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***WIDENING OUR HORIZONS***

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**Section 01 Management of Sustainable Economic Development**

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**Motivation of the insurance company's personnel**

The success of the insurance company, namely its maximum profitability, depends on the effective work of its employees. In order to achieve the results, it is necessary to actively promote the system of motivation for the development of human resources. The use of labor potential is achieved through satisfaction of social, material and other needs. So, finding ways to increase staff motivation is one of the top priorities.

The issue of developing a system of motivation, determining the motivational factors, is a subject of a large number of papers written by modern scientists: M.D. Vedernikov, O.A. Garvat, V.M. Grinyova, I.A. Georgia, P.Z. Kapustyansky, N. Karlova, M.V. Savchin, M.V. Semikina, O.V. Khitra [1].

The purpose of this work is to analyze existing systems of motivation of insurance companies' personnel.

The purpose of motivation to sell insurance services should be to increase the amount of insurance premiums, increase operating profit, improve the quality of service.

Motivation can be both material and immaterial. Material motivation includes wages (simple, proportional, categorized); commission fees; bonus payments (bonuses); social package; material and technical support.

Immaterial motivation may include competitions among insurance service providers; staff training; the possibility of career growth. Also, among immaterial factors leadership and control; personal guidance; participating in sales planning can be mentioned.

Increase in wages does not always lead to an increase in the level of motivation of staff, because sometimes it can be the cause of financial abuse. There is a risk that material remuneration can be an end in itself for workers.

It is necessary that employees have the opportunity to move in the hierarchy of the company, have a social package, which must necessarily include insurance protection.

For example, the insurance company "PZU Ukraine" changed the system of personnel motivation. So, the staff who sells policies gets bonuses once a month. Unpaid employees receive bonuses based on interim and annual evaluations. In addition, there are other types of incentives, including bonuses that are paid on the successful completion of a project. According to PZU Ukraine employees themselves, the opportunity to go for internship to other company's offices in Poland and Lithuania play an important role for them. Every year about 20 people study in Poland, the average duration of the trip is 3-5 days [2].

In international practice, the following non-standard methods of motivation for staff are used [3]:

- One-time cash reward for the task performed, lack of delays and awarding gifts with medals, honorary titles (IBM, McDonald's);
- System of internal trainings, individual development programs, additional education at the expense of the employer (Johnson & Johnson, Renault, Peugeot);
- Creating a friendly family atmosphere, preferential medical service (Johnson & Johnson);
- Publication in its own printing body (GeneralMotors, Westing-house Electric, Polaroid);
- Allocation of free time, opportunities for visiting scientific events to support creative, inventive activities (Toshiba, IBM, Polaroid);
- Free or privileged food for workers (Google, Yandex, Vkontakte).

The following methods of motivating the insurance company's staff could be considered effective: self-assessment of labor; positive assessment of the work by the management; increase of authority, order of special work, material encouragement (with positive motivation); material penalties, decrease in position (with negative motivation); dividends; participation in capital; tuition fee; preferential loans; flexible work schedule; career growth, etc.

Consequently, material and non-material methods of motivation should complement each other, because it is impossible to identify the most effective method. One of the interesting approaches is the segmentation of workers according to their needs, that is, each group uses different systems of motivation.

Also, when forming the system of personnel motivation, it is necessary to use foreign experience, namely, the focus on the development of corporate unity and the construction of a strong team taking into account the peculiarities of the Ukrainian mentality. The system of motivation must be integrated with the planned and implemented insurance sales program.

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### **The role of women in management**

Women strongly influence the development of the economy in the modern world. Gender diversity has a positive effect on the improvement of business results. In recent years the number of females in the workplace has increased. Women have proved that they can be successful leaders. For example, in 2018, 75% of businesses had at least one female in an executive position, compared to 66% in 2017. In the European Union, 73% of businesses reported having one female in a senior position and 27% of senior roles performed by women. So, it is necessary to analyze the reasons that have led to an increase in the number of women in senior positions.

No doubt, women are effective leaders. They are able to manage goals and projects of the enterprise bringing effective outcomes. They are also good motivators being able to increase the employees' passion for work. Women are good at relationships and teamwork building and cooperation. So, they try to maintain a positive attitude to the work and increase productivity in result.

Then, women adhere to work ethic monitoring that employees follow the corporate values. A moral code helps cope with problems, which can push people to the limit. Females are also great communicators because they can listen much better than men, and this is a very important management tool. Women prefer to discuss, while men like to act. And employees want their managers to listen first and act next. In result, women easier reach a general agreement on the issue under discussion.

Another key feature is that females are multitasking and can combine several responsibilities simultaneously. As managers, they skillfully identify the aspects that need attention and improve the strategy for further actions.

Women are very thorough and more attentive to details. These factors are very important for the organization. They can recognize risks and are able to deal effectively with a crisis. Women can work hard. They are very resistant to failure. Women always strive for self-development, the development of new skills and the improvement of their own effectiveness.

Female managers are much more patient than male managers. They do everything deliberately and they are protected from sudden decisions. Women are willing to wait for the result as long as it takes.

However, such qualities as excessive perfectionism, hard work for long hours, sensitivity can adversely impact the quality of work and career advancement, on the other hand.

So, gender in no way affects leadership qualities and ability to manage. Female have certain qualities that exceed male managerial qualities. Therefore, an increase of women managers and leaders will have a beneficial effect on the global economy and will help to develop at a fast pace.



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## **Freelance as a tool to improve the efficiency of personal finance**

All of us in one way or another deal with cash throughout life. During the whole period of work, no less than \$100,000 or even more passes through an ordinary person, therefore raising the efficiency of personal finance is an important aspect of an individual wellbeing.

Personal finance at the micro level is a combination of income and expenditures, the distribution of penny stocks, their accumulation and use for the purpose of increasing the financial resources that an individual owns [1].

The main principles of individual finance are economic efficiency, financial control, financial incentives and financial responsibility.

The income part of personal finance can be divided into such categories as: work (employment), freelance (part-time work), business (profit), investment (passive income), heavy stocks (ownership) and light stocks (cash).

In Ukraine, most of the income of an average person comes from work (employment). But if a person wants to increase the efficiency of personal finances from the point of view of increasing the revenue, they should optimize it by means of other categories.

As world experience shows, recently the main category of income for 24% of the population is work by freelance and this market is developing more and more in the modern world. So, for example, according to the US labor market review “Freelance in America 2017” this category makes up more than one third of the entire workforce of the country. In 2015, about 53.7 million Americans were considered self-employed, in 2016 – 55 million, and in 2017 their number reached 57.3 million. This is 36% of the working population of the United States [2].

