997, #4, p. 111-114
4. Evtexhov V.D., Tikhlivets S. V., Evtexhov E. V. Geological factors of ores and rocks formation of Northern iron-ore region. Metamorphism. Development of industry and society. International scientific and technical conference. Conference Proceedings 17-20 November 2020, Kryvyi Rih, KNU, p. 59-61.
5. Nickolskyi A.P. Geology of Pervomaiskyi iron-ore deposit and its structure transformation by meteor impact. Moscow: Nedra, 1991, 72 p.
6. Peregudov A.P., Evtexhov V.D., Paranko I. S. Formation of data bases for computer modelling of open-pit mining of Annovskoe and Pervomaiskoe deposits of Northern GOK. Kryvyi Rih National University funds, 2006, 75 p.

## **Section 06 French Language Section**

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### **Yoga, sport, alimentation consciente : trois aspects de la vie saine**

Le sport nous rend plus vigoureux, plus énergiques, renforce le système nerveux, normalise les processus métaboliques, augmente l'efficacité et favorise la production "d'hormones du bonheur". Le sport maintient le corps en bonne forme, le rend plus résistant au stress, à la fois physique et psychologique. Et une nutrition correcte ou rationnelle - c'est le type de nutrition qui renforce et améliore la santé, la force physique et spirituelle d'une personne, la prévention et le traitement des maladies. En bref, une bonne nutrition est une alimentation saine. Une alimentation saine est la clé d'une longue vie.

Tout d'abord, c'est le yoga qui est un excellent moyen de vous distraire des problèmes et de vous débarrasser des pensées inutiles. Cela vous aide à vous connaître à la fois extérieurement et intérieurement. Déjà pendant les premières leçons, vous ferez un grand pas vers la maîtrise de votre corps et le contrôle de votre respiration. De plus, comme tout exercice, le yoga vous aide à tonifier vos muscles. À mon avis, le yoga sera utile pour les personnes de tous âges, en particulier les adolescents, les étudiants qui peuvent être très surchargés de pensées sur l'étude ou le travail. Également, cette pratique aidera à détendre non seulement le corps mais aussi la tête. D'après ma propre expérience, le yoga aide à résoudre des problèmes d'estomac, de la nervosité et de l'acné à cause des nerfs, et aide à faire face à tout cela beaucoup plus facilement. En étant une étudiante et en travaillant en même temps, le yoga permet de vivre des situations stressantes plus facilement.

Également, c'est le sport qui aide à rester fort, à avoir un beau corps, ce qui entraîne une bonne estime de soi et une bonne confiance en soi. Mais le plus important, c'est le fait que le sport aide à rester en bonne santé. La pratique régulière du sport permet de faire plus de choses que les personnes non-sportives. Aussi, cela aide à être moins fatigué et rester dans les rangs plus longtemps. Ainsi, la régularité de faire des exercices physiques ou simplement d'avoir n'importe quelle activité dans votre vie aide à rester en bonne santé, ce que je peux confirmer moi-même en me citant comme un exemple d'une personne sportive.

De plus, une alimentation consciente implique l'inclusion de tous les sens pendant le repas. Autrement dit, cette nutrition aide à comprendre quoi et quand il faut manger, en écoutant les signaux internes – le faim et la satiété. Je tiens à noter tout de suite qu'il n'est pas possible immédiatement de passer à ce type d'aliment. Puisqu'il nécessite une concentration sur l'apport alimentaire, il ne devrait y avoir aucune distraction inutile (téléphone, télévision, ordinateur).

Pour résumer, ces trois aspects de la vie saine sont en fait très efficaces et ils aident à préserver notre santé mentale et physique, puisque dans le monde moderne notre objectif n'est pas de survivre, mais de vivre. Mais n'oubliez pas que vous ne pouvez pas rester en bonne santé lorsque vous avez fréquemment des tensions mentales et du stress.

**Bibliographie :**

1. “La nourriture et le cerveau. Ce que les glucides font pour la santé, la réflexion et la mémoire”. David Perlmutter.
2. “Boussole de puissance. Des découvertes nutritionnelles importantes pour chacun de nous”. Bass Cast.

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### **La culturologie et ses tâches en tant que science**

La culturologie est une science complexe, dont le sujet est la culture en tant que la partie spéciale de la vie de la société humaine, son rôle et son importance dans la vie des individus et de la société dans son ensemble. La culturologie étudie les prérequis et les processus de formation et de développement de certains phénomènes dans les domaines matériels et spirituels de la vie de diverses communautés de personnes.

La culturologie ne peut pas se limiter à l'explication. Après tout, la culture s'adresse toujours à la subjectivité humaine et n'existe pas en dehors d'un lien vivant avec elle. Par conséquent, la culturologie doit être étudiée pour comprendre son sujet, c'est-à-dire l'acquisition d'une implication holistique intuitive-sémantique du sujet dans le phénomène perçu.

La culturologie étudie non seulement la culture dans son ensemble, mais aussi les domaines divers, souvent très spécifiques, de la vie culturelle, interagissant (jusqu'à l'interpénétration) avec l'anthropologie, l'ethnographie, la psychologie, la sociologie, la théorie économique, la linguistique, etc. En d'autres termes, la culturologie est une science humanitaire complexe, une science des arts appliqués. Le terme «cultural studies» a été proposé par l'anthropologue américain Leslie White pour désigner une nouvelle discipline scientifique comme science indépendante dans le complexe des sciences sociales.

Néanmoins, dans la classification scientifique étrangère, les études culturelles ne sont pas considérées comme une science distincte. Le phénomène de la culture en Europe et en Amérique est compris principalement dans le sens socio-ethnographique, donc l'anthropologie culturelle est considérée comme la science principale.

Le sens des études culturelles d'aujourd'hui est d'enseigner à une personne au niveau de la culture, en tant que son créateur. En fonction des objectifs et des domaines, du niveau de connaissance et de généralisation, on distingue les études culturelles fondamentales et appliquées. La tâche la plus importante des culturologues est d'analyser les processus et les tendances de l'environnement socioculturel de notre temps.

#### **Bibliographie:**

1. С.В. Козира, “Культурологія: навчальний посібник (ВНЗ I—III р. а.)” , Київ, 2017, 352 с.

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### **L'importance de l'apprentissage des langues étrangères dans le domaine de relations économiques internationaux**

Pour commencer je voudrais signaler que mon but principal est d'expliquer l'importance de l'apprentissage des langues étrangères pour un économiste international ainsi que pour les spécialistes des autres domaines.

Premièrement, l'apprentissage d'une langue développe les savoirs-faires de la communication, augmente le niveau intellectuel et ouvre la voie vers de nouvelles opportunités. Par exemple, on peut voyager librement, étudier la culture des pays différents, étudier et travailler à l'étranger, se perfectionner et s'épanouir.

Deuxièmement, si vous voulez travailler dans une entreprise internationale aujourd'hui, à l'époque de la mondialisation, vous ne pourrez pas vous passer sans la coopération avec les grandes entreprises multinationales. C'est pour cela qu'il faut maîtriser les langues de la communication internationale.

Troisièmement, quel que soit votre métier - juriste, économiste, manager, financier, architecte, informaticien - la connaissance des langues différentes vous aidera toujours trouver un bon travail. Car si vous travaillez dans une entreprise internationale, vous devrez traiter beaucoup d'information en langues différentes, communiquer avec vos collègues, rédiger des lettres officielles et des contrats, négocier avec vos partenaires, etc.

Pourquoi est-ce que pour un économiste international il est tellement important de maîtriser pas une seule langue étrangère, mais quelques-unes? La réponse à cette question est dans la nature même de ses tâches parmi lesquelles: les études des variations des prix sur les marchés mondiaux, la protection des intérêts économiques de l'entreprise lors des opérations internationales, les études des relations avec des organismes économiques internationaux différents, la mise en oeuvre de la politique commerciale extérieure.

Vu le niveau de la globalisation des procès économiques à tous les niveaux des relations commerciales entre les pays, il s'impose la forte nécessité de parler la langue de ses clients et ses partenaires. C'est pourquoi pour les économistes internationaux la maîtrise de quelques langues étrangères représente un grand atout et un avantage compétitif dans la situation de la concurrence rude sur le marché de travail.

En conclusion, tous les spécialistes du monde moderne ont envie de se développer, et la connaissance des langues de la communication internationale joue dans leur épanouissement un rôle primordial. Quant à un spécialiste dans le domaine des relations internationales, il aura toujours besoin d'apprendre et de maîtriser plusieurs langues étrangères - pour progresser et réussir sa carrière professionnelle constamment.

**Bibliographie:**

1. ResearchGate [Веб-сайт]. - 2009. - URL:  
[https://www.researchgate.net/publication/46533346\\_LES\\_LANGUES\\_ETRANGERES\\_COMME\\_FACTEURS\\_D'AVANTAGE\\_CONCURRENTIEL\\_DANS\\_UNE\\_ECONOMIE\\_GLOBALISEE](https://www.researchgate.net/publication/46533346_LES_LANGUES_ETRANGERES_COMME_FACTEURS_D'AVANTAGE_CONCURRENTIEL_DANS_UNE_ECONOMIE_GLOBALISEE)
2. Mgimo.ru [Веб-сайт]. - 2019. - URL:  
[https://mgimo.ru/upload/diss/2019/bykadorova\\_dissertaciya-1.pdf](https://mgimo.ru/upload/diss/2019/bykadorova_dissertaciya-1.pdf)

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### **Phénomène de l'anarchisme**

Il n'y a pas de philosophie unique de l'anarchisme en tant que telle. Les théoriciens anarchistes tout au long de l'histoire de ce mouvement n'ont finalement convergé que sur l'idée de la nécessité d'éliminer le pouvoir de la vie des gens. Les anarchistes peuvent partager les mêmes objectifs et les mêmes idées sur le chemin menant à eux, mais le contexte philosophique et l'argumentation peuvent être complètement différents.

Il suffit de comparer simplement les points de vue d'au moins quelques-uns des principaux théoriciens de l'anarchisme. Si nous regardons les positions des anarchistes de la seconde moitié du XXe siècle ou ceux qui ont participé au mouvement de 1968, nous rencontrerons des partisans d'une grande variété de points de vue philosophiques. Le plus important pour l'anarchisme est le concept de liberté humaine. Il existe de nombreuses définitions de la liberté. Liberté des interdictions, des restrictions, de la persécution, de la répression, de l'incapacité d'exprimer votre point de vue. Bien sûr, une telle liberté est reconnue par les anarchistes, mais c'est une «liberté négative».

Cependant, contrairement au libéralisme et à la démocratie, les anarchistes ne s'arrêtent pas là. Ils ont également des idées sur la liberté positive - «la liberté pour». C'est la liberté de la réalisation de soi. La liberté dans la représentation de l'anarchisme est inséparable. La liberté d'une personne présuppose la liberté d'une autre personne et ne peut pas être limitée par elle.

Tous les principes de l'anarchisme s'inscrivent dans la triade de la Grande Révolution française: liberté, égalité, fraternité. Bien que la Grande Révolution française n'était pas faite par des anarchistes et ce ne sont pas eux qui ont formulé le slogan, cette triade correspond le plus étroitement à l'idéal anarchiste, et non pas à chacune de ses parties individuellement, mais précisément dans la totalité et l'interconnexion de ces concepts.

Dans les discussions sur la société anarchiste, le problème du manque de préparation psychologique du monde d'aujourd'hui à un tel modèle d'ordre social libre et harmonieux est souvent discuté. Cependant, la révolution sociale anarchiste n'est pas un acte politique au sens étroit du terme, mais l'élimination des obstacles sur la voie de la diffusion de nouvelles structures libres d'auto-organisation dans la société.

#### **Bibliographie:**

- 1) Albert Camus "L'homme révolté", Gallimard, Paris 2002, ISBN 2-07-032302-1
- 2) Прудон Пьер Жозеф, "Что такое собственность?", Республика, Москва, 1998.

## **Typologie de la personnalité dans le contexte du comportement monétaire**

L'argent fait partie intégrante du fonctionnement de l'économie dans le monde d'aujourd'hui. Bien que la monnaie remplisse diverses fonctions économiques: mesures de valeur, moyens de circulation et de paiement, etc., elle stimule le progrès économique et social. [1]

Selon V. Moskalenko, l'argent est un facteur de formation de la psyché humaine dans le processus de survie, d'existence, d'autosatisfaction, de maintien d'un certain statut dans la société. [2].

Des études sur les attitudes envers l'argent, les mises en argent et les caractéristiques socio psychologiques des revenus et des dépenses ont permis de distinguer les types de personnalité monétaire. Les scientifiques pensent que les significations psychologiques les plus courantes de l'argent sont la sécurité, le pouvoir, l'amour et la liberté. G. Goldberg et R. Lewis ont développé une typologie des personnes, qui est basée sur l'argent comme symbole de sécurité, de pouvoir, d'amour et de liberté. [3]

Selon les chercheurs [3], les personnes pour qui l'argent symbolise la sécurité sont divisées en quatre types:

- Les «avares» pour lesquels la tâche principale est d'économiser de l'argent; en se limitant à dépenser de l'argent, ils se procurent un sentiment de sécurité. L'avare accumule constamment de l'argent et a très peur de le perdre. Cependant, il ne sait pas comment utiliser efficacement ses propres réserves monétaires.
- Les «ascètes» - font attention à l'argent, mais ils aiment l'abnégation et la pauvreté ostentatoire.
- «Chasseurs à rabais» dépensent de l'argent pour acheter des marchandises à des prix réduits; l'objectif principal est de déjouer à la fois les acheteurs et les personnes qui achètent des produits au prix fort. Le "chasseur de rabais" essaie toujours de faire des achats rentables et cela lui apporte du plaisir. En outre, il gâche généralement l'ambiance lorsqu'il doit payer le prix complet pour un produit.
- «Collectionneurs fanatiques» gaspillent de l'argent pour collecter des objets inutiles qui les sauvent de la solitude et leur garantissent un sentiment de sécurité.