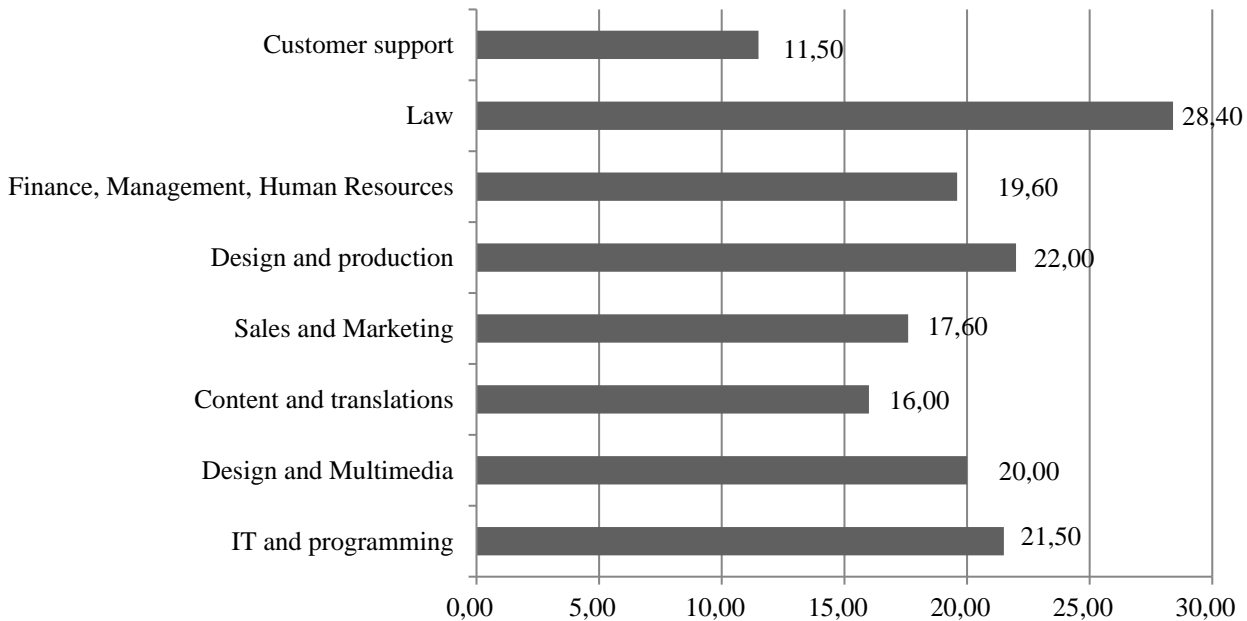
We analyzed the average profitability of freelance work by major industries, which are presented in Figure 1.

According to Fig. 1 we can see that the most highly paid industry in the freelance services market is “Law”, followed by “Design and Production” and “Design and Multimedia”.

Obviously, the time that freelancers spend on finding a job is directly proportional to their demand in the market. Thus, IT and programming specialists spend almost no time searching for work. Regarding the main industries, it should be noted that the maximum amount of time spent on a project search is 7 hours on average.

Thus, we can conclude that, apart from the main job, freelancing is an excellent opportunity for earning extra money during free time, since remote employees select their customers, the number of working hours and build a schedule, focusing on their needs, not on the company personnel schedule. All of this has a significant effect on

the quality of work and, as a result, increases the income part of personal finances. This, in turn, can be considered one of the tools to improve the efficiency of personal finances.



**Fig. 1.** The average profitability of freelancer by industry per hour [2]

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**Qualification increment as a factor of profit growth**

In modern world, the high competition in the international market forces organizations to look for all possible ways to stay in the "game". That is why the goal of any enterprise is to raise the economic efficiency, implying the ratio of manufactured products to the amount of expenses (financial, material, and labor) for its generation to be increased. Any production has its own economic sense resulting in increasing income compared to costs, thus extending the difference between them.

One of the ways to increase economic efficiency is to improve the skills of employees. Therefore, it should be noted that highly qualified staff as a component of

labor potential, nowadays, is one of the most important competitive advantages to ensure enterprise competitiveness [1].

As my future profession is a manager and I am going to deal with such direction as confectionery production, I would like to get some experience in this field. That is why I decided to use social network "Instagram" for taking poll of 30 confectioners having their own successful business. The masters of different skills level have been interviewed.

The results of my analysis can be presented in such a way. The interviewed were asked a set of questions divided into different sections. The first set of questions was connected with taking professional training and demonstrated, that 77 percent took part in it. Therefore, I continued my research with this group of respondents. The second block of questions dealt with skills obtained through professional development and increased economic efficiency and effectiveness. Unfortunately, there was some misunderstanding with such issue as efficiency. That is why some explanation was required.

Due to these factors, 74 percent raised their awareness in terms of life learning and necessity of professional development in conditions of complete world. This resulted in increasing order quantity and decreasing production costs (time, money and ingredients) while offering the same assortment of desserts.

It should be emphasized that in the conditions of modern market increasing professional skills and enhancing competence are in great demand in case of profit growth and necessity of developing the courses availability. Therefore, many organizations are trying to offer a great variety of training courses for workers in almost every field. Prices for these courses in different companies vary as well, so an option for any budget can be easily found.

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### **Relevance of demand for financiers in the labor market of Dnipropetrovsk region**

Modern economic conditions have led to an awareness of the clear dependence of the financial situation of both enterprises and financial institutions on the efficiency of managing their financial activities. As a result, there is a growing need for financiers who would have a sufficient level of knowledge to manage financial activity in any field of the economy.

The dictionary of bank terms gives the following definition: "a financier is a specialist who conducts large monetary transactions on a legitimate basis". His area of activity is market, investment and real estate. The duty of a financier is to successfully and profitably invest in returning profits, to assess risks, to find the optimal ratio of income and predictable risks [1].

For today, the problem of employment in Ukraine, and the demand of financiers in one or another field, is very relevant.

According to the recruitment portal HeadHunter Ukraine for the first half of 2018, the largest offer of vacancies for all professions was observed in five regions of Ukraine: Kyiv, Kharkiv, Dnipro, Odesa and Lviv regions. The largest number of both vacancies and resumes is offered in the capital of the country. Minimal competition in the first half of 2018 was observed in areas such as automotive business, consulting, insurance, labor, installation and service [2].

According to the State Statistics Service of Ukraine, the situation on the labor market of the Dnipropetrovsk region is characterized by an increase in the number of employed. The number of the employed population aged 15-70 during the 9 months of 2018 amounted to 1409.4 thousand people, and the employment rate was 58.9% (for 9 months of 2017 respectively, 1394.1 thousand people and 58.2%).

During 9 months of 2018, the number of inhabitants of the region aged 15-70, who became unemployed for various reasons, decreased by 10.1 thousand people (as compared to 2017) and amounted to 117.4 thousand people. The indicator determining the unemployment rate in the Dnipropetrovsk region remains one of the best among the oblasts and was 7.7% against 8.4% for 9 months of 2017, in general, this figure is 8.6% [3].

In our country, the profession of financier has become more popular recently. The imbalance between supply and demand in the labor market in financial and insurance activities remains significant. As of January 1, 2019, 1 job vacancy was claimed by 26 employees among financial and insurance employees (Table 1) [4].

Worldwide, this profession is considered to be one of the most highly paid: according to the American magazine Money Magazine, financial advisers earn \$ 123,000 a year, the largest amount among the top 10 profession rankings [5].

Table 1

The number of vacancies and the number of unemployed as of January 1, 2019 in the financial and insurance activities of the Dnipropetrovsk region

	Number of vacancies, units	Number of unemployed, persons	Number of applicants for 1 vacancy, persons
Total for all types of economic activity	6 372	25 709	4
Financial and insurance activities	28	723	26

In Ukraine, financiers and insurers are also among the most highly paid professions. If the average salary of regular employees of the Dnipropetrovsk region in December 2018 amounted to UAH 10.18 thousand, in the financial and insurance activities the average salary of employees was the highest among other types of economic activity, UAH 16.8 thousand [6].