Les gens pour qui l'argent est un symbole de pouvoir croient que l'argent peut acheter l'affection et le contrôle des gens. Ces personnes sont divisées en trois types:

- «Manipulateurs» - pour les «manipulateurs», manipuler les gens, cela signifie se sentir moins impuissants et frustrés. Ils ne se soucient pas de tromper les gens.

- «Constructeurs d'Empire» qui en niant leur propre dépendance vis-à-vis des autres, essaient de rendre les autres dépendants d'eux-mêmes.
- «Parrains et marraines» - les «parrains» utilisent l'argent pour les pots-de-vin et le contrôle, et assurent ainsi leur satisfaction [3].

L'argent est souvent utilisé pour acheter de l'amour, du dévouement et de l'estime de soi. G. Goldberg et R. Lewis ont identifié trois types de personnes qui considèrent l'argent comme un symbole d'amour.

- Les «acheteurs d'amour» se sentent privés d'amour et essaient d'éviter ce sentiment en montrant leur générosité.
- Les «vendeurs d'amour» promettent aux autres de l'amour, de la gentillesse et de l'affection qui impressionnent leur égoïsme.
- Les «voleurs d'amour» recherchent l'amour, mais sentent qu'ils ne le méritent pas; ces gens sont sujets à des relations superficielles [3].

Selon G. Goldberg et R. Lewis, il existe deux types de personnes pour qui l'argent est un moyen d'atteindre l'autonomie personnelle:

- Les «acheteurs de liberté» considèrent l'argent comme un moyen d'exemption des règles et obligations qui limitent leur indépendance.
- Les «combattants de la liberté» rejettent l'argent et les autres valeurs matérielles, les considérant comme des moyens qui rendent les gens esclaves. L'amitié est pour eux la principale récompense dans la lutte contre l'argent [3].

Ainsi, on peut dire que la compréhension de la typologie de la personnalité dans le contexte du comportement monétaire peut être appliquée en entreprise, en recherche marketing, pour leur propre développement personnel sur le chemin de l'indépendance financière.

### **Bibliographie:**

1. Дейнека О. Динамика отношения российских предпринимателей к деньгам // Ежегодник Российского психологического общества: Материалы 3-го Всероссийского съезда психологов 25-28 июня 2003 года: В 8 т. СПб.: Изд-во СПб. ун-та, 2003. Т. 2. С. 28–33.
2. Москаленко В. Сучасні напрямки досліджень в економічній психології // Соціальна психологія, 2004. № 3(5). С. 3–21.
3. Фенько А. Проблема денег в зарубежных психологических исследованиях // Психологический журнал, 2000. № 1. С. 50–62.

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## **Argo comme une particularité linguistique de la langue française**

Argo est le mot d'origine française «argot». En fait, c'est une langue avec une lexique spécifique d'un groupe fermé d'individus. Argo a trouvé sa plus grande usage parmi les jeunes d'aujourd'hui avec leur argot particulier, ou encore il est considéré comme la langue du groupe déclassifié des voleurs.

Le but de cette étude est de montrer la spécificité de l'usage de la langue argo sur l'exemple des expressions françaises modernes, et aussi de soulever ce sujet à travers son prisme d'éclairage dans le célèbre roman «Les Misérables» de Victor Hugo.

Un phénomène très courant dans le français moderne sont les abréviations. Par exemple, le restaurant devient «resto», sympathique - «sympa». Mais à quel point peut-on comprendre les coupures de textos ? Par exemple, «LcKc» signifie «elle est partie», et «tu vi1 2m1» = «tu viens demain?». Il y a certainement un glossaire des acronymes.

Un exemple particulier de discours d'argot est le mot «Tchatcher», qui derrière son essence est emprunté à la langue anglaise - c'est un dérivé de «chat». En argot français, cela signifie «bavarder sur tout et à la fois». Ce mot peut être entendu beaucoup plus souvent que sa forme classique «parler».<sup>1</sup>

Également, le mot français «L'oseille» - bien sûr nous savons quel est le genre de cette plante, mais en argot français il a pris le sens de «argent». Et avec le mot «Dodo» peut souhaiter bonne nuit. On pourrait penser que BCBG signifie «bon chic bon genre», ce qui est une analogue du mot «elegant».

Un exemple frappant de l'utilisation de l'argot est la bande de rue des voleurs du roman «Les Misérables», ainsi que l'héroïne - Azelma, qui a très bien maîtrisé le jargon criminel. Ainsi dans leurs conversations nous pouvons entendre «plume», ce qui signifie essentiellement «couteau»; «pharaons»- «police».<sup>2</sup> Souvent ces héros sont fiers de leur parole, et les dialogues qui ne sont pas accessibles à tous considèrent leur particularité.

Bien sûr, l'usage de l'argot va élargir votre vocabulaire dans une certaine mesure et la connaissance de l'argot lui-même nous rapproche de la compréhension de l'environnement linguistique.

Je voudrais résumer les paroles de Victor Hugo du roman «Argo pleure et Argo rit»: «Comme vous pouvez le voir, tous les argos - ceux qui étaient en circulation il y a 400 ans et les modernes - sont imprégnés par l'esprit symbolique qui donne des mots de ce genre de menace, ce genre de souffrance et de tristesse. Il peut ainsi sentir la tristesse sauvage de ces vagabonds pathétiques ».<sup>3</sup>

**Bibliographie:**

1. Francelex.URL: <https://francelex.ru/leksika/francuzski-zhargon.html> (дата обращения: 11.03.2021)
2. « Les Misérables » de Victor Hugo, 1845
3. «Argo pleure et Argo rit» de Victor Hugo

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## **Comment la psychologie de la gestion affecte l'efficacité de la gestion**

La connaissance des modèles de gestion et des caractéristiques psychologiques du comportement humain dans les organisations est désormais considérée, en substance, comme faisant partie intégrante de la culture générale de la personnalité d'un professionnel de tout domaine. En fait, l'objet des activités des spécialistes varient ; par conséquent, les méthodes de gestion varient également. Cependant, la partie principale de la gestion est la personne. Ses particularités psychologiques restent inchangées et possèdent un sens universel.

La psychologie du management est une science qui a évolué et s'est développée à l'intersection de deux disciplines scientifiques - la théorie du management et la psychologie. La psychologie de gestion est la science qui détermine les connaissances psychologiques pour la résolution de problèmes et la gestion de l'ensemble du processus éducatif. La psychologie de la gestion du personnel a ses propres caractéristiques. Le sujet de la psychologie de gestion est l'activité organisée des personnes travaillant dans un collectif ayant un but de production et exécutant le travail en commun.

Les méthodes principales de psychologie de gestion comprennent :

1) L'observation : c'est un processus psychologique et objectif qui consiste à réfléchir la réalité. La difficulté réside dans la mise en œuvre de cette méthode dans l'environnement naturel de l'ensemble de l'organisation.

2) L'expérience : c'est une méthode de collecte d'information pour confirmer les hypothèses existantes. Les résultats permettent une variété de décisions de gestion.

Les tâches de la psychologie de gestion du gestionnaire moderne sont différentes.

Premièrement, il faut avoir une bonne connaissance des bases de la bonne gestion des employés de l'ensemble de l'organisation, c'est-à-dire avoir une connaissance de la science de la gestion. Cette tâche doit être exécutée au cours de la formation.

Deuxièmement, il est nécessaire de savoir à quel moment il faut appliquer une connaissance pratique (ou scientifique), c'est-à-dire, avoir l'art complet de la gestion. Cela doit être traduit en action. La psychologie de la gestion fournit un aperçu des diverses influences qu'une organisation peut exercer sur la gestion et sur les relations au sein d'une équipe qui sont unies par une idée et des valeurs communes.

Les défis de la psychologie de gestion peuvent être considérés comme les suivants.

1) Analyse psychologique des activités de gestion; afin d'exercer une bonne gestion de l'équipe et de mener à bien le travail, le gestionnaire doit être en mesure de

comprendre et d'analyser ses propres actions, à partir de laquelle de bonnes décisions de gestion seront prises à l'avenir.

2) Étude des mécanismes d'exercice de la régulation mentale de la communauté de travail dans des conditions normales et extrêmes; l'étude de tous les mécanismes de travail contribuera à la bonne prise de décision.

3) "Leadership" et la recherche mentale ; cette tâche se manifeste dans l'étude du processus de leadership, dans lequel la personne individuelle influence activement le collectif et organise ses activités. Les gestionnaires doivent posséder de qualités solides de leadership pour mettre en œuvre un style individuel de gestion du travail.

4) Élaboration de lignes directrices de gestion psychologique pour l'application pratique des connaissances psychologiques dans le domaine de la gestion, de la résolution des conflits et de la régulation du microclimat psychologique au sein des équipes de l'organisation. Il est nécessaire de développer un sentiment de confiance stable sur le travail de toute l'équipe et le type de son comportement. L'indicateur le plus important des attitudes à l'égard du travail est la satisfaction professionnelle.

Les gens sont à la base de tout le système économique. C'est la ressource humaine qui est le moteur et la source d'énergie principale. Ce sont les êtres humains qui sont capables de s'améliorer et de se développer infiniment. L'esprit humain crée de nouveaux produits, accumule et utilise des ressources financières, assure le contrôle de la qualité, etc. Une bonne politique en matière de ressources humaines assure un leadership en matière de concurrence, car elle procure un certain nombre d'avantages importants à l'entreprise.

Finalement, la capacité et l'initiative du personnel sont presque illimitées et ne nécessitent pas de ressources financières supplémentaires. Les entreprises les plus fortes et les plus prospères du monde ont déjà réalisé que le meilleur investissement est un investissement dans une ressource de travail. Cela signifie qu'il est important de développer votre personnel et de prendre soin de son confort.

### **Bibliographie:**

1. Климов Э.А. "Общая психология". М. Питер 2001.
2. Крайг Г., Бокум Д. "Психология развития" СПб: Питер 2006.
3. [Электронный ресурс]. Режим доступа: [www.ht.ru](http://www.ht.ru)

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### **Pourquoi devons-nous apprendre les langues ? L'aspect de la communication dans des études linguistiques**

De nos jours, de nombreuses personnes apprennent des langues étrangères. Certains le font dans un but précis, certains pour leur propre plaisir, et certains sont simplement obligés d'apprendre la langue, par exemple à l'école. Et pourtant, que nous apporte l'apprentissage des langues en tant que l'instrument de la communication ?

La première raison est le développement du cerveau. Les nombreux avantages cognitifs de l'apprentissage des langues sont indéniables. Les personnes qui parlent plus d'une langue ont une mémoire améliorée, des capacités de résolution de problèmes et de pensée critique, une concentration accrue et de meilleures capacités d'écoute. Ils basculent entre les tâches concurrentes et surveillent les changements dans leur environnement plus facilement que les monolingues, tout en affichant des signes de plus grande créativité et flexibilité. En vieillissant, le fait d'être bilingue ou multilingue aide également à éviter le vieillissement mental et le déclin cognitif [2].

Également, la maîtrise des langues étrangères permet de comprendre le système, la structure et les règles de la langue maternelle. Par exemple, lorsqu'un enfant apprend sa langue maternelle, il ne pense pas encore aux règles de grammaire. En commençant à étudier une langue étrangère, nous nous familiarisons immédiatement avec sa structure, avec les règles de formation des mots et de construction des phrases. En comparant une langue étrangère et une langue maternelle, nous comprenons mieux cette dernière, apprenons plus rapidement des règles grammaticales complexes.

En outre, l'une des raisons évoquées par John McWhorter est que les personnes qui apprennent différentes langues réussissent mieux à effectuer plusieurs tâches à la fois [1]. De plus, les effets du bilinguisme se prolongent jusque-là vieillesse. Dans une étude récente portant sur 44 personnes âgées bilingues espagnol-anglais, des scientifiques dirigés par le neuropsychologue Tamar Gollan de l'Université de Californie à San Diego, ont constaté que les personnes ayant un degré plus élevé de bilinguisme - mesuré par une évaluation comparative de la maîtrise de chaque langue - étaient plus résistants que d'autres à l'apparition de la démence et à d'autres symptômes de la maladie d'Alzheimer: plus le degré de bilinguisme est élevé, plus l'âge d'apparition est tardif [6]. Soit dit en passant, il n'est pas nécessaire d'apprendre une langue étrangère depuis l'enfance pour devenir bilingue. Il existe trois types généraux de bilinguisme: un bilingue composé (acquérant plusieurs langues simultanément depuis l'enfance), un bilingue coordonné (apprendre une deuxième langue à l'école, en utilisant souvent la première dans des situations de tous les jours)

et un subordonné bilingue (les personnes qui ont appris une deuxième langue et ne peuvent pas la comprendre sans l'aide de leur première langue) [3].

De plus, la connaissance d'une langue différente peut être bénéfique au travail. La connaissance d'une deuxième langue élargit considérablement les possibilités de construire une carrière à l'étranger. Littéralement, le monde entier est ouvert à une personne connaissant plusieurs langues. De nombreux hommes d'affaires anglophones ne prennent pas la peine d'apprendre d'autres langues car ils pensent que la plupart des gens avec qui ils font des affaires à l'étranger peuvent parler anglais, et s'ils ne parlent pas anglais, ce sont des interprètes qui peuvent aider. Le manque de connaissances en langues étrangères désavantage les anglophones. Dans les réunions, par exemple, les gens de l'autre côté peuvent discuter entre eux dans leur propre langue sans que les anglophones ne comprennent, et l'utilisation d'interprètes ralentit tout. Lors de toute socialisation après les réunions, les habitants se sentiront probablement plus à l'aise d'utiliser leur propre langue plutôt que l'anglais [4].

Et l'une des raisons les plus importantes pour apprendre une langue est la communication. Avec la communication, vous pouvez vous imprégner d'une culture de locuteurs natifs ou, comme le dit John McWhorter, que les langues peuvent être des tickets pour pouvoir participer à la culture des personnes qui les parlent [1]. Il convient de mentionner ici la citation de Nelson Mandela: «*Si vous parlez à un homme dans une langue qu'il comprend, cela lui monte à la tête. Si vous lui parlez dans sa langue, cela lui va à cœur*». Lorsque vous parlez à des personnes dans leur langue, c'est comme si vous leur parliez dans leur propre code. Être capable de communiquer dans une autre langue nous expose et favorise une appréciation des traditions, des religions, des arts et de l'histoire des personnes associées à cette langue. Une meilleure compréhension, à son tour, favorise une plus grande tolérance, empathie et acceptation des autres - avec des études montrant que les enfants qui ont étudié une autre langue sont plus ouverts et expriment des attitudes plus positives à l'égard de la culture associée à cette langue. Plusieurs exemples merveilleux de la façon dont les gens peuvent vous accepter, si vous parlez leur langue sont montrés dans un livre de Trevor Noah «*Born a crime*». Par exemple, en tant qu'enfant d'une femme noire et d'un homme blanc, Trevor Noah est brun et pendant l'apartheid en Afrique du Sud sa couleur de peau était très perceptible. Les gens pouvaient donc se demander d'où il venait. Voici ce qu'il écrit: «*«D'où viens-tu?» ils demanderaient. Je répondrais dans la langue dans laquelle ils s'étaient adressés à moi, en utilisant le même accent qu'ils ont utilisé. Il y aurait un bref moment de confusion, puis le regard suspect disparaîtrait. «Ah d'accord. Je pensais que tu étais un étranger. On va bien alors.»»* [5 , 61]. Une autre situation a été lorsque des gens ont éclo pour le voler car ils pensaient qu'il était un étranger, mais dès qu'il a commencé à leur parler dans leur langue, ils ont changé d'avis, car ils l'ont accepté. Voici comment il décrit des situations comme celle-là: «*Je suis devenu un caméléon. Ma couleur n'a pas changé, mais je pourrais changer votre perception de ma couleur. Si vous m'avez parlé en zoulou, je vous ai répondu en zoulou. Si vous m'avez parlé à Tswana, je vous ai répondu à Tswana. Peut-être que je ne vous ressemblais pas, mais si je parlais comme vous, j'étais vous*» [ 5 ].

Ainsi, le processus d'apprentissage des langues demande beaucoup de temps et de patience, mais il est très enrichissant. Les langues rendent votre vie plus intéressante et vous devenez plus ouvert au monde et aux gens. Ils créent des attitudes plus positives et moins de préjugés envers les personnes différentes. Vous vous développez avec l'apprentissage des langues et devenez une personne consciente de ce monde.

**Bibliographie :**

1. John McWhorter. 4 reasons to learn a new language. URL : <https://ed.ted.com/lessons/i9eDOogu>
2. Leonardo De Valoes. Importance of Language – Why Learning a Second Language is Important. URL : <https://discover.trinitydc.edu/continuing-education/2014/02/26/importance-of-language-why-learning-a-second-language-is-important/>
3. Mia Nacamuli. The benefits of a bilingual brain. URL : <https://ed.ted.com/lessons/how-speaking-multiple-languages-benefits-the-brain-mia-nacamulli>
4. Omniglot, the online encyclopedia of writing systems and languages. URL : <https://www.omniglot.com/language/why.htm>
5. Trevor Noah. Born a Crime: Stories from a South African Childhood. First Edition. New York : Spiegel & Grau, 2016. 304 p.
6. Yudhijit Bhattacharjee. Why Bilinguals Are Smarter. URL : [https://www.nytimes.com/2012/03/18/opinion/sunday/the-benefits-of-bilingualism.html?\\_r=0](https://www.nytimes.com/2012/03/18/opinion/sunday/the-benefits-of-bilingualism.html?_r=0)

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### **Activités économiques dans l'arctique et le subarctique**

Le pergélisol de l'arctique et du subarctique est très sensible au changement climatique et à la technogénèse, qui, séparément, et surtout, améliorent conjointement la chaleur dans le sol et perturbation non compensée des couvertures naturelles et des roches du pergélisol. En raison du réchauffement climatique des dernières décennies, des conditions favorables ont été créées pour le dégel du pergélisol souterrain dans la partie sud de la zone de pergélisol russe. Le toit de pergélisol a commencé à couler.

La technogénèse la plus active est associée à l'utilisation du sous-sol. Selon les conditions d'utilisation du sous-sol, le territoire de la zone de pergélisol est complexe et surtout en conditions géologiques, hydrogéologiques et géoécologiques. Et leur faible connaissance prédétermine des risques accrus au cours du développement.

En conséquence, il est impossible de déterminer objectivement la contribution de la conception, de la construction et de l'exploitation aux réactions négatives de la nature à l'utilisation du sous-sol. Cela nécessite une base méthodologique et juridique sérieuse. Deux raisons principales sont le manque de financement public pour la recherche et le manque d'exigences conceptuelles pour les utilisateurs du sous-sol. Il y a un manque de compréhension de la signification de la surveillance derrière les deux raisons. En attendant, on sait que le projet national d'écologie, qui est prêt à être approuvé (y comprend les subdivisions «déchets», «air», «eau», «biodiversité»), ne contient pas de sections relatives au pergélisol.

Tel programme devrait se fonder sur la généralisation de l'expérience du développement de l'Arctique par région. Le travail régional et la surveillance devraient s'étendre et dépasser considérablement l'avancement des projets économiques dans l'Arctique dans les zones nouvellement développées. Les zones de développement avec des territoires adjacents deviennent de nouvelles zones de surveillance dont la valeur informationnelle est déterminée et modifiée en fonction du stade de développement économique.

Finalement, la zone cible de la surveillance et de la recherche géocryologique régionale devrait garantir:

1) le futur utilisateur du sous-sol - informations sur la présence de risques géologiques (géoécologiques) potentiels dans le développement des gisements les étapes du processus d'exploration, de l'exploration à la conservation;

2) les organes de gestion du fonds de sous-sol - matériaux pour le contrôle périodique du respect des règles et règlements pour la conduite de l'exploration et travaux opérationnels et gestion équilibrée de la nature dans le domaine des gisements minéraux et du territoire adjacent dans la zone de l'impact environnemental passif;

3) organes administratifs territoriaux - matériels sur l'évaluation de l'état écologique des territoires développés.

**Bibliographie:**

1. В.А. Косьянов, В.Ю. Керимов, В.В. Куликов, “Развитие новых идей и тенденций в науках о Земле: гидрогеология и инженерная геология, геоэкология”. Материалы XIV Международной научно- практической конференции "Новые идеи в науках о Земле", т.3, 508 с.

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### **La culture des débats et leur importance dans l'éducation**

Nous vivons à l'époque de la mondialisation, où les questions relatives aux droits de l'homme et la recherche de moyens de sortir de situations politiques et économiques difficiles sont cruciales. Compte tenu de la communication de la communauté internationale, le débat atteint une nouvelle place. La simple réalisation du progrès et la technicisation du monde ne sont pas en mesure de résoudre les problèmes de communication et de capacité des gens à négocier. La recherche du consensus et du compromis dans la société reste la prérogative du peuple. La culture des débats devient donc de plus en plus importante pour chaque pays. C'est sous la forme de débats que fonctionnent les parlements des démocraties traditionnelles, les débats sont des éléments de la campagne électorale, et le sujet du débat est étudié dans les institutions éducatives les plus prestigieuses d'Europe et des États-Unis.

La popularité du débat dans le monde moderne était en grande partie due aux premiers débats télévisés entre J. Kennedy et R. Nixon pendant la campagne présidentielle américaine de 1960. On peut dire qu'après cela, le débat s'est fermement ancré dans la vie politique tant sur le continent américain qu'en Europe. Pas étonnant que les premiers débats télévisés en Ukraine suscitent un tel intérêt.

À l'heure actuelle, l'existence d'une situation dans laquelle deux parties se disputent leur reconnaissance en tant que troisième est assez courante. Les plus connus sont les débats judiciaires, où les représentants des parties (plaignant et défendeur, ou poursuite et défense) tentent de convaincre le juge de leur justesse. Je tiens à souligner que les deux côtés ont raison, personne ne peut utiliser la tromperie pour persuader et jurer de ne dire que la vérité. Mais celui qui est le mieux à même de convaincre le juge est le vainqueur du procès.

Dans les affaires, les appels d'offres pour certains travaux ou commandes, appelés appels d'offres, sont de plus en plus annoncés. Si une organisation ou une entreprise peut convaincre que c'est celle qui fait le mieux le travail, elle l'obtient. Les deux défenses ouvertes des projets de différents groupes créatifs au sein d'un même ordre, et dans le travail d'une entreprise ont des signes de débat.

Il y a aussi un débat dans l'activité scientifique – il s'agit de chaque défense d'une thèse de doctorat ou il y a quelqu'un qui la défend et ceux qui s'y opposent.

De point de vue éducatif, le débat est un moyen d'établir une personne comme orateur. Mais c'est aussi un moyen d'accéder à une position active dans la vie. La capacité de prouver son opinion en public, de choisir sa manière de résoudre un problème et de prouver son opportunité - cette compétence est nécessaire dans la vie moderne pour ceux qui ne sont pas indifférents.

En général, les jeunes qui participent aux débats apprennent à penser de manière critique. La pensée critique ne signifie pas rechercher les erreurs. Cela signifie analyser et synthétiser des idées. Ils apprennent à augmenter la force de

l'argumentation, à formuler clairement des thèses et à vérifier la légitimité des idées. Ils apprennent à découvrir comment les idées sont liées les unes aux autres; ils comprennent l'importance de la séquence logique. Aussi, les élèves apprennent à penser de manière abstraite. Ils sont capables de voir que les conflits ne concernent pas toujours l'argent, les sentiments personnels ou les luttes de pouvoir - bien que tout cela semble être à la surface. Ils comprennent que les conflits sont souvent alimentés par des différences de valeurs et de principes.

Les capacités de réflexion acquises au cours du débat sont également importantes et utiles dans d'autres situations. Il en va de même pour les compétences de prise de parole en public qui sont améliorées lors de la participation au programme. Les participants au débat apprennent à parler clairement au public. Ces compétences peuvent aider ces étudiants dans leurs études, mais elles sont également importantes pour diverses professions telles que les enseignants, les avocats, la gestion ou le service communautaire. En résumé, il y a de grands avantages éducatifs à participer au débat. Le débat n'est pas une compétence distincte et isolée. Oui, les étudiants qui y participent apprennent à débattre, mais ils apprennent aussi beaucoup plus.

Le caractère unique du débat tient au fait qu'il est:

- curriculum de connaissance approfondie du monde;
- programme de résolution de problèmes sans conflit;
- formation aux procédures démocratiques et à la tolérance;
- préparation des participants au programme aux activités publiques;
- programme d'organisation extrascolaire des jeunes étudiants;
- programme de concours intellectuels.

Enfin, le débat est un bon moyen de développer la pensée critique et la parole. Cependant, un résultat plus tangible sera atteint par ceux qui savent identifier les contradictions dans les sujets, formuler des preuves convaincantes et les défendre, et en même temps, écouter attentivement les contre-arguments et considérer les réponses. Les étudiants qui pensent de manière indépendante obtiennent un résultat positif.

### **Bibliographie:**

1. [Електронний ресурс]. Режим доступу: <https://mon.gov.ua/ua/news/usi-novivni-novini-2016-02-04-evropejskij-trend-po-ukrayinski-studentski-debati>

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**Reverse Engineering Von Drehmaschinengetriebe**

Eine Drehmaschine ist eine Werkzeugmaschine, die vor allem für das Fertigungsverfahren Drehen gedacht ist, und dient zur Herstellung rotationssymmetrischer Werkstücke (Drehteile). Auf allen Drehmaschinen kann auch gebohrt werden, sofern die Mitte der Bohrung mit der Drehachse zusammenfällt. Manche Drehmaschinen besitzen auch Zusatzeinrichtungen zum Fräsen oder Stoßen.