Thus, we can conclude that a financier is a profession which will always be in high demand.

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### **Stages of successful expansion of the company's production base**

Following the progressive economy criteria a lot companies not to lose their position in the sales market need to expand their production base. Production expansion is rather a difficult process that requires detailed planning. The proposed method will undoubtedly help allocate funds from the company's internal reserves and plan to invest in the expansion of production to obtain maximum profit.

To build a model it is greatly required to perform three primary stages of calculations. At the first stage, statistical data of the work of departments for past periods are used to build production functions for each department of the company.

This data includes the cost of materials, the amount of depreciation deductions, payroll minus social insurance and other deductions.

At the second stage of the simulation, the total resources of the company should be distributed among the departments to maximize company's income. To achieve this goal a dynamic programming method is applied. According to this method, when allocating resources, management at each step must be chosen with regard to its future results in order to have a maximum total income at the current stage and all subsequent stages. Using the basic dynamic programming formula applied at each stage, the company's maximum income and resource allocation plan are obtained thus generating the maximum income.

After calculating the income at the third stage, the company's profit and the percentage of funds allocated for the expansion of production are evaluated. To understand how much the production should be expanded for receiving the corresponding income, it is necessary to spend all the funds allocated for the expansion of production on purchasing the resources. Using the method of dynamic programming the tools are distributed between departments at the beginning without counting their maximum production capacity. This process is cyclically repeated until the necessary income is obtained, and with the subsequent repetition, the amount of resources distributed between departments increases.

After obtaining the necessary profit, it is determined which departments and how much production should be expanded. To do this, the difference between the amount of resources that the department uses to generate an appropriate income, and the maximum capacity of the department are calculated. When a positive difference is introduced as an exogenous parameter, the amount of funds requires increasing the production capacity of the department to the desired value [1].

Resource allocation is made once during the relevant period. Thus it is possible to qualify the number of periods necessary for the expansion of production. The development allows expanding the production by allocating funds without affecting the stability and minimizing the productivity of the company.

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## **Types and Characteristics of Possible Organizational Structures**

In an organization of any size or complexity, employees' responsibilities typically are defined by what they do, who they report to, and for managers, who reports to them. The structure of every organization is unique in some respects, but all organizational structures are designed to enable the organization to accomplish its work.

Researchers generally identify four basic decisions that managers have to make as they develop an organizational structure, although they may not be explicitly aware of these decisions. First, the organization's work must be divided into specific jobs. Second, unless the organization is very small, the jobs must be grouped in some way, which is called departmentalization. Third, the number of people and jobs that are to be grouped together must be decided. Fourth, the way decision-making authority is to be distributed must be determined. [1]

In making each of these design decisions, a range of choices are possible. At one end of the spectrum, jobs are highly specialized with employees performing a narrow range of activities; while at the other end of the spectrum employees perform a variety of tasks. In grouping jobs into departments, the manager must decide the basis on which to group them. The most common basis, at least until the last few decades, was by function. For example, all accounting jobs in the organization can be grouped into an accounting department, all engineers can be grouped into an engineering department, and so on. The degree to which authority is distributed throughout the organization can vary as well, but traditionally structured organizations typically vest final decision-making authority by those highest in the vertically structured hierarchy. The traditional model of organizational structure is thus characterized by high job specialization, functional departments, narrow spans of control, and centralized authority. Such a structure has been referred to as traditional, classical, bureaucratic, formal, mechanistic, or command and control. A structure formed by choices at the opposite end of the spectrum for each design decision is called unstructured, informal, or organic.

The traditional model of organization is a hierarchical or pyramidal structure with a president or other executive at the top, a small number of vice presidents or senior managers under the president, and several layers of management below this, with the majority of employees at the bottom of the pyramid. The number of management layers depends largely on the size of the organization. The jobs in the traditional organizational structure usually are grouped by function into departments such as accounting, sales, human resources, and so on.

As noted in the previous paragraph, many organizations group jobs in various ways in different parts of the organization, but the basis that is used at the highest level plays a fundamental role in shaping the organization. There are “4+1”

commonly used bases. The first one is functional departmentalization. Every organization of a given type must perform certain jobs in order to do its work. For example, key functions of a manufacturing company include production, purchasing, marketing, accounting, and personnel. Using such functions as the basis for structuring the organization may, in some instances, have the advantage of efficiency.

The second one is geographic departmentalization. Organizations that are spread over a wide area may find advantages in organizing along geographic lines so that all the activities performed in a region are managed together. For example, marketing a product in Western Europe may have different requirements than marketing the same product in Southeast Asia.

The third one is product departmentalization. Large, diversified companies are often organized according to product. All the activities necessary to produce and market a product or group of similar products are grouped together. In such an arrangement, the top manager of the product group typically has considerable autonomy over the operation.

The fourth one is customer/market departmentalization. An organization may find it advantageous to organize according to the types of customers it serves. For example, a distribution company that sells to consumers, government clients, large businesses, and small businesses may decide to base its primary divisions on these different markets.

There is an additional hybrid matrix organizational structure. Some organizations find that none of the afore-mentioned structures meet their needs. One approach that attempts to overcome the inadequacies is the matrix structure, which is the combination of two or more different structures. Functional departmentalization commonly is combined with product groups on a project basis. For example, a product group wants to develop a new addition to its line; for this project, it obtains personnel from functional departments such as research, engineering, production, and marketing. These personnel then work under the manager of the product group for the duration of the project, which can vary greatly.

According to Ms Angela Tripoli: “A new company cannot go forward without this and established companies must ensure their structure reflects their target markets, goals and available technology.” [2] Organizational structure refers to the way that an organization arranges people and jobs so that its work can be performed and its goals can be met. When a work group is very small and face-to-face communication is frequent, formal structure may be unnecessary, but in a larger organization decisions have to be made about the delegation of various tasks. Thus, procedures are established that assign responsibilities for various functions. It is these decisions that determine the organizational structure.

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## **Management 4.0 in a Digital Age**

The Fourth Industrial Revolution (4IR) is an incredibly fast changing environment in which technology, based on artificial intelligence, determines the way the humanity develops. Klaus Schwab, the founder of the World Economic Forum, wrote that 4RI will change not only what we do but also who we are. It will affect our identity, sense of privacy and ownership, consumption patterns, the time devoted to work and leisure, career development, skills cultivation [1]. In result, all these changes will cause a global work shift – replacement of some jobs and creation of new ones. The focus of this paper is to analyze how 4IR will change management and if it will be still needed in the digital age.

The first challenge management faces is the expectation of the stakeholders and society as a whole that business should take bigger social responsibility by protecting climate, solving environment problems, training workers etc. Therefore, managers might be interested not in making profit, but in improving the society. Second, as 4IR runs on knowledge, we need a concurrent revolution in education. Here, both government and business must join forces providing workers with the skills and qualifications they need to participate in the new digital economy [2]. The next important field is leadership. The best managers will have to look at the overarching need and then build a team to meet that need, relying on their input in decision-making rather than dictating what to do.