Auf der Drehmaschine können verschiedenste Rotationskörper hergestellt werden; im einfachsten Fall sind dies zylindrische Drehteile, die auch ebene, zur Drehachse rechtwinklige Flächen aufweisen können. Komplexere Formen sind Kegel- oder Kugelflächen oder freie Formen, die mittels Zusatzeinrichtungen auch von der Drehsymmetrie abweichen können.

Die Hauptkomponenten sind das Gestell mit den Führungen für die Schlitten und den Reitstock, die Schlitten, der Antrieb und die Steuerung.

Das Reengineering von Geräten ist einer der relevantesten Prozesse, mit dem Sie das Funktionsprinzip des Untersuchungsobjekts ohne technische Dokumentation untersuchen oder fehlende Produktdaten erhalten und diese ändern oder modifizieren können. Das Reengineering eines Teils in der Industrie ist eine Reverse-Design-Entwicklung (Reverse-Design) eines Produkts, um zuverlässige Daten mit einer bestimmten Genauigkeit über die Geometrie des Reengineering-Objekts zu erhalten. Das Ergebnis des Reverse Engineering (Reengineering) ist ein 3D-Modell des Objekts im Solid-Data-Format. Wenn dieses 3D-Modell qualifiziert ist, ähnelt es der Originalzeichnung des Originalprodukts.

Drehmaschinen führen verschiedene Drehvorgänge mit Werkstücken aus Metall, Holz und anderen Materialien in Form von Rotationskörpern durch. Sie können auch Gewinde schneiden und die Oberfläche auf eine minimale Rauheit schleifen. Bolzen, Stifte, Holzsäulen für Treppen in schönen Häusern, Holzschalen mit originellem Design und Ausführung und viele andere Dinge, die ohne Drehmaschinen professionell nicht möglich gewesen wären, und deshalb wurden Drehmaschinen früher und heute benötigt.

Der Gegenstand des Forschungsprojekts ist eine Drehmaschine. Maschinen dieses Typs führen verschiedene Drehvorgänge mit Werkstücken aus Metall, Holz und anderen Materialien durch. In Form von rotierenden Körpern auf Drehmaschinen werden verschiedene Vorgänge mit dem Schlichten und Schruppen von Werkstücken durchgeführt.

Die Aktualität der Arbeit besteht sowohl in der Restaurierung verlorener Konstruktionsunterlagen als auch in der Modernisierung der Maschine. Es wird zusätzlich das Prinzip der Funktion der Maschine für die Suche nach den neuen Design-Lösungen bei der Untersuchung bestehender Aggregate, den

Anwendungsmöglichkeiten von Design-Lösungen für ein bestimmtes Produkt oder ein ähnliches durchgeführt.

Der Zweck der Arbeit ist die Wiederherstellung der verlorenen Dokumentation der Drehmaschine des unbekanntes Modells Reverse Engineering.

Die aktuellen Drehzahlen sind so ausgelegt, dass sie die Drehzahl oder das Moment der Spindel ändern, beispielsweise den Gewindeschneidmodus und seine Art der Einstellung.

Das Ziel der Arbeit ist es, ein Computermodell der Speed Box zu entwickeln und das Wirkprinzip zu verstehen.

Die technischen Daten sind wie folgt:

- Motorleistung 4 kW.
- Motordrehzahl 1420 rpm.

Als Ergebnis ist während der Fertigstellung ein Computermodell einer Speed-Box, in der alle Zahnräder Peitschen aus Steel 40S sind, zu erhalten:

Die Konstruktion besteht aus: Holm, in das ein Mechanismus eingebaut ist, Keilwellensystem mit Zahnrad, Zahnmuster und Schwenkgabeln, Geschwindigkeitsregelsystem und Gewindetyp.

Mithilfe der Computersimulation in SolidWorks konnten die Erfassung und das Vorhandensein der erforderlichen Lücken in der Baugruppe sowie das Fehlen von Interferenzen überprüft werden.

Die Durchführung des Forschungsprojektes widmet sich der Lösung des eigentlichen technischen Problems - Reengineering der Drehmaschine und Konstruktion ihres 3D-Modells für die Entwicklung der technischen Dokumentation des Produkts und die Durchführung einer detaillierten Berechnung des zylindrischen Getriebes für weitere Modernisierung.

Im ersten Teil des Forschungsprojekts wurden die Berechnungen durchgeführt, im anderen die Konstruktion von dreidimensionalen Modellen sowie die Konstruktion ihrer Hauptteile. Als Ergebnis wurde die Dokumentation mit den Materialien der Maschine, ein Paket mit Zeichnungen und Daten für eine Stromversorgung erhalten.

Technologische Probleme wurden ausgearbeitet.

#### **Literaturverzeichnis:**

1. Каталог верстатів «Рубікон ООО» [[Електронний ресурс](http://stanki-katalog.ru)] URL: <http://stanki-katalog.ru>
2. Чернавский С.А. «Проектування механічних передач». - 1984. - 560с., стр. 88. 5е видання.» *Машинобудування» Москва*
3. Ануриев В.І. «Довідник конструктора-машинобудівника: 2 Том»./ Перераб. і доп. під ред. І.Н. Жесткова. - М.: *Машинобудування*. - 2001, стр. 150 – 162. «*Машинобудування» Москва*
4. «Курсове проектування деталей машин». /Під ред. В.Н. Кудрявцева. - Л.: *Машинобудування*. - 1983, стр. 397. Москва
5. Таблиця твердості матеріалів [[Електронний ресурс](http://www.profprokat.ru/content/view/1296/)] URL: <http://www.profprokat.ru/content/view/1296/>.

## **Unternehmertum Ist Die Wichtigste Art Der Wirtschaftstätigkeit**

Unternehmertum ist ein wichtiger Faktor für die Entwicklung des wirtschaftlichen Umfelds. Mithilfe des Unternehmertums in verschiedenen Bereichen kann die Gesellschaft Arbeitsplätze schaffen, den eigenen Bedarf decken, zum wissenschaftlichen und technischen Fortschritt beitragen. Unternehmertum ist eine Form der wirtschaftlichen Tätigkeit. Es handelt sich um eine initiative, unabhängige Tätigkeit von Bürgern und ihren Vereinen, die auf eigenes Risiko und eigene Verantwortung durchgeführt wird und auf Gewinn abzielt.

Aus rechtlicher Sicht ist ein Unternehmer eine natürliche Person, die ordnungsgemäß registriert ist und eine unternehmerische Tätigkeit ausübt. Ein Unternehmer darf jede Art von Tätigkeit ausüben, solange sie nicht gesetzlich verboten ist (wirtschaftliche Produktion, Handel und Einkauf, Innovation, Beratung, Vermittlung). Die unternehmerische Tätigkeit kann von einer einzelnen Person oder von einem Kollektiv ausgeübt werden.

Bedingungen, die für die Entwicklung der unternehmerischen Tätigkeit notwendig sind: Stabilität der wirtschaftlichen und sozialen Situation im Land; wirtschaftliche Freiheit von Produzenten und Konsumenten; Offenheit und Ausgeglichenheit des Marktes.

Die Wirtschaftskrise auf der einen Seite schafft Schwierigkeiten für die Entwicklung des Unternehmertums, auf der anderen Seite versucht der Staat, die Unternehmer durch ein System von Gesetzen und Leistungen zu schützen.

Die wirtschaftliche Freiheit des Produzenten ist das Recht des Warenproduzenten, das Profil, die Struktur und den Umfang der Produktion, die Verkaufsbedingungen und die Preise für die Produkte selbständig zu wählen. Sie wird durch Kompromissvereinbarungen mit anderen Marktteilnehmern erreicht. Die Freiheit des Verbrauchers drückt sich in der freien Wahl des Verbrauchers auf dem Markt der Waren und Dienstleistungen aus. Und die Freiheit des Unternehmertums drückt sich in der Tatsache aus, dass jedes Mitglied der Gesellschaft unabhängig seine Ressourcen in Übereinstimmung mit seinen Interessen verteilt und den Prozess der Produktion von Waren und Dienstleistungen unabhängig organisieren kann. Der Unternehmer bestimmt selbst, was und für wen er produziert, zu welchem Preis er die produzierten Güter verkauft, wie er die Produktion organisiert und wie er den Erlös ausgibt.

Ein offener Markt ist ein Markt, auf dem jedes Subjekt handeln kann und dessen Preise nur durch Angebot und Nachfrage bestimmt werden. Marktgleichgewicht (Marktgleichgewicht) ist eine Situation auf dem Markt, wenn die Nachfrage nach einem Produkt gleich dem Angebot ist; die Menge des Produkts und sein Preis werden als Gleichgewicht bezeichnet. Das Marktgleichgewicht wird durch

den Gleichgewichtspreis und das Gleichgewichtsvolumen definiert. Wenn die oben genannten Bedingungen erfüllt sind, wird sich Unternehmertum entwickeln.

Das Ziel im Unternehmertum ist es, einen Gewinn zu erzielen. Der Unternehmer entwickelt seine eigene Spezifität seiner Tätigkeit und mit Hilfe dieser Eigenschaften schafft und integriert er moderne Technologien für unternehmerisches Einkommen. Damit ein Unternehmen auf dem Markt existieren und sich entwickeln kann, müssen besondere Bedingungen erfüllt sein, wie z. B.: freier Preis; Verfügbarkeit eines einzigen Grundstücks; technologische Bedingtheit der Produktionsfaktoren; ein bestimmter Platz in der Gesellschaft; Eigentum; und Wettbewerb.

Die wichtigsten Merkmale des Unternehmertums sind: Risiko, Mobilität und Dynamik. Der Unternehmer ergreift die Initiative zur Kombination von Produktionsfaktoren zur Schaffung von Gütern (Arbeiten, Dienstleistungen) mit dem Ziel, einen Gewinn zu erzielen; er ist der Organisator der Produktion. Der Unternehmer bestimmt die Strategie und Taktik des Unternehmensverhaltens, übernimmt die Verantwortung für deren Umsetzung; führt neue unkonventionelle Techniken und Wege zur Gewinnsteigerung ein; hat keine Angst vor dem Risiko und nimmt es bewusst in Kauf, um das Ziel zu erreichen. So spielen die Persönlichkeit und die Charakterstärke des Unternehmers eine besonders wichtige Rolle beim Unternehmertum.

Um eine Ware zu verkaufen, muss man sie haben. Der Unternehmer kann die Waren selbst herstellen, sie von anderen erhalten und dann verkaufen. Auf dieser Grundlage kann das Unternehmertum in drei Formen unterteilt werden: industriell, kommerziell, finanziell. Da sie relativ unabhängige Tätigkeitsarten sind, ergänzen sie sich gegenseitig.

Produzierendes Unternehmertum ist eine Tätigkeit, die auf die Herstellung von Produkten, die Erbringung von Dienstleistungen, die Durchführung von Arbeiten, die Sammlung, Verarbeitung und Bereitstellung von Informationen usw. abzielt, um anschließend an Verbraucher verkauft zu werden. Seine Umsetzung erfordert finanzielle und materielle Ressourcen. Das erste Element in der Technologie der Umsetzung dieser Art von Unternehmertum ist die Wahl des Hauptbetätigungsfeldes. Vor der Auswahl ist es notwendig, Marketingforschung zu betreiben: inwieweit das Produkt oder die Dienstleistung vom Kunden (Klienten) benötigt wird, wie hoch die Nachfrage ist, wie groß sie ist und welche Entwicklungstendenzen sie hat, wie hoch der mögliche Verkaufspreis ist, wie hoch die Produktions- und Verkaufskosten sind und wie hoch der erwartete Absatz ist. Das Ergebnis dieser Art von Unternehmertum ist die Herstellung eines Produkts, das verkauft werden soll. Die Bemühungen des Unternehmers sollten sich darauf konzentrieren, einen Vertrag über die Lieferung des hergestellten Produkts zu schließen, bevor die Produktion beginnt, um das Risiko eines Konkurses zu verringern. Der Unternehmer sollte bestrebt sein, den Umsatz zu beschleunigen, wobei er davon ausgeht, dass das Geschäft einen jährlichen Gewinn von mindestens 20-22% der Kosten einbringen sollte.

Kommerzielles Unternehmertum zeichnet sich dadurch aus, dass sein Inhalt aus Ware-Geld-, Tauschgeschäften besteht, d. h. es findet ein Wiederverkauf statt.

Die Anfangsphase der Technologie ist eine Auswahl - was soll gekauft werden, was soll weiterverkauft werden und wo der Verkaufspreis höher sein sollte als der Einkaufspreis, sollte die Nachfrage nach dem beabsichtigten Produkt ausreichend sein. Es ist notwendig, eine Marktforschung durchzuführen, um die Konjunktur (d.h. eine Reihe von Bedingungen, die die Marktsituation zu einem bestimmten Zeitpunkt bestimmen) zu beurteilen: welche Waren, Dienstleistungen, Arbeiten werden am meisten nachgefragt, wie sind die Kauf- und Verkaufspreise.