Another significant area is human resources. Effective managers should be good at evaluating candidates for soft and technical skills to hire the best ones. Also, they will have to be able to spot employees' strong critical thinking and problem-solving skills. Jennifer Currence, the president of OnCore Management Solutions, thinks that in a digital age companies will adopt Results-Only Work Environments (ROWEs) strategy. In other words, effective managers will create environments that focus less on where and how people work, but measure success based on results and output [3]. The role of contractors will rise, and managers will need to think how to optimize the process for better results [3]

Therefore, it is easy to conclude that management will change dramatically, and if we handle it successfully, a company's efficiency will rise. No doubt that management will be a part of the new world, because all fields connected with human resources cannot be replaced by robots. Artificial intelligence can help us do routine work, make us and our organizations better, but the main task of leaders is the "orchestration" of the process. We will not do different things but we will do things differently.

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### **What does the Ukrainian generation Y spend money on?**

Young Ukrainians began to spend more on impressions and less on expensive items. How can you make money on this? A new consumer economy with a turnover of USD 500 bln is being formed around the “industry Y”, Tristan Pollock, a well-known venture investor, wrote in TechChunch. According to Pollock, most of the growing generation of millennials (or generation Y, which includes young people born in 1981-2000), want to spend their money on impressions (events, new experience), and not on material values. [1]

In pursuit of new impressions, people increasingly go to the Internet. Millennials now account for almost a third of the world labor market, and in 2020 they will occupy a dominant position in it. In 2025, their share will be about 75% of the total employed population of the planet. It means that generation Y will soon become the main consumer of goods and services. As a result, in just 5-10 years, consumer preferences in the world can change dramatically. Millennials are increasingly saving on such things as their own car or their housing; at the same time, they spend more money on more affordable entertainment in the era of high-speed Internet. To study the trend regarding the Ukrainian generation Y, we will use the statistics in Table 1 represented by mobile bank – Monobank, which can be used only with a smartphone. According to the statistics on the bank cards use, in December 2018, Monobank customers spent the most on buying products and visiting restaurants. One of Monobank founders Oleg Gorokhovsky wrote about this fact in his Telegram channel. "Our customers often buy products and go to cafes and restaurants. This month they have spent the most on clothes and food," wrote Gorokhovsky. [2]

According to the Table, the largest number of card transactions falls under such categories as "Products and supermarkets", "Cafes and Restaurants" and "Other". The largest amount of expenses is in "Products and supermarkets", "Entertainment and Sports" and "Auto" categories. The average amount per card user is 2420 UAH in "Clothes and shoes" category, 2418 UAH - "Products and supermarkets", 2093 UAH - "Auto", 2035 UAH - "Travel", and 1909 UAH - "Entertainment and Sports."

Table 1. – Expenses of Monobank clients in December 2018

Expense category	Number of operations per month	Sum of expenses, UAH	Number of clients	Average transaction amount, UAH	Average amount per client per month, UAH
Products and supermarkets	4 613 894	918 009 421	379 615	199	2 418
Cafes and restaurants	1 359 290	231 041 074	221 578	170	1 043
Home appliances	921 250	228 802 786	295 045	248	775
Travels	850 754	228 877 012	112 478	269	2 035
Entertainment and Sports	672 239	265 776 336	139 230	395	1 909
Taxi	617 336	59 500 282	67 467	96	882
Beauty and medicine	590 190	181 695 378	202 374	308	898
Auto	538 237	261 346 806	124 848	486	2 093
Municipal services and Internet	368 017	134 906 172	103 460	367	1 304
Clothes and shoes	211 976	240 843 218	99 511	1 136	2 420
Repairs	167 158	124 229 732	83 347	743	1 491
Movies	83 371	18 203 757	48 301	218	377
Animals	42 739	12 744 365	22 790	298	559
Books	28 403	13 251 001	16 979	467	780
Budget and taxes	14 145	11 872 398	6 619	839	1 794
Flowers	8 529	3 451 488	6 723	405	513
Duty Free	6 667	5 799 483	4 854	870	1 195
Other	919 354	407 016 851	331 682	443	1 227
Total	12 013 549	3 347 367 559		279	

Taking into consideration the abovementioned, following conclusions should be drawn. Basing upon the costs of young people businessmen and managers should pay attention to such niches as: cafes and restaurants with up-to-date service and design; healthy food, environmental and functional food; entertainment and sports; - traveling; beauty and medicine; clothes and shoes; pet care.

At the same time, basing upon of the needs and interests of the millennials, who will soon cover the lion's share both in the Ukrainian market and around the world, successful business requires taking into account such features of young people as:

- they prefer shopping on the Internet;

- they examine carefully the goods before buying; thanks to the Internet opportunities (various video reviews, forums, social networks) advantages and disadvantages of a products or services are described in detail;
- they prefer increasingly functionality and quality rather than premium and expensive brands;
- generation Y (including Z) wants to spend money for memories and experience rather than for material things; thus, they are active to buy tickets for concerts as well as to spend money for traveling and various entertainment.

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## **State intervention in the economy: Korean experience for Ukraine**

In 2018, an agreement was signed between Ukraine and South Korea, that allows our country to adapt the evolution of the state system of the Republic of Korea to our realities. South Korea is one of the examples when the country did not have anything, made a huge step forward and was able to become one of leaders.

The following factors have contributed to the achievement of the stunning economic results for the country with the limited natural resources and rather unfavourable starting conditions:

1. The country relied on its only resource - people. All efforts were directed on the improvement of the level of education and professional literacy. The country managed to prepare an army of highly skilled engineers and workers. Human resources provided the basis for economic growth of the country.

2. The founder of the Korean reforms, president Park Chong Hee, took the advantage of his authority to force rich Koreans to invest in the country's industry. The management style “purpose justifies the means” raises many questions, but it was he who needed to restore the economy that had been destroyed by the war.

3. The economic success of South Korea is hard to imagine without large conglomerates, called "Chebol". This is a group of formally independent firms that are under the sole administrative and financial control. The principle of the hereditary transfer of power, which is deeply embedded in the Korean mentality, guarantees the stability that many consider to be an important factor of the Korean miracle [1].

The significant difference between the Korean and the Ukrainians reforms is that oligarchs in Ukraine have their influence on the government. In South Korea, the situation is the opposite. Korea is often cited as an example of a successful state intervention in the economy. Korean experience is quite possible to apply in Ukraine. The rapid and steady Ukrainian economic growth can be achieved by reducing taxes, controlling the export of capital from the country, improving the quality of education and the professional level of engineers and workers [2].

The phenomenon of South Korea can be repeated only in a country where socio-economic and political problems can be solved in a balanced way, where the government can count on hardworking people. Ukraine can do this, given its unique capabilities.

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### **Theoretical Basis of the Processes of European Integration**

Considering the strategic objective of Ukraine to integrate into the European community, the theoretical background to the European Union creation is worth considering within the framework of analysis of problems related to practical implementation of the integration. Thus, the issue of regularities of the development of integration processes in Europe, their theoretical and methodological basis from the economic and philosophical perspectives become even more relevant.

Nowadays, the European Union is the most developed integrational organization in the world, and it continues to develop dynamically. The analysis of European integration processes demonstrates development of the idea of European nations' unification and considers the main theoretical trends that have evolved over several centuries of European history. Each theory is based on a separate aspect of

European integration development and plays its role in understanding this process. At the same time, none of them managed to cover the process completely, to structure the research of all its elements and to predict the future development of events.

European civilization as the result of a complex historical interaction between different nations, states, values, cultures, is characterized by categories of complexity, evolution, diversity, versatility accordingly [3, p.6]. Europe has become a place of birth and embodiment of the ideas of democracy, fundamental and political rights and freedoms, meanwhile it used to be the bearer of colonialism, nationalism, communism and fascism. At the same time, the multiculturalism of Europe has formed European values, whose spiritual and political features are not limited to the geographical boundaries of the countries of the European part of the world, but are also embodied in America, Asia, and Australia.

The most well-known theories in the research of scientific problems of integration are the ones which formed the corresponding schools: federalism, functionalism and neofunctionalism, transnationalism (pluralistic school).

The founder of federalist theory, one of the first integration concepts that laid the theoretical foundations for the processes of European unification, is medieval European thinker J. Altusius. This theory had its practical embodiment in the formation of the Netherlands Union in 1579 [6, p. 35].

According to the vision of Europeans, the existence of the state and its own interests was the main cause of all interstate contradictions. Therefore, supporters of the idea of "united Europe" considered the need for a supranational grouping, which would be guided primarily by the establishment of common values and their unity in all the diversity of national differences. This goal has remained unchanged for centuries.

At various times, the emperors, politicians, philosophers tried to implement various projects guided by the idea of uniting Europe. The most prominent projects are the plan for the unification of European states (1464) by the Czech King I. Podebrad, the Grand Plan (1617) of Duke Sully, the Westphalian treatise (1648), which stated the equal rights of all European states and provided guarantees of peaceful coexistence.

V. Penn, J. J. Russo, the famous German philosopher E. Kant, the French philosopher A. Saint-Simon are also considered the supporters of a united Europe. The results and documents of the Vienna Congress of 1815, the Berlin Congress of 1878, the Hague conferences of peace in 1899 and 1907 can be named as significant stages of the development of federalism [2, p.12]. Attempts to provide practical implementation of the federal idea were made by the Pan-European movement, the founder of which was the count R. Kudenhovye-Kalergi who outlined the plan for the creation of the United States of Europe in 1923.

At the beginning of the XX century, the federalist theories of Ukrainian origin were quite famous. Their representatives are M. Hrushevsky, R. Laschenko, S. Shelukhin. They substantiated the possibility of federative associations of Ukraine with other states that it is historically linked with: according to M. Hrushevsky, – Belarus, Lithuania and Russia; according to R. Laschenko – with Russia; according to

S. Shelukhin – the union of Slovak, Czech, Slovenian, Serbian and Croatian nations [4, p. 15].

The idealization of participation and role of supranational structures in the development of European integration can be stated as the disadvantage of classical federalism [2, p.15]. Modern federalist concepts take into account the requirements and trends of real integration processes. Though modernized, they pay insufficient attention to the economic factors of integration.

The main opponents of the federalists were the supporters of functionalism – the trend which emphasized the need for the development of economic, social, scientific and technological integration to be primary, and political integration deriving from it. The founder of the theory of traditional functionalism was the famous English sociologist D. Mitrani. He developed a strategy for creating permanent peace between states. His idea was taken as basis for implementing the creation of the European Coal and Steel Community.

Functionalism laid theoretical foundation for the development of a neofunctional concept of integration, which developed actively in the 50's of the twentieth century. Proceeding from theoretical benefits of functionalism, neofunctionalism also used some features of federalism. His representatives, such as E. Haas, S. Shaygold, L. Lindberg, F. Schmitter, favored economic integration, but acknowledged the need for political integration to coordinate actions [5,7,8,10].

Based on the critique of the theoretical positions of political realism, the concept of transnationalism, whose founder was the American political scientist K. Doich, stated the idea that intergovernmental integration is aimed primarily at creating a secure space for a group of states whose relations are based on mutual preferences, trust, mutual respect, as well as the establishment of institutions to ensure peaceful coexistence [1, p. 16].

Among other theories and concepts of integration, the most widespread ones are intergovernmentalism, market concept (economic liberalism), structural concept, market-institutional concept (neoliberalism), the concept of 'Variable-geometry' Europe, etc. These theories and concepts are mainly economic [9,11].

Summarizing the review of these conceptions of European integration, it should be noted that the problems associated with the definition of the theoretical foundations of modern integration development caused both deepening and expansion of the European Union itself.

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### **Cooperation of territorial communities as a tool of the sustainable development of the region**

In the conditions of the implementation of the administrative and territorial reforms in Ukraine, the use of effective tools for the sustainable development of the territories is becoming particularly relevant. The concept of sustainable development, which generally defines its goals, was proposed by the United Nations World Commission on Environment and Development in 1987. According to the document, “sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs [1]”.

The researcher O.V.Bezuglyy emphasizes that the main initiatives of the world's leading countries in terms of ensuring sustainability in development belong to local self-government bodies as the most effective bodies for managing local affairs [2].

According to the Law of Ukraine "On Local Self-Government in Ukraine", cooperation of territorial communities is a form of relations between two or more territorial communities that is maintained on a contractual basis in certain forms in order to ensure socio-economic and cultural development of the territories, improve



the quality of service provision to the population on the basis of common interests and goals, effectively use the local self-government bodies' powers and duties determined by the law [3].

The law determines the following forms of cooperation:

- delegation of one or several tasks and corresponding resources to one of the subjects of cooperation by other subjects of cooperation;
- implementation of joint projects including coordination of activities of the subjects of cooperation and accumulation of resources for a certain period of time in order to jointly take appropriate measures;
- co-financing (maintenance) of enterprises, institutions and organizations of communal ownership (infrastructure objects) by the subjects of cooperation;
- formation of joint public utility companies, establishments and organizations (common infrastructure objects) by the subjects of cooperation;
- formation of the joint management body by the subjects of cooperation for a joint performance of the duties determined by the law.

Cooperation of territorial communities is based on the fact that solving urgent problems for all participants in the cooperation requires attraction of material, labor and financial resources that are inaccessible to the community under normal conditions. The choice of the sphere of territorial communities' cooperation is determined by the availability of the community perspective development plans, community resource potential, location features, infrastructure development, the conditions of public amenities, etc.

At the same time, financing is carried out both at the expense of the local budgets of the subjects of cooperation, self-taxation system, and from the state budget, international technical and financial assistance, credit resources and other sources. It should be noted that the state provides financial support in the form of subventions to the local budgets of cooperation subjects within the priority areas of the state policy.

The state support of the communities' cooperation takes place under the following conditions [4]:

- the capacity of the territorial communities to ensure the exercise of powers is strengthened;
- additional resources are involved, including financial assets;
- cooperation is maintained by more than three subjects;
- active participation of the public in maintaining the cooperation is ensured.