Der Unternehmer muss einen konkreten Aktionsplan entwickeln - einen Marketingplan. Es definiert die Aktivitäten des Kauf- und Verkaufsgeschäftes; kalkuliert Kauf- und Verkaufspreise, Kosten, Ergebnisse; bestimmt Mittel für Werbung, Transportkosten, Kosten für kaufmännische Formalitäten, benötigtes Personal, Kosten für die Anmietung von Räumlichkeiten, Formen des Warenverkaufs, Wareneinkaufs, rechtfertigt die Kreditaufnahme, berechnet Steuern. Ein sorgfältig ausgearbeiteter Marketingplan ermöglicht es, die Rentabilität oder Unrentabilität der Transaktion zu beurteilen.

Finanzielles Unternehmertum ist eine Art kommerzielles Unternehmertum, aber der Gegenstand des Kaufs und Verkaufs ist hier ein bestimmtes Produkt: Geld, Währung, Wertpapiere. Der Geld-, Devisen- und Wertpapiermarkt ist eine Realität; seine Teilnehmer sind Banken, Börsen, juristische und natürliche Personen. Ein Unternehmer muss den Markt für Wertpapiere und Marketingaktivitäten analysieren. Es ist notwendig, potenzielle Käufer von Geld, Währung und Wertpapieren zu finden und zu gewinnen. Gleichzeitig legt er die Quelle für Geld, Währung und Wertpapiere fest. Der Unternehmer kann als Verkäufer, als Wucherer auftreten und dem Verbraucher Geld, Devisen und Wertpapiere gegen ein bestimmtes Entgelt oder zu einem bestimmten Zins leihen.

Das Unternehmertum wird nach folgenden Merkmalen weiter in verschiedene Typen unterteilt. Es wird in lokales, regionales, nationales, internationales und globales Unternehmertum unterteilt, je nach Verbreitung in verschiedenen Gebieten. In Bezug auf Entwicklungstempo, Rentabilitätsniveau und Profitabilität: in schnell und langsam wachsende Unternehmen; in hochprofitable und niedrigprofitable Firmen; in risikoarme und sehr risikoreiche Unternehmen.

Das Unternehmertum nimmt zweifelsohne einen zentralen Platz in der modernen Gesellschaft ein.

### **Literaturverzeichnis:**

1. Tim Schütte. Wirtschaftslexikon «Unternehmertum». [Elektronische Ressource]. 2021. URL: <https://www.onpulson.de/lexikon/unternehmertum/>
2. Lexikon «Unternehmertum». [Elektronische Ressource]. 2019. URL: <https://www.businessinsider.de/gruenderszene/lexikon/begriffe/unternehmertum/>

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## **Schädliche Wirkung der Nutzung von sozialen Netzwerken**

Um genauere Informationen zu diesem Thema zu liefern, wird hier ein soziales Netzwerk als Beispiel angeführt. Doch wurde kein routinemäßiges Facebook oder Instagram als Modell genommen, sondern der Begriff „Weblogs“ im Allgemeinen.

In der heutigen digitalen Welt nutzen “Weblogs“ nicht nur Jugendliche, sondern auch ältere Generation. Wenn jemand es ablehnt, dann ist es leicht, Entgegengesetztes zu beweisen. Z.B. nach einem neuen Kochrezept zu suchen, heißt es, dieselben sozialen Netzwerke zu nutzen, jedoch mit einem anderen Wort – Weblogs. Wenn man irgendwelche Fragen und nützliche Tipps hat, dann schreibt man nach der Fassung des Textes im Blog seine Gedanken oder man bietet um den Rat. Danach muss man ein bisschen auf die Antwort warten. Alles ist ganz einfach. Aus diesem Grund werden Weblogs immer beliebter sowohl wegen Einfachheit, als auch wegen Verfügbarkeit. Entweder kann man einfach seinen Computer einschalten und schnell ins Google gehen oder eine App, wie zum Beispiel „Reddit“, herunterladen. In den Weblogs tauschen Menschen sehr viel über die verschiedenen Themen aus. Die Themen variieren von Kochen, Gesundheit und Verletzungen beim Sport bis Literatur, Brettspiele und wie man Origami selbständig zusammenbauen kann. Jedoch ist alles nicht so perfekt, wie es erstmals scheint. Zum Beispiel kann jemand in den Kommentaren sehr ärgerlich sein und eine böse Antwort hinterlassen. Dann kann es später zu einem Konflikt führen. Oder jemand kann zur Sprache etwas Heikeles, wie zum Beispiel Politik, bringen. Deswegen wird es sinnlos lange Zeit um den Kaisers Bart gestritten.

Aber bei der Nutzung von Weblogs kann man wirklich die realen Nachteile nur später treffen. Man darf dort nicht jeder geschriebenen Antwort sein Vertrauen zuwenden. Denn fast alles, was man im Netz mitteilt, lässt sich nicht überprüft werden. Jemand kann selbst etwas erfinden und dann es als Dogma vertreten, als ob es die Wahrheit wäre. Hier fällt unverzüglich das bekannte Beispiel “Impfen macht dumm”. Eines Tages hat jemand sich ausgedacht, dass bestimmte Impfstoffe die schrecklichsten Sachen in der Welt sind, da sie zur Zerstörungen der schon vorhandenen Chromosomen führen. Sozusagen münzen sie die Leute angeblich zu Behinderten um, infolgedessen werden viele quasi an dem Autismus erkrankt.

Die Information über den Schaden der Impfungen hat sich so rapid breit gemacht, dass es möglich ist, zu behaupten, dass Internet wahrscheinlich nie zuvor so einen extremen Boom erlebt hat. Diese Neuigkeit ließ sich in ein paar Tagen überall beobachten, sodass es sogar in Wikipedia eine Seite erschienen ist. Bei niemandem ist sogar die Zweifel eingeschlichen, dass es ein bisschen später zu gravierenden Konsequenzen führen kann. Seit Jahren haben nur in den USA etliche Millionen Menschen auf Impfen verzichtet. Infolge dieses „Protestes“ kann man sich nur

vorstellen, wie viele Erwachsene und Kinder an gewöhnlichen Erkrankungen wie Masern gestorben sind, weil sie sich nicht impfen lassen haben.

Dank diesem anschaulichen Beispiel soll man in Kauf nehmen, dass alles, was man in World Wide Web liest, sieht oder hört, muss nicht nur unbedingt nachgeprüft, sondern auch kritisch beurteilt werden. Dazu muss noch ein wichtiger Punkt akzeptiert werden. Zwar sollte man alles überprüfen, aber dieses alles lässt sich nicht völlig oder gar auf 50% kontrolliert werden. Soziale Netzwerke sind für viele nur eine realitätsferne Welt. Man kann Bilder von Karibiken hochladen und hinzufügen, dass man dort Urlaub gemacht hat, obwohl das eigentlich nicht stimmt. Dank Photoshop hat es allzu vereinfacht, als es vor 20 oder sogar 10 Jahren war. Deshalb hat jeder heutzutage die Gelegenheit, sowohl schnell nach einem Tutorium zu recherchieren, als auch in ein paar Minuten anhand des letzten "nach Karibiken zu verreisen". Nebenbei verschärft die Situation die menschliche Gewohnheit, sich selbst mit den anderen zu vergleichen. Dadurch kann man sich nur verletzen, wenn man z. B. ein schönes Bild von einem extrem teuren Auto sieht. Auf dieser Note verwechselt man oft "Internet" mit Realität, was zu schädlichen Folgen führt. Infolge dieser Verzerrung stellt man sich die Fragen bezüglich des Glücks, Erfolgs und Gelds, was schon ein Fehler ist. Die Leute, die für einen eigentlich egal sein müssten, werden die gelungensten Menschen der Welt. Einerseits kann es so sein, doch andererseits könnten diese Menschen 10 Jahren lang Tag und Nacht hart schufteten, um die Stelle unter der Sonne zu erzielen. Aus diesem Grund soll man akzeptieren, was hinter den Kulissen steht: steinreiche Eltern, harte Arbeit oder Glückssache. Im Web veröffentlicht man nur die besten erlebten Momenten, weswegen die Hinterbühne fast oft undurchschaubar ist.

Genauso lassen sich die echten Emotionen durch Fotos sehr schwierig vermitteln. Obwohl man auf dem Bild lächelt, lacht, neue Freundin hat usw., trotzdem ist man zurzeit ganz allein und empfindet harte depressive Verstimmung. Der Grund dafür ist, dass man sich als der Beste zeigen will, als ein richtiger Mensch, denn niemand will ein Pechvogel sein. Im Gespräch per Chat entsteht das Problem mit den Emotionen. Geschriebene Worte werden nie das Gesagte ersetzen.

Die Nutzung von sozialen Netzwerken reduziert das menschliche Wohlbefinden, statt zu steigern, obwohl die Hauptidee war, die Welt besser und näher zu machen. Doch sind wir alle in der modernen Welt vom Netz sehr besessen, weil dort heute das meiste Leben durchläuft.

### **Literaturverzeichnis:**

1. Radio interview «How false information spreads» in English. LearnEnglish Teens & British Council Org. 2017. [Online]

Available: <https://learnenglishteens.britishcouncil.org/skills/listening/advanced-c1-listening/how-false-information-spreads>

2. Artikel von Philipp Laage « Hunderte „Freunde“ bei Facebook – und doch alleine». Deutsche Welt, 2013. [Online]

Available: <https://www.welt.de/gesundheit/psychologie/article122536789/Hunderte-Freunde-bei-Facebook-und-doch-alleine.html>

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## **Unterschiedliche Arten der galvanischen Zelle und ihre Spezifik**

Der Gegenstand dieser Forschungsarbeit ist die galvanische Zelle, ihre Arbeit und Verwendung in der modernen Welt. Das Ziel ist es, die Prozesse, die in einer galvanischen Zelle ablaufen, und ihre Verwendung in der Praxis kennenzulernen.

Eine galvanische Zelle ist eine chemische Stromquelle, die auf der Wechselwirkung zweier Metalle und / oder ihrer Oxide in einem Elektrolyten beruht und zur Erzeugung eines elektrischen Stroms in einem geschlossenen Kreislauf führt.

Ein wichtiges Merkmal der Reaktionen in einer galvanischen Zelle ist, dass dort spontan Redoxreaktionen auftreten. In einer galvanischen Zelle ist die Anode der negative Pol und die Kathode der positive. In diesem Fall fließen Elektronen von der Anode zur Kathode. Außerdem findet in einer galvanischen Zelle muss der Elektronentransfer sichergestellt werden. Dies liegt daran, dass die Elektroden sind in einiger Entfernung beanstandet. Dies bedeutet, dass Reduktion und Oxidation auch getrennt in einer Halbzelle stattfinden.

Um zu unterscheiden, in welcher Hälfte der Zelle die Reduktion stattfindet und bei denen Oxidation auftritt, kannst du die Elektroden in „**edel**“ und „**unedel**“ einteilen. Sie können eine Elektrode "edel" nennen, wenn sie sehr bereit ist, Elektronen aufzunehmen. Wenn die Bereitschaft gering ist, können Sie sie in "unedel" unterteilen. Ein Maß für diese Bereitschaft ist das sogenannte Redoxpotential unter Standardbedingungen oder auch Standardelektrodenpotential genannt. Je größer das negative Redoxpotential ist, desto stärker ist die Reduktionsfähigkeit der entsprechenden Elektrode. Da das weniger "edle" Metall eine größere Tendenz hat, in Lösung zu gehen, bedeutet dies, dass mehr Elektronen in der weniger "edlen" Elektrode verbleiben, was bedeutet, dass es negativer geladen ist als die "edlere" Elektrode. Dies erzeugt einen elektrischen Strom.

Die einfachste galvanische Zelle kann aus zwei Streifen bestehen: Kupfer und Zink, eingetaucht in Wasser, das leicht mit Schwefelsäure angesäuert ist. Wenn das Zink rein genug ist, um frei von lokalen Reaktionen zu sein, tritt keine merkliche Änderung auf, bis Kupfer und Zink durch Draht verbunden sind. Allmählich wird die Schwefelsäure des Elektrolyten durch Zinksulfat ersetzt, das aus dem gelösten Teil der Zinkelektrode gebildet wird. Dies reduziert die Zellenspannung. Ein noch größerer Spannungsabfall wird jedoch durch die Bildung von Gasblasen auf dem Kupfer verursacht. Beide Aktionen erzeugen eine "Polarisation". Solche Elemente haben fast keinen praktischen Wert.

Akkumulatoren sind sekundäre galvanische Zellen. Im Gegensatz zu galvanischen Zellen treten in einer Batterie unmittelbar nach dem Zusammenbau keine chemischen Prozesse auf. Damit der Akkumulator chemische Reaktionen im Zusammenhang mit der Bewegung elektrischer Ladungen auslösen kann, muss die

chemische Zusammensetzung ihrer Elektroden (und teilweise des Elektrolyten) entsprechend geändert werden. Diese Änderung der chemischen Zusammensetzung der Elektroden tritt unter der Wirkung eines elektrischen Stroms auf, der durch die Batterie fließt. Damit der Akkumulator elektrischen Strom abgeben kann, muss sie daher zuerst mit einem konstanten elektrischen Strom von einer Fremdstromquelle "aufgeladen" werden.

Akkumulatoren unterscheiden sich von herkömmlichen galvanischen Zellen auch dadurch, dass sie nach dem Entladen wieder aufgeladen werden können. Bei guter Pflege und unter normalen Betriebsbedingungen können die Batterien bis zu mehreren tausend Lade- und Entladungen standhalten.

Derzeit werden in der Praxis am häufigsten Blei- und Cadmium-Nickel-Akkumulatoren eingesetzt. Im ersten Fall dient eine Schwefelsäurelösung als Elektrolyt und im zweiten Fall eine Alkalilösung in Wasser.

Der Zustand der Platten in einem Säure-Akkumulator –Gerät entspricht einer entladenen Batterie. Wenn nun die Batterie zum Laden eingeschaltet, d.h. an einen Gleichstromgenerator angeschlossen ist, beginnt die Polarisation der Platten aufgrund der Elektrolyse darin. Infolge der Batterieladung sind ihre Platten polarisiert, d.h. sie verändern die Substanz ihrer Oberfläche und von homogen ( $\text{PbSO}_4$ ) zu heterogen ( $\text{Pb}$  und  $\text{PbO}_2$ ). Die Batterie wird zur Stromquelle mit einer Platte, die mit Bleidioxid als positiver Elektrode bedeckt ist, und einer sauberen Bleiplatte als negativer Elektrode. Am Ende der Ladung steigt die Konzentration des Elektrolyten aufgrund des Auftretens zusätzlicher Schwefelsäuremoleküle darin an. Dies ist eines der Merkmale einer Blei-Säure-Batterie: Ihr Elektrolyt bleibt nicht neutral und nimmt selbst an chemischen Reaktionen während des Batteriebetriebs teil. Am Ende der Entladung sind beide Platten der Batterie wieder mit Bleisulfat bedeckt, wodurch die Batterie keine Stromquelle mehr ist. Die Batterie wird niemals in diesen Zustand gebracht. Aufgrund der Bildung von Bleisulfat auf den Platten nimmt die Elektrolytkonzentration am Ende der Entladung ab. Wenn der Akku aufgeladen wird, kann die Polarisation erneut verursacht werden, um ihn wieder zu entladen usw.

Für die Stromversorgung von Funkgeräten werden versiegelte Cadmium-Nickel-Batterien hergestellt, die bei Temperaturen von  $-30$  bis  $+50$  ° C effizient sind und 400 bis 600 Lade- / Entladezyklen standhalten. Diese Batterien werden hergestellt aus kompaktem Parallelepiped und Scheiben mit einem Gewicht von mehreren Gramm bis Kilogramm.

#### **Literaturverzeichnis:**

1. «ElectricalSchool». [Elektronische Ressource].

URL: <http://electricalschool.info/main/osnovy/>

2. «Wikipedia». [Elektronische Ressource]. 2016.

URL: <https://ru.wikipedia.org/wiki/>

3. «Studyflix». [Elektronische Ressource].

URL: <https://studyflix.de/chemie/elektrochemische-spannungsreihe-1769>

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## **Das Wort regiert die Welt, und der Philologe regiert das Wort!**

**Philologie** (aus dem Griechischen φίλος - Liebe und Griechisch λόγος - Wort, Lehre) - eine Reihe von Geisteswissenschaften, die die spirituelle Kultur eines Volkes oder einer Zivilisation durch sprachliche und stilistische Analyse literarischer und anderer Denkmäler untersuchen. Das Hauptthema ihrer Forschung ist der Text, und der Zweck ist sein Kommentar und seine Interpretation.

Die Philologie als eigenständige Wissenschaft entwickelte sich im 17 – 18. Jahrhundert zu einem Wissenssystem. Zu dieser Zeit wurde Philologie das Studium der Sprache der Kunst, Literatur, Geschichte, Philosophie und sogar der materiellen Kultur. Der gleiche Begriff "Philologie" tauchte später im frühen 19. Jahrhundert in der Arbeit des deutschen Philologen Wolf auf. Er veröffentlichte das Buch "Encyclopedia of Philology", das 1930 veröffentlicht wurde. Es war Wolf, der das Konzept der Philologie eingeführt, dass wir heute klassische Philologie nennen, da Philologie für Wolf die Wissenschaft der Antike, der alten Texte ist. Zu Beginn des 19. Jahrhunderts wurde die vergleichend-historische Methode entdeckt, die Linguistik begann sich als eigenständige wissenschaftliche Disziplin zu bilden, die über eine eigene Forschungsmethode und ein eigenes Studienfach verfügte. Daher zu Beginn des 19. Jahrhunderts die Linguistik begann sich von der Literaturkritik zu trennen. Dieser Prozess war nicht einfach. Neue Spezialdisziplinen tauchten im frühen 19. Jahrhundert auf.

Das Fach der Philologie ist das Studium von Literatur oder Sprachtexten.

Das Philologische Aufgaben:

1) die Definition von Werken der Literatur, die kulturelle Bedeutung haben, im Gegensatz zu Werken, die keine kulturelle Bedeutung haben, z.b. Haushalts Notizen;

2) die Definition der Art der Literatur, d.h. mündliche oder schriftliche Literatur, gedruckte Literatur, Massenkommunikation;

3) Bestimmung der Arten von Werken der Literatur: Folklore, mündlicher Text, schriftliche mündliche Werke, d.h. Fiktion;

4) Analyse des philologischen Textes, der Mitte des 20. Jahrhunderts in zwei Typen unterteilt wurde: literarische Analyse und sprachliche Analyse des Textes. Die philologische Analyse des Textes geht davon aus, dass jeder Text von einer Seite in Richtung Linguistik und von der anderen in Richtung Literaturkritik gerichtet ist. Das ist ein Axiom für die philologische Analyse des Textes. In der philologischen Analyse des Textes befasst sich die Literaturkritik traditionell mit dem Studium des ideologischen und thematischen Inhalts (Text) eines literarischen Werks, seines Genres und ihrer kompositorischen Originalität, und die Linguistik untersucht die sprachlichen Mittel, die im Text funktionieren und sicherstellen seine Konstruktion,

seine Kohärenz und Integrität, daher Gegenstand des Studiums der Linguistik und Literaturwissenschaft, ist der Text.

5) Text ist eine verbale Spracharbeit, bei der alle sprachlichen Einheiten vom Phonem bis zum Satz realisiert werden.

Die Philologie hat zwei Hauptabschnitten: Literaturwissenschaft und Linguistik.

**Literaturwissenschaft** ist die Wissenschaft der Kunst des Wortes. Es wurde im späten XVIII - frühen XIX Jahrhundert gebildet.

In der Literaturwissenschaft gibt es drei Haupt- und eine Reihe von Hilfsdisziplinen. Die wichtigsten sind: Literaturgeschichte, Literaturtheorie, Literaturkritik. Jeder von ihnen hat sein eigenes Thema und seine eigene Aufgabe.

*Die Literaturgeschichte* untersucht die Besonderheiten der Entwicklung der Fiktion in Beziehungen und gegenseitigen Einflüssen; die Rolle einzelner Schriftsteller und Werke im literarischen Prozess; Bildung von Gattungen, Arten, Genres, Richtungen, Strömungen. Die Geschichte der Fiktion untersucht die Entwicklung der Literatur im Zusammenhang mit der Entwicklung der Gesellschaft; soziales, kulturelles Umfeld von der Antike bis zu den Werken von heute. Es gibt nationale, kontinentale und weltweite Literaturgeschichten. Die Fiktion jeder Nation hat ihre eigenen Besonderheiten.

*Die Literaturtheorie* untersucht die allgemeinen Entwicklungsmuster der Fiktion, ihr Wesen, ihren Inhalt und ihre Form, Kriterien für die Bewertung von Kunstwerken, Methoden und Methoden zur Analyse der Literatur als Sprachkunst, Merkmale von Gattungen, Arten, Genres, Trends, Richtungen und Stile. Die Literaturtheorie wurde um die Wende des 18. zum 19. Jahrhundert aufgestellt.

*Die Literaturkritik* untersucht neue Werke, den aktuellen literarischen Prozess. Sein Thema ist ein separates Werk, das Werk eines Schriftstellers, neue Werke mehrerer Schriftsteller. Literaturkritik hilft dem Leser, die Besonderheiten des Inhalts und der Form des Kunstwerks zu verstehen, seine Gewinne und Verluste, sie trägt zur Bildung eines ästhetischen Geschmacks bei.

**Linguistik** (oder Sprachwissenschaften) ist eine Wissenschaft, die Sprache in ihrer Statik und Dynamik, verschiedenen Erscheinungsformen, Interaktionen und Verbindungen mit anderen sozialen, kulturellen, historischen und mentalen Phänomenen untersucht. Es ist die Wissenschaft der natürlichen menschlichen Sprachen im Allgemeinen und aller Sprachen der Welt.

Es gibt spezifische, angewandte und allgemeine Sprachwissenschaften.

*Spezifische Linguistik* studiert einzelne (spezifische) Sprachen wie Ukrainisch, Polnisch, Englisch, Chinesisch oder eine Gruppe verwandter Sprachen - slawisch, germanisch, romanisch, baltisch, iranisch, türkisch usw.

*Die Allgemeine Sprachwissenschaft* untersucht die allgemeinen Merkmale einer Sprache, die von bestimmten Sprachen abstrahiert wurde. Dazu gehören das Wesen der Sprache, ihre Natur, Herkunft, Entwicklungsgesetze, Verbindung mit dem Denken, Kultur und so weiter. Es untersucht auch die Struktur und Funktionsmuster aller Sprachen der Welt. Das Thema der allgemeinen Sprachwissenschaft ist also

einerseits die Sprache als Mittel der menschlichen Kommunikation und andererseits die allgemeinen Merkmale aller Sprachen.

*Angewandte Linguistik* untersucht die Anwendung der Sprachtheorie in der Praxis (im Unterrichten von Muttersprachen und Fremdsprachen, in der Praxis des Übersetzens, bei der Erstellung von Alphabeten für Analphabeten, zur Verbesserung von Rechtschreibung, Schreiben, Lesen, Sprachkultur, zur Vereinheitlichung der Terminologie, Annotation und Zusammenfassung von Informationen, Kommunikation eine Person mit einem Computer in natürlicher Sprache usw).

Es gibt auch viele Hilfsdisziplinen, die in direktem Zusammenhang mit der Philologie stehen.

*Die Paläographie* ist eine historische und philologische Disziplin, deren Gegenstand die Geschichte des Schreibens, seine Entwicklung (hauptsächlich auf der Grundlage antiker Denkmäler) und charakteristische Merkmale in bestimmten Entwicklungsstadien ist. *Ethnographie* - eine Sozialwissenschaft, deren Untersuchungsgegenstand die Völker, ihre Kultur und Lebensweise, Herkunft, Besiedlung, Geschichte ihrer Sprache sind. *Folklore* - eine Wissenschaft, die Folklore studiert: ihre Essenz, Themen, Besonderheiten, Muster, Merkmale und Beziehungen zu anderen Künsten. *Textologie* ist eine historische und philologische Disziplin, die die Denkmäler des Schreibens, der Literatur und der Folklore zur kritischen Prüfung und Etablierung auf der Grundlage der verfügbaren Optionen für die Authentizität von Texten untersucht. *Comparative Studies* - sind vergleichende Studien zu Folklore, nationalen Literaturen, den Prozessen ihrer Verbindung, Interaktion und gegenseitigen Einflüssen auf der Grundlage der vergleichend-historischen Methode. *Rhetorik* ist die Kunst, Meinungen auf hochwertige Weise auszudrücken, um das Publikum unter Berücksichtigung seiner Merkmale zu überzeugen und zu beeinflussen. Diese Kunst untersucht die Methode zur Erstellung eines Textes, bestimmt dessen Struktur und eignet sich am besten für eine klare und begründete Darstellung des Denkens. *Stilistik* ist ein Zweig der Linguistik und Literaturwissenschaft, der die funktionalen und stilistischen Mittel der Sprache untersucht.

*Bibliographie* - ein Wissensgebiet über ein Buch, eine Zeitung oder ein anderes Bibliotheksdokument, dessen Aufgaben sind:

1. Identifizierung, Buchhaltung, Beschreibung, Systematisierung und qualitative Analyse gedruckter Werke;
2. Zusammenstellung verschiedener bibliografischer Handbücher usw.

### **Literaturverzeichnis:**

1. Kotschergan M.P. Einführung in die Linguistik. – Kiew: Verlagszentrum "Akademie", 2001
2. Bilous P.V. Einführung in die Literaturwissenschaft. – Kiew: Verlagszentrum "Akademie", 2011
3. Skopnenko O. I., Cimbalyuk T.V. Kleine philologische Enzyklopädie. – Kiew: Verlag «Dovira», 2007

**Section 08 Humanities: Challenges and Issues (Social Studies, Philosophy,  
Pedagogics, Law, Applied Linguistics, Theory and Practice of Translation)**

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**Mediation and legal prospects of its development in Ukraine**

Today, mediation is one of the most popular alternative ways of resolving disputes (conflicts) in developed countries. It involves the involvement of a mediator (mediator), who helps the parties to the conflict to establish a communication process, to analyze the conflict situation so that the parties can choose the solution that will satisfy the interests and needs of both parties to the dispute. Currently, mediation is actively developing in Europe, Australia, and the United States, as well as in the post-Soviet countries where there is already a relevant law introducing the institution of mediation and defining the legal basis for mediation services, the practice of peaceful settlement of disputes out of court thus balancing the relationship between the judiciary and mediation.