The most popular and the most efficient form of cooperation provided by the law is the realization of the joint projects that address the issues of ensuring the efficient management of solid household waste; functioning of the housing and communal utilities (energy saving, energy efficiency, water supply, drainage, etc.); upgrading and ensuring the reliable operation of the firefighting system; improving the provision of administrative services and addressing many other issues of life sustenance; providing social and leisure services, etc.

The consolidation of the territorial communities' efforts to implement such projects will contribute to the sustainable development of both a particular territory and the country as a whole.

Therefore, the implementation of sustainable development should be supported at the local level and implemented by the local communities' cooperation.

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## **Small and medium business in support of sustainable development of the region**

Sustainable development of the region is a development that meets the needs of the present, without compromising the ability of future generations to meet their own needs. It should be aimed at solving the three main tasks necessary for the progress of human society, namely [1]:

- improvement of the quality of life of the population (and the environment of its residence);
- increase in the productivity of social labor;
- preservation of nature (natural environment).

The objective essence of sustainable development is characterized by the unity of entrepreneurial motivation of a person, society as well as the state regarding rational resource management in a single priority area of economic system development at all levels [2].

The concept of sustainable development is based on the model of balancing economic, environmental and social spheres in order to improve the quality of life of citizens and ensure the socio-economic development of territories.

In broad sense, this seems to be the achievement of a triple effect of economic development (state of the regional economy, financial and investment potential), social (budget expenditures of social orientation, demographic status) and ecological (preservation of the biosphere on the basis of the functioning of the "green economy", "green energy", "Clean production") of the spheres of social life within a separate territory [3].

Small and medium entrepreneurship is extremely important for the sustainable development of the Dnipropetrovsk region. The role and place of small and medium-sized businesses are best shown in the inherent functions which it performs in the economy of the region:

- formation of a competitive environment and the creation of significant competition to monopolies;
- activation of innovative processes and introduction of flexible production;
- ensuring the effective use of local raw materials;
- elimination of imbalances in certain commodity markets due to the rapid saturation of the market with goods and services;
- creation of additional workplaces and reduction of unemployment;
- the formation of the middle class - a stratum of the population of the region, which is really ready to be responsible for the sustainable development of the economy.

As of 01.01.2018, according to the data [4] in Dnipropetrovsk region 135,7 thousand individuals - entrepreneurs, 35.9 thousand small enterprises and 1017 medium enterprises were registered. Therefore the small and medium business is the sphere of ensuring employment of the population and creating new jobs. In 2017, the small and medium-sized enterprises of the region employed 362,000 people, of whom 127,500 people were employed in small enterprises, and 234,500 people at medium-sized enterprises, which is 61% of the total number of employed workers of all enterprises in the region.

Taking into account the importance of ensuring the sustainable economic development of the region, the priority tasks of the development of small and medium enterprises in the Dnipropetrovsk region for 2019-2020 are as follows:

- creation of a favorable environment for the development of small and medium enterprises;
- improvement of financing small and medium enterprises;
- popularization of entrepreneurial culture and development of entrepreneurial skills;
- strengthening of competitiveness and innovative potential of small and medium enterprises.

Thus, the promotion of small and medium-sized enterprises with clear and understandable business rules, stable regulatory environment, as well as with developed business infrastructure and information resources, is aimed at creating conditions for sustainable development of economic entities and activation of employment policy in the region.

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**Logistics in the international trade: Logistic infrastructure**

Nowadays logistics plays a significant role in world trading. A lot of countries worldwide are looking for opportunities to increase market share in international transportation of goods. Production increase may cause difficulties for companies dealing with delivery and storage.

Numerous studies confirm that logistics is a rapidly developing sector in the context of globalization. But there are a lot of barriers that can differentiate national economies, they are: quotas, capital control and custom taxes [1].

Against the background of economic recession and stagnation of freight transport performance indicators, logistic companies' competition continues to grow. In the 21-st century logistics creates conditions for contention of big and small enterprises that are involved in transportation trade.

But logistics doesn't only mean delivery and storage. All logistic companies apply management of supply chain in their practice. In this way logistic companies provide the management of the flow of goods and services, involve the transportation and storage of primary products, work-in-process inventory, and final products from manufacturer to consumer [2].

Logistics is applied in all sectors of national economic. For example, a company will not function successfully in marketing, production or international trade without well planned logistics and supply chain management.

Any production requires different types of costs. Concerning logistic, the costs are connected with company management, stocking, storage, and transportation, including supply chain management as well.

The main goal of any logistic strategy is to deliver what customers want and when they want it and to get that done by spending as little money as possible. It is explained by the fact that the lower is cost of transportation, the more profit the company will receive. Nowadays all logistic companies are looking for ways of minimizing transportation costs using different mathematical and scientific methods.

Another challenge for logistics is getting information. To cope with the task all transportation companies should use automation systems and latest IT technologies to know about transportation process as much as they can to control it. For example, one of the most popular IT-solution of this problem is the use of mobile vehicle tracking systems. Using tracking systems logistic companies can monitor the location of vehicles and goods [1].

Thus, well planned logistics and logistic infrastructure will help companies to reduce operational costs, increase their productivity and develop a competitive structure in the world transportation market.

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## **Online shopping sustainability**

Satisfying consumer's needs affects the success of marketing strategies and the development of online business.

Due to the rapid growth of online business, a large number of consumers have unique opportunities: low cost for information searching, a wide range of products and services, the possibility to order goods from abroad etc.

There are few research proposals to assess the implications of online shopping for sustainability. Our study focuses on the following. Firstly, we propose to make a poll relying on our own experience in online shopping. The study compares purchasing unnecessary stuff online and offline and explains why people depend on online shopping. Our research describes data collection and problem recognition stages of decision-making.

Each visitor of the online store is in a certain stage of the purchasing. The traditional purchase cycle includes:

- awareness: the identification of a need or emotion that needs satisfaction;
- interest: how a proposal can satisfy this need;
- learning: benefits and characteristics;
- choice: the emotional attraction of the client to a particular proposal;
- purchase / loyalty: acquisition and re-acquisition.

The online purchase cycle looks like user interface of the online store. This key difference leads to the digital appearance:

- the problem: “What is wrong, what is the problem, what is missing?”
- google search: “What can I do with this?”
- evaluation: “What are the pros and cons of various options?”
- decision: “This option fulfills criteria. I consider that this is the best option.”
- purchase: “I just press the big orange “Buy” button.”
- repentance: “ How did I spend so much?”

Although this is a simplified cycle, at the same time it authentically shows the stages of the user's thinking in the process of finding a solution to the problem.

Internet has changed customers' preferences regarding standard retail stores. The speed of goods delivery is very important for customers. However, some people would like to take their orders by themselves. The most important factor for consumers is still the price. Before committing an expensive purchase online, people study the offer in retail stores. They often watch video reviews of the products they are interested in. A lot of people will not buy anything until they check comments, and surprisingly online products and services need bad reviews too because sometimes we just do not rely on some sources or websites. For example, many people say that the site's reviews help them feel more confident in their travel decisions, and help them have the better trip. In our research we demonstrate the essential nature of reviews to hospitality businesses. The results underpin the need for business entrepreneurs not only to monitor their online reputation, but also to engage as much as possible with their past and potential customers. The benefits are clear: the more engaged the property is, the more likely travelers are to book.