Mentioning the world examples of the use of mediation, one cannot avoid the cases of its use in political spheres as a way of resolving international and domestic conflicts. In particular, there is a successful example of political mediation in international relations - the Camp David Accords signed in 1978 by Israeli Prime Minister Menachem Begin and Egyptian President Anwar Sadat in Camp David, Maryland, USA, in the presence of US President Jimmy Carr, who acted as an international mediator of a kind of political mediator. The agreements signed by the conflicting parties concerned the withdrawal of Israeli troops from Sinai, which was completed by 1982, and the establishment of Palestinian Authority in the West Bank and Gaza Strip.

The effectiveness of the mediation procedure is recognized by the European Community, which recommends its implementation as the main method of alternative dispute resolution at the pre-trial stage and during court proceedings, which is reflected in Ukraine's Association Agreement with the European Union and the European Atomic Energy Community members. Thus, according to Article 1 of this Agreement, Ukraine and the EU must strengthen cooperation in the field of justice, freedom, and security to ensure the rule of law and respect for human rights and fundamental freedoms. The countries of the European Union have agreed that ensuring the rule of law and better access to justice should include access to both judicial and extrajudicial methods of dispute resolution. At its meeting in Tampere on 15 October 1999, the European Council called on Member States to introduce alternative out-of-court procedures, among which mediation is the main method of settling disputes.

Mediation is becoming increasingly popular in Ukraine. Ukrainian society needs it in almost all types of legal relations, including political ones. In this regard, mediation in recent years has begun to carry out its active development in Ukraine. Evidence of this is creating a number of public organizations that distribute mediation in Ukraine. Also, it should be noted that the establishment of the Committee on Mediation at the National Bar Association of Ukraine indicates the interest of the law firm in the mediation procedure. The successful dissemination of the mediation procedure among the legal community will enable lawyers to acquire new professional skills in out-of-court dispute resolution by the mediation procedure.

It should be emphasized that modern lawyers need to change the stereotype of thinking when providing clients with dispute resolution services. They need to focus not only on the legal positions of the client, but also on their interests that are hidden behind these positions. The lawyer must be able to move from his usual adversarial strategy to the ability to apply a strategy of consensus or compromise in dealing with the other party to the dispute.

During mediation, the lawyer, as the client's representative, must facilitate the achievement of a mediation agreement on terms that will satisfy the interests of both parties to the dispute. The main task of a lawyer in this process is not to prove the validity of the client's position to the other party to the dispute and to convince the mediator of the client's rightness as well. This means representing the client in the mediation procedure. At the same time, the lawyer is not deprived of the opportunity to examine possible options for resolving disputes to determine the existence of legal obstacles to their implementation. When examining possible dispute resolution options, a lawyer has the right to enter mediation negotiations in accordance with the requirements of conciliatory rather than adversarial nature of mediation. If necessary, the lawyer can provide the client with advice, clarification on legal issues, which it is desirable to do openly during the mediation session. Thus, the lawyer's mastery of the mediation procedure will significantly increase the authority of the lawyer and the role of the bar in general, as in the future the mediation procedure may be one of the main ways to resolve disputes in society.

Like any field of activity in Ukraine, mediation needs legal regulation, namely specialized legislation that can effectively regulate relations in the field of mediation, and it is necessary to amend the relevant laws, including procedural, supplementing them with articles that will allow for the increasing use of mediation procedures between the parties to the dispute. Unfortunately, today mediation in Ukraine, in contrast to other European countries, is not regulated by law, which significantly reduces the effectiveness of its dissemination in our country. For example, there is no clear mechanism for training and certification of mediators, which is a consequence of the emergence in the Ukrainian mediation space of many entities that pose themselves as professional mediators, but, unfortunately, do not have necessary skills to conduct mediation at the appropriate professional level. All this requires legal regulation at the legislative level.

It should be noted that the Verkhovna Rada of Ukraine has not yet adopted the draft Law of Ukraine "On Mediation". In my opinion, the adoption of this bill will

expand alternative ways of resolving disputes and allow the parties to resolve the dispute out of court thus improving established mechanisms in Ukraine and provide the opportunity to protect human and civil rights. It is important to keep in mind that, unlike a court procedure for resolving a dispute where there is always a party not satisfied with the court decision, in the mediation procedure the parties make a decision that satisfies both parties to the dispute. Recalling the bill, it is important to note that excessive standardization of mediation is a danger of any regulatory regulation of the mediation procedure.

In my opinion, the legislation on mediation, in particular the draft law "On Mediation", which will be adopted by the Verkhovna Rada of Ukraine, should regulate only the basic principles of mediation, such as voluntary participation, neutrality, independence, and confidentiality. Other issues, such as the professional ethics of mediators, should be governed by a code of ethics for mediators, which should be based on a model document, namely the European Code of Conduct for Mediators, developed by an initiative group with the support of the European Commission and adopted at a conference in Brussels on June 2, 2004.

In conclusion, it should be noted that the processes of changing the dispute settlement procedure between the parties will significantly reduce the burden on the judiciary and have a positive impact on its work thus promoting the implementation and application of European standards and norms of international law. All these processes will contribute to the effective spread of a culture of peaceful settlement of disputes in society, which will significantly strengthen integration processes and bring our society closer to the European Community.

### **References:**

1. Y.S. Kanarik and A.M Kostyuchenko, "Mediation as a way to solve economic disputes and regions", *Law Forum*, №4 (58), 2017, pp. 24-27.
2. V.P. Kozyreva and A.P. Gavrilishin, "Conciliation procedures in resolving economic disputes", *Legal Bulletin*, №3 (36), 2015, pp. 129-133.
3. O.A.Ostrovskaya, "Mediation as an alternative way of settlement conflict and consulting service" in *Economic theory and history economic thought*, V. 21, 2018, pp. 34-38.
4. I.O. Pereverzev, "On the concept of mediation as an alternative method settlement of economic disputes", *Law Forum*, №4, 2017, pp. 171-176.

## **The cultural distance and the peculiarities of the translation of cinema discourse**

There is the concept of «internal» and «external» cultural distance not only in a source and a target cultures but within one culture itself. The translator's task is significantly challenged with the necessity of adequate translation and presentation of both «internal» and «external» peculiarities of the source culture with the translating language to a viewer as a representative of the receiving culture.

It is necessary to notify the intercultural issue in any kind of translation and interpreting. However, nowadays the meaning of intercultural communication as phenomena started loosing its value and actuality remaining one of the most important issues in adequate translation. Different foreign and linguists and researchers as Ladmiral G.R., Richard G.R., G.G. Slyshkin., Jurt J. and others study the equal relation between the translation and the intercultural communication emphasizing that «la traduction se révéle être une modalité de la communication inter-culturelle». This definition can point out that the translator is represented as mediator of translating process dealing with different cultures.

The cinematograph became the most popular kind of art and the state model of behavior for the average representative of contemporary culture. The cinema and the media are the main sources of the majority of modern allusions, quotations etc. functioning in the modern communication. The cinema is the system where the specific ways of perception and description of the reality are reflected. Moreover, this is the cultural phenomena that defines, forms and directs the viewers world perception. It is important to emphasize that the cultural transfer is the translation itself.

The example of the cinema discourse and its translation show the distance between cultures and the difficulty of its transfer in translation. That is the translation of the cinema should be observed as the cultural process. The best description of the cinema translation problem can be observed in studies made by French philosophers and linguists and based on studying the phenomena of cultural perception in other cultural area.

- *Pardon, excuse-moi. - Sorry!*

- *Arrête de t'excuser. C'est pas grave. - Stop apologising. It doesn't matter.*

- *Pas grave? c'est une table d'époque, je te rappelle. - It doesn't matter? That lan antique!*

- *Ah bon ? - Really?*

- *Si, Si. Epoque Monsieur Meuble. - Oh, sure. Early «Ikea».*

- *Attends, attends, attends ... Elle ne vaut pas un pet de lapin? - Don't you want to say... that it isn't worth a button?*

- *Non, même pas. - Well, even less.*

In this pattern the culture transfer refers to the situation when the subject of speech is known to both cultures, but the different descriptions are used in the process of translation. French phraseological unit as «*Elle ne vaut pas un pet de lapin*» the translator decided to use the analog of English idiom «*isn't worth a button*» reflecting the important cultural element of target culture. In order to describe the cheap furniture store the author mentions the popular name of French furniture chain «*Monsieur Meuble*» but the translator replaced it as «*Ikea*» that is quite popular cheap furniture store for English viewer. The «external» cultural element allows to transform the «internal» cultural structure boosting the cultural distance that significantly challenges the importance of cultural adaptation of the translation.

The cinema is the easiest way to understand the other culture. It can create the state stereotypes in the viewers mind and it is quite difficult to understand the main concept due to cultural distance. That is why the requirements to the translation are quite strong. Furthermore, in cinema translation there are two contrasting concepts - the proper reflection of source or «internal» culture and the necessity of adaptation to the target or «external» culture in order to make the translation more understandable to the viewer.

### **References**

2. Слышкин, Г. Г. Кинотекст : Опыт лингвокультурологического анализа / Г. Г. Слышкин, М. А. Ефремова. М., 2004. URL : <http://www.vfrsteu.ru/elib>. С. 8.
3. 1. Ladmiral, J.-R. Le prisme interculturel de la traduction / J.-R. Ladmiral // Palimpsestes: Traduire la culture / Université Paris III - Sorbonne Nouvelle. - Paris, 1998. - № 11. - P. 15-30.
4. Richard, J.-P. Traduire l'ignorance culturelle / J.-P. Richard // Palimpsestes: Traduire la culture / Université Paris III - Sorbonne Nouvelle. - Paris, 1998. - N° 11. - P. 151-160.
5. Jurt, J. Traduction et transfert culturel // De la traduction et des transferts culturels. Paris, 2007. P. 105.
6. Thill, B. “Défaire les cases” : la langue et la traduction dans le transfert culturel // De la traduction et des transferts culturels. Paris, 2007. P. 195.

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### **Сопоставительная характеристика морфологических маркеров существительных в русском и украинском языках, связанных с процессами адаптации**

Иностраный студент, родным языком которого является один из языков тюркской семьи, сталкивается с объективными сложностями в процессе изучения других лингвальных систем. Вместе с тем, понимание структурных особенностей языков флективного типа помогает такому студенту освоить принципы организации славянской языковой системы вообще. Предлагаем анализ дифференциальных морфологических признаков имен существительных в русском и украинском языках.

1. Русскоязычный материал демонстрирует колебание в роде, которое характерно для ряда заимствованных неодушевленных существительных, не имеющих форм словоизменения, например: *ханты* м. и ж. род; *манси* м. и ж.; *мартини*, м. и с. и т.д. В украинском языке наблюдаем аналогичное колебание в роде (*наргіле*, с. и м., *па-де-де*, с. и м. и т.д.), однако многие заимствования, общие для русского и укр. языков, имеющие родовые варианты в русском языке, в украинском функционируют как слова одного, определённого грамматического рода, напр.: *мокко*, *пенальті* и др. (неодуш. несклон. сущ. среднего рода). Это связано с процессами ограниченной / неограниченной адаптации заимствованных существительных в указанных языках.

2. В устной речи, а также в письменных формах русского литературного языка, отражающих устную речь, употребительны женские родовые параллели личных существительных – обобщённых наименований лиц по профессии, специальности и т.п., образующиеся от заимствованных основ при помощи суффикса -ша (*аптекариша*, *гастролёрша*). Этот суффикс подчеркивает стилистическую окраску сниженности. Носителями фемиальной семантики шире выступают образования с суффиксами «женскости» от сущ. Мужского рода с семей «лицо». Стилистически нейтральные: *авторка*, *агітаторка*, *агрономка*; разговорные: *бухгалтерка*, *директорка*, *інженерка*. Это также связано с процессами разной степени структурной адаптации слов в русском и украинском языках.

3. Русскоязычные субстантивы с семей «лицо» воспринимаются как единицы общего рода: *дитя*, *чадо*, *ничтожество*, *лицо*, *совершенство*, *светило*. В украинском языке именами среднего рода являются названия незрелых существ обоих полов: *дівча*, *дівчатко*, *хлоп'я*, *хлопчєня* и др.

Грамматическая семантика во втором случае починена форме, тем самым доказывая большую способность украиноязычного материала к формальной адаптации.

Итак, исследуемый материал позволил нам сделать вывод, что в обоих языках действует принцип аналогии, однако в украинском языке он проявляется активнее, чем в русском.

## **Репрезентация категории рода существительных в русском и украинском языках**

Род определяется по системе флексий и лексическому значению, синтаксически при согласовании субстантивированных существительных с разными прилагательными и прич. в функции определений; у несклоняемых сущ. синтаксическое выражение родовой принадлежности является единственно возможным. Род может определять лексическое значение слова, а может и наоборот обозначать лишь родовые варианты. Напр. рус. проток – боковой рукав реки/канал; протока – соединительная полость/боковой рукав реки; укр. вінець/вінце – горизонтальный ряд сруба; вінець – многозначное слово, функц. только в м.р. Колебания в роде могут быть характерны для ряда заимствованных слов. Напр., картины (м. и ср.)/нарігле (ср. и м.).

Одни и те же лексемы в русском и украинском языках могут отличаться по роду: степь (ж.р.), собака (ж.р.), боль (ж.р.) и т.д.; Степ (ч.р.), собака (ч.р.), біль (ч.р./ж.р.). Род существительных может колебаться в устойчивых словосочетаниях. Напр., табель (м.р.) – табель о рангах (ж.р.).

Русский язык менее приспособлен к образованию феминитивов. Родовые варианты с сохранением коннотативного значения могут образовывать далеко не все существительные. В большинстве случаев феминальная сема обозначается аналитически. Напр. хорошая врач, старательная инженер; студент/студентка, читатель/читательница, но филолог/филологша (груб.), доктор/докторша (груб.). Украинский язык более приспособлен к образованию феминитивов. Родовые варианты с сохранением коннотативного значения могут образовывать многие существительные. Феминальная сема может обозначаться как синтетически, так и аналитически. Напр. доктор/докторка, філолог/філологіня.

Существительные общего рода и несклоняемые существительные присущи обоим языкам. В украинском языке, по мнению Г. Д. Басовой [1] и др., их значительно больше за счёт разного рода суффиксов, которые по большей части просто выражают экспрессивную окраску. Тем не менее, то же можно сказать и о русском языке. Ср. бедняга/бедняжка/бедняжечка и бідняга/бідняжка/бідняжечка. В обоих языках половая принадлежность лиц, обозначаемых такими существительными, определяется аналитически, в контексте.

Итак, мы наблюдаем целый ряд различий в родовой репрезентации русскоязычного и украиноязычного материала.

1. Басова Г. Д. Сопоставительная грамматика русского и украинского языков. Киев: «Наукова думка». 2003. 536 с.

### Специфіка назв художніх музеїв Польщі

Дослідники власних назв виділили в окрему групу **прагматоніми** (від грец. *πράγματος* – „предмет, річ”) – це власні назви тих об’єктів, які мають безпосереднє відношення до матеріальної сфери діяльності людини. Саме так кваліфікує їх і Н. В. Подольська: „Під цим терміном, поки що умовно, об’єднані різні категорії власних назв, які мають денотати у прагматичній сфері діяльності, пов’язаної з практикою, з предметною галуззю, зокрема хремотонім, урбанонім, ойконім, ойкодомонім, порейонім, дромонім, агроонім” [1, с. 110].

Український учений Торчинський М.М. запропонував термін на позначення назв музеїв, а саме: **музейонім** – найменування приміщень музеїв [3, с. 199]. (пор. „[лат. *museum* < грец. *museion* – храм муз] – науково-дослідний та культурно-освітній заклад, який проводить збирання, вивчення, збереження й експонування пам’яток духовної та матеріальної культури” [2, с. 469]). Серед назв музеїв у польській мові можна виділити:

1. Музеї – королівські палаци: *Zamek Królewski na Wawelu* (Королівський замок на Вавелю), *Zamek Królewski w Warszawie* (Королівський замок в Варшаві), *Muzeum Pałacu Króla Jana III w Wilanowie* (Музей палац короля Яна III), *Muzeum Łazienki Królewskie* (Музей Лазенкі королівські), *Muzeum Zamkowe w Malborku* (Музей-замок у Мальборку), *Muzeum Okręgowe w Zamku Królewskim w Sandomierzu* (Окружний Музей в королівському замку в Сандомежу), *Muzeum Narodowym w Lublinie* (Національний музей у Любліні).

2. Галереї: *Galeria Magiel* (Гелерея Магель), *Galeria Marii Ritter w Nowym Sączu* (Галерея Марії Ріттер в Новому Сончі), *Galeria Sztuki Dwór Karwacjanów* (Галерея мистецтва двору Карвацянів), *Galeria Sztuki im. Włodzimierza i Jerzego Kulczyckich* (Галерея мистецтва імені Влодзімежа й Єжи Кульчицьких), *Galeria Sztuki Polskiej XIX wieku w Sukiennicach* (Галерея польського мистецтва XIX століття в Сукенніцах).

3. Музеї ікон: *Muzeum Ikon w Warszawy* (Музей ікон у Варшаві), *Muzeum Ikon w Supraślu* (Музей ікон в Супраслю).

4. Музеї карикатури: *Muzeum Karykatury im. Eryka Lipińskiego* (Музей карикатури імені Еріка Ліпінського).

5. Музеї скульптури: *Centrum Rzeźby Polskiej w Orońsku* (Музей польської скульптури в Ороньську).

6. Музей вітражу: *Pracownia i Muzeum Witrażu* (Виробництво і музей вітражу)

7. Мзей сучасного мистецтва: *Muzeum Sztuki Nowoczesnej w Warszawie* (Музей сучасного мистецтва у Варшаві).

8. Музеї плакату: Muzeum Plakatu w Wilanowie (Музей плакату в Вілянові), Centrum Sztuki Współczesnej Zamek Ujazdowski (Центр сучасного мистецтва в Уяздовському замку).

9. Центри малюнку та графіки: Centrum Rysunku i Grafiki im. Tadeusza Kulisiewicza (Центр малюнку та графіки імені Тадеуша Кулісевича).

Таким чином, у польській мові можна виділити групи музеонімів, серед яких найбільшими є музеї-королівські палаци й художні галереї.

### **Література**

1. Подольская Н. В. Словарь русской ономастической терминологии, М.: Наука, 1988. 192 с.

2. Сучасний словник іншомовних слів / Уклали: О. І. Скопненко, Т. В. Цимбалюк. – К.: Довіра, 2006. – 789 с.

3. Торчинський, М. М. Структура онімного простору української мови : монографія / М. М. Торчинський ; Київ. нац. ун-т ім. Тараса Шевченка. – Хмельницький : Авіст, 2008. – 550 с.

### Особливості назв польських національних парків

Дослідження топонімії тісно пов'язане з краєзнавчою діяльністю й туризмом. Однією з основних функцій, як у виконують топоніми, є фіксація в географічному просторі об'єктів за його індивідуальними ознаками і особливостями. Це дозволяє топонімам бути акумулювати знання з культурної, соціальної, природничої, історичної інформації. Географічні назви є своєрідними мовними пам'ятками.

Топонім (назва географічного об'єкту) – конкретна адреса географічного об'єкту, конкретна прив'язка його до місцевості [2, с.167]. Походження деяких географічних назв пов'язано з особливостями природного середовища: в назвах тією чи іншою мірою відображається характер місцевості. Географічні умови поряд з історичними дозволяють встановити причинність, мотивацію назв, етимологію. Дослідник назв географічних об'єктів В. Ніконов відзначив, що топоніміка відображає не саме географічне середовище, а відношення суспільства до нього [1]. Економіко-географічна обумовленість знаходить відображення і в назвах, наданих за видом промислу, розвиненого в тому чи іншому поселенні. У топоніміці відображаються і особливості земельних відносин, і географія землеробства. Кожна географічна назва – історія, яка виражена засобами мови. Існує ціла низка класифікацій топонімічного матеріалу (Д. Бучка, Ю. Карпенка, В. Ніконова, В. Німчука, С. Роспанда, А. Селіщева, О. Суперанської, В. Ташицького, К. Цілуйка та ін.), в яких обґрунтовано основні засади групування власних географічних назв. Різноманітні аспекти топонімічної системи стали предметом аналізу праць багатьох вчених та мовознавців.

У мовознавстві існують терміни на позначення назв територій (районів, у т. ч. адміністративних, історичних областей, країн) які називають **хоронімами** (з гр. ὄρος – “рубіж, кордон, межа” та гр. ὄνομα – “ім'я, назва”). Хороніми поділяють на природні – назви природно-ландшафтних областей, тому назви національних природних парків належать до цієї групи.

Мета нашого дослідження – визначити особливості найменувань національних парків Польщі. Для досягнення мети ми презентуємо загальну інформацію про природні заповідники й визначимо походження їх назв.

Усього у Польщі двадцять три національних парків. Найстаріший парк Біловезький налічує понад 90 років. Парк знаменитий зубрами і деревами – рекордсменами по висоті і віку. Існує легенда, що під Дубом Ягелла (висота 39 м, обхват 550 см) король Ягелло відпочивав по дорозі до Грюнвальду. Наймолодший – Національний парк Гирла Варти. Найбільшим є Бебжанський національний парк, майже повністю просякнутий водою річки Бебжа. Найменший – Ойцовський національний парк –це 12-кілометровий фрагмент

долини річки Прондник з безліччю вапнякових скель казкових форм різноманітної величини, з печерами і старовинними п'ястівськими замками. Кожен парк має свої природні скарби. Однією із двох у світі пущ є Кампінський національний парк поблизу Варшави. Річка Нарев, чимала частина якої протікає через територію Нарвянського національного парку – це одна із двох в світі річок з унікальним водним режимом. А Національний парк Столових гір охороняє єдині в Польщі гори з горизонтальним заляганням стародавніх пісковиків. Польські національні парки відомі певними історичними подіями. У Поліському національному парку в Сосновіці є місце, де молодий Костюшко, закоханий у дочку господаря маєтку, отримав чорну поливку. А в Желязовій Волі, поряд з Кампінським національним парком, народився Фредерік Шопен.

Походження найменування національних природничих парків Польщі можна класифікувати таким чином: від назви гір, річок, озер, сіл чи містечок, лісів, територіально-історичних регіонів тощо.

1). Найбільшою групою хоронімів є найменування, утворені від назв гір, зокрема: **Babiogórski Park Narodowy** – Бабьогурський національний парк походить від назви південної сторони гірського масиву *Babiej Góry* (Бабині гори); **Bieszczadzki Park Narodowy** – Бещадський національний парк, назва якого утворена від найменування гір Бещади; **Gorczański Park Narodowy** – Займає центральну і північно-східну частину Горчанських гір, які є частиною масиву Західних Бескид; **Park Narodowy Gór Stołowych**, який розташований у Центральних Судетах на північному заході землі Клодзько, на польсько-чеському кордоні. Назва Столових гір відображає їх ландшафт, характерними елементами якого є величезні площини рівнин та плоскі стіни скельних бастіонів, що піднімаються над ними крутими стінами; **Karkonoski Park Narodowy** – національний парк на південному заході Польщі, в Нижньосілезькому воєводстві, що розташований в горах Карконоші; **Magurski Park Narodowy** – Магурський парк представлений головним чином гірським масивом Магура Вятковська; **Pieniński Park Narodowy** – П'єнінський національний парк розташований в самому серці гір П'єніни в південній частині Польщі; **Świętokrzyski Park Narodowy** – Свентокшиський національний парк знаходиться в Свентокшиському воєводстві, розташовується в центральній частині Свентокшиських гір; **Tatrański Park Narodowy** – Татранський національний парк знаходиться на кордоні зі Словаччиною, назва походить від гірського масиву Татри.

2). Група хоронімів, що вмотивована назвою міста чи села, як-от: **Białowiecki Park Narodowy** – походить від назви містечка в Польщі Біловезь; **Kampinoski Park Narodowy** – Кампінський національний парк Кампінська пуща отримала свою назву від села Кампінос, етимологію назви не повністю з'ясовано. Вперше згадується під цією назвою в 1489 році; **Ojcowski Park Narodowy** – штаб-квартира парку розташована в селі Ойцув, за назвою якого він і отримав свою назву.

3). Від назв історико-географічних регіонів: **Poleski Park Narodowy** – Поліський національний парк на сході Польщі, в Люблінському воєводстві, в історичному регіоні Полісся; **Roztoczański Park Narodowy** – Розточанський парк, що розташований на території Розточчя; **Słowiński Park Narodowy** Словінський національний парк; **Wielkopolski Park Narodowy** – національний парк в центральній частині Польщі, розташований у Великопольському воєводстві.

4). Хороніми національних парків, що утворені від назв річок та їх частин: **Wiebrzański Park Narodowy** – Бебжанський національний парк, назва походить від річки Бебжа; **Drawieński Park Narodowy** – парк являє собою долину річки Драва, на ім'я якої він і був названий; **Park Narodowy „Ujście Warty”** – Парк «Уйсьце Варти» розташований в Любуському воєводстві, в нижній течії річки Варта, недалеко від її впадіння в Одру, на польсько-німецькому кордоні; **Narwiański Park Narodowy** – національний парк на північному сході Польщі, в Підляському воєводстві, територію парку перетинає річка Нарев.

5). Найменування парку, що походять від назви озера: **Wigierski Park Narodowy** – національний парк на північному сході Польщі. Найбільше озеро парку – Вігри.

6). Назва острова, від якої утворилося найменування парку: **Woliński Park Narodowy** – національний парк в Польщі, що знаходиться на острові Волін у Західнопоморському воєводстві.

7). Хоронім від назви бору: **Park Narodowy „Bory Tucholskie”** – Національний парк «Тухольські Бори», що є одним з найбільших комплексів соснових борів у Польщі. Найближчим містом є Тухоля.

Отже, походження назв Національних парків Польщі пов'язано з особливостями природного середовища в яких відображається характер місцевості.

### Література

1. Ніконов В. Введение в топонимику. М.: Изд-во ЛКИ, 2011. 184 с.
2. Подольская Н. В. Словарь русской ономастической терминологии, М.: Наука, 1988. 192 с.

# **Розширюючи обрії**

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і молодих учених**

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