The sustainability of online shopping is lower if we compare it to offline shopping. One more thing that makes it more attractive is fast delivery. Many online stores propose free shipping. Although free shipping inspires the visitor to make a purchase, it does not always determine at which stage of the decision-making process this will happen. In other words, free shipping works but not for everyone.

Online shopping is the future of shopping. There are many unexplored areas here, and some small details can completely change consumer's opinion. Implications of online shopping for sustainability are emphasised in the research: re-acquisition on the same websites or the growing number of online stores reviews. More research is needed to explore online shopping sustainability to satisfy consumers' needs.

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## **Franchising in Ukraine**

Ukrainian entrepreneurs and companies are interested in diversifying their business. Franchises as popular business models are available on a per license basis.

The current state of franchise market in Ukraine is quite dynamic as foreign companies are interested in cooperation with Ukrainian partners.

Those companies that develop foreign franchises are the most profitable and active. "Fast Food System" company (FFS) is the leader among other Ukrainian companies. By purchasing foreign franchises Ukrainian restaurant businesses are trying to enhance their own business portfolio. [1]

Domestic franchises dominate in Ukraine. They control 74 percent of the market share. Ninety three companies from such countries as Belarus, Belgium, China, Germany, Hungary, Italy, Finland, France, Poland, Russia, and the U.S. control the remaining 26 percent of the market. Most of them belong to the foreign franchises and operate in the services and restaurant subsectors.

The period from 2014 to 2017 was characterized by the active search for new directions, ideas, approaches in the field of franchising. 2018 is the first year that is distinguished by the lull in the franchise sphere.

Among the top franchises and the most interesting examples of this business is the chain of restaurants of Italian and Japanese cuisine called MAFIA.

The franchising market in Ukraine today is experiencing a period of quite rapid growth. Abroad, in the USA and Europe, franchise business is the most popular way to start your own business for businessmen. In our country, it is also rapidly gaining the confidence of entrepreneurs.

According to the statistics, in 2017, Ukraine's franchise market contracted by 22 percent compared to 2016. 725 existing outlets were closed. In spite of that, the number of franchise outlets increase. Today the total number of outlets is 16,136. Their annual gross income in 2017 was more than \$38 million. [2]

The range of issues to be resolved for the Ukrainian franchise market is wide: from unawareness of entrepreneurs about the basic principles of doing this business as a franchise, to the barriers of conducting it.

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**The state of the global computer market**

Electronic and electrical industry in recent decades occupy a special place at the global market. The significance of these industries is determined primarily by their enormous contribution to the development of the material basis of scientific and technological progress.

The global computer market is one of the largest and fastest growing markets in the world. At the same time, in 2018, the global computer market had losses.

Worldwide shipments of desktop PCs, laptops and workstations in the final quarter of 2018 did not exceed 68.1 million devices, reports IDC. In the annual comparison, this result indicates a decline of 3.7%.

Although the figure turned out to be better than the forecasted decline in deliveries of 4.7% earlier, the YoY quarterly decline was the worst since the third quarter of 2016.

YoY: Year-over-Year - changes in performance comparable to last year.

The industry has been directly affected by the lack of a number of new Intel processors and the growing economic tensions between the US and China.

On August 23, 2018, the United States introduced customs duties of 25% on 279 names of Chinese goods - the total estimated import of these goods is about \$ 16 billion. The list of names includes various types of polymers, metals, electronics, etc. China responded.

In the trade conflict with China, the United States has already been resorting to a fine for a second time. Prior to that, the parties exchanged an increase in duties on July 6. Then the White House introduced 25 percent fees for 818 Chinese products. Beijing, in return, imposed duties on 659 US product groups.

The active filling of stockpiles in the third quarter associated with these factors led to a decrease in supplies during the calendar period in question. And although, as



a rule, the last quarter of the year is supposed to have high consumer demand, this year's marked events have led to worse quarterly growth since 2012.

In the EMEA countries, the market has gone down for the first time in the last six quarters, with the fall reported both desktop and portable destinations. In addition to the lack of components, the situation was aggravated by uncertainty due to geopolitical and economic problems in a number of major economies in the region.

In the 4th quarter only two representatives of the Tor-5 managed to account for the growth of supplies. One of them is the Chinese company Lenovo - thanks to it, returned to the first place of the rating. However, according to the results of the year, the American company HP still has better performance and the first position in the overall standings.

For several months, a trade conflict with the United States has been one of the most important topics in China. After the Chinese state media called it a trade war, immediately after the introduction of customs duties as America, the tone changed.

Increasingly, there are arguments that in this conflict the United States will eventually lose: the national economy, consumers, employers. A few days ago, the Chinese state-owned newspaper Global Times wrote: "The trade conflict will severely affect, first of all, the American middle class and the poorest."

Meanwhile, at the very beginning of the conflict, the PRC media talked about the damage to their own economy. Now in Chinese society, not only is there a discussion about the consequences of the trade conflict with Washington, but also nervously expressing assumptions on this topic. Despite the powerful state propaganda, it seems that more and more people are preparing for the worst.

Thus, it can be concluded that even being the most developing industry, which is the computer market, losses can be observed. This may be affected by the location of companies, the political situation in the world as a whole and within the country. Also a strong factor of influence is the quality of foreign economic relations and competitiveness in the world market.

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### **Specifics of production and consumption in modern conditions**

Economics has always paid great attention to the study of consumption, which is due to the fact that this sphere of human activity plays a crucial role in the development of economy.

Firstly, the reproduction of labor power, the main productive force of society, depends on the existing level and quality of consumption. Secondly, consumption gives impetus to the formation of demand for resources and, thus, lays the possibility of gaining incomes for their owners. Thirdly, through the proportions that determine the share of consumption and savings, supply is formed on the money market, which serves as the material basis of investment. [1] The presence of such connections in the economy suggests that trends in consumption largely determine the prospects of economic growth.

In modern conditions, we are witnessing great changes in consumer and production spheres. If earlier it was the consumer who, through his willingness to pay for certain goods, made the manufacturer interested in their release, now there is a reverse process. The growth of productive forces and new technologies, an increase in labor productivity led to an increase in the capacity of output and made it more diverse. Increased competition led to the fact that the manufacturer tries to make his product more attractive, more differentiated to the buyer.

As a result, the markets turned out to be oversaturated with various goods, which more and more often did not find sales. As a result, the profit maximization conditions have changed. For the manufacturer in modern conditions, the creation of such circumstances under which the consumer is forced to constantly purchase more and more new goods becomes a vital necessity. [2] As practice shows, people's needs are consciously shaped and changed by large companies that skillfully manipulate through the use of advertising and other tools to influence customers.

Pursuing an aim to maximize profits, manufacturers implant the need for constant updating of durable goods. Getting under the influence of advertising, consumers with an extraordinary ease go over to new models of phones, televisions, refrigerators and other equipment. The development of innovative banking products has significantly expanded the possibilities of providing consumer credit - a credit card today makes available something that people used to save money for. [3] As a result, the level of savings in society drops sharply, which negatively affects investments and the possibilities for economic growth.

In this regard, the scope of consumption should be regulated. Society must find a middle ground, which on the one hand, will not deprive the consumer of diversity, but on the other, will maintain the necessary proportions of manufacturing and consumption in order to ensure the social and economic development.

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## Causal aspects of labour migration in Ukraine

One of the most pressing issues in the development of independent Ukraine is a phenomenon called migration. Each of its waves takes away a huge part of our talented, young and prospective population of the country. On the pages of the Internet, as well as on television, we often observe a hard lot of our Ukrainian workers, and this is a huge problem that attracts the attention of society. However, the scale of the migration of today is influenced not only by globalization, but also by the situation that has developed in the state. Unsolved problems with the labor market, increase in unemployment, low living standards - all this is a direct impetus to the problem of increasing the outflow of population from the country, both labor migrants and young people.

Foreign labor migration has become an objective reality in Ukraine. Migration processes intensified back in the 1990s. Against the backdrop of the financial crisis, they were characterized by growth from 2006 to 2008-2009. And since 2014, these processes have recovered significantly.

According to the international methodology and with the participation of international organizations, the State Statistics Service of Ukraine conducted studies on external labor migration of Ukrainians in 2005-2008, 2010-2012 and 2015-2017. During 2015-2017 abroad, about 1.3 million Ukrainian citizens were living abroad for the purpose of earning money. On the basis of generalized data, the structure of external labor migration for 2015-2017 has the following characteristics: 44% - Poland, 29% - Russia, 13% - Italy, 10% - Czech Republic, 2% - Belarus and 2% - USA.

Scientists, classifying the factors of influence on migration processes, distinguish economic, political, social and environmental factors. At the same time, the main causes of emigration of Ukrainians are political instability, devaluation of

the national currency and persistent corruption, unstable economic situation, low wages, imbalance between supply and demand in the labor market, rising unemployment, underemployment, unofficial employment, and lack of opportunities for professional growth.

The research highlights the main tendencies of modern migration processes in Ukraine:

- an increase in the number of migrants in absolute terms for all types (migration as emigration, labor migration, internal migration);
- an increase in the volume of long-term labor migration to the USA and Canada, as well as an increase in short-term labor migration to the EU region and a decline to the CIS countries;
- the main directions of migration flows - the Russian Federation, Poland, the Czech Republic, Italy, Belarus (about 80% of the total volume of short-term and long-term migration flows);
- changes in the gender-age structure of migration: an increase in the number of women in migratory flows and significant "rejuvenation" of migration;
- a significant increase in the migration of young people in the form of labor migration and short-term migration to study, but with a progressive tendency towards non-return to their homeland and integration into the countries of study.

From the point of view of the country's development prospects, one can not afford to lose his human potential. According to expert estimates, if Ukraine does not change anything, 20-30% of the able-bodied population will leave Ukraine in search of a better future.

External labor migration has a negative impact on the provision of human resources to entrepreneurial structures in Ukraine and causes inconsistencies in the number of economic jobs and economically active population on its territory. Filling job vacancies is becoming more difficult, as well as keeping workers in the workplace.

Under the influence of labor migration, the turnover of personnel increases. In 2017, the strongest staff turnover was observed in the wholesale and retail sector (69%), the banking sector (33%) and IT developments (21%). The biggest problems with recruitment and retention of personnel are in telecommunication (86% of companies) and banking (71%) sectors, as well as in home appliances and electronics (80% of companies).

In industries that are dynamically developing, where the largest number of vacancies is open, there is a shortage of workers. In the long run, such a situation threatens the economic security of the state.

The processes of labor migration cannot be stopped completely, at the same time they can be adjusted to reduce by implementing appropriate reforms in all spheres of the economy and improving the living standards of the population in Ukraine. Creating conditions for sustainable economic growth in Ukraine, and the emergence of a sufficient number of jobs, will facilitate the return to the country of the majority of citizens who are currently working abroad. The experience,

knowledge and skills acquired during the work abroad our compatriots will enrich the economy and business environment of our country.

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**The concept of development of the centers for providing administrative serviced in Dnipro**

In conditions of the state course realization for the formation of a legal social state, issues of higher relevance of public authorities and local self-government bodies for the provision of public services are becoming acute and of social significance. At the current stage of development of the Ukrainian state, the main task of the authorities is to serve the citizens - consumers of administrative services, the quality of which must meet European standards. Under these circumstances, it is particularly relevant to formulate approaches that allow us to obtain the maximum socially useful result at the minimum cost of resources (material, human, etc.).

The purpose of the study is to substantiate the model concept of the functioning and development of the centers for providing administrative services and the formation of approaches to the integrated organization of a unified system of centers for providing administrative services(CPAS) activity in cities that have a territorial division.

In the course of the research, information was obtained about the CPAS from 13 city councils websites of Dnipropetrovsk region, the website "Regional Virtual Office of Electronic Administrative Services of the Dnipropetrovsk Region";

analytical data on CPAS, which are placed on the official website of the Ministry of Economic Development and Trade of Ukraine; the website of the "Unified State Administration of Administrative Services Portal", personal observations of project experts gathered during visits to the CPAS and during communication with the management of the CPAS, as well as the documents provided.

The assessment of the quality of service was carried out according to the following criteria: CPAS work organization; CPAS location, requirements for the premises and its arrangement and other amenities; CPAS staff; work of the back office; internal analysis of CPAS activity.

According to the criterion of completeness (sufficiency) of the administrative services list, the center for the provision for administrative services "Visa" in Kryvyi Rih has a primacy, since it can provide such services as: permissions / declarations in the field of construction; registration of legal entities management, private entrepreneur; registration of real estate rights; services with "internal" passports (paper); services in the field of land (issuance of information from the SLC and registration of land plots); social services (including assistance and so-called "package" services in life situations) with the exception of subsidies.

The analysis of information given in the CPAS administrative service card found that some cards contained outdated or incomplete information about the CPAS (location, mode of operation, telephone, email address, and website). It is necessary to update the information in the information cards for the administrative services provided at the Dnipro, Dnipropetrovsk oblast.

The monitoring of open sources of information showed that only two of the 13 surveyed CPAS have their own web-sites on "Regional Virtual Office of Electronic Administrative Services of Dnipropetrovsk Region" (CPAS, Dnipro and CPAS, Novomoskovsk). The information provided on "Regional Virtual Office of Electronic Administrative Services of the Dnipropetrovsk Region" regarding the CPAS operation, their location, telephone numbers, e-mail addresses, web resources, lists of administrative services provided by the CPAS and information cards is mostly irrelevant and needs updating. There is no complete list of services and information cards on any of the CPAS website resources (sites or pages).

According to the results of the study, the related services are provided only in the central CPAS of Kryvyi Rih, in the CPAS in the city of Kamensk, in the CPAS of the city of Volnogorsk (terminal for payment of services).

In the premises of the central CPAS of Kamyanets'k there is a separate place for the provision of related services (document copying services, free Wi-Fi, photo on documents, a free computer with Internet access), as well as Internet banking. After the payment is made, the administrator prints the receipt.

The premises of the central CPAS of Kryvyi Rih are equipped with free Wi-Fi. Visitors to the CPAS have the opportunity to use banking services through a full-fledged bank branch of Privatbank. CPAS has services for copying documents in the waiting sector. A free computer with Internet access is installed. Photographs for documents are made by the administrators of the Passport service of the CPAS.

As for the CPAS staff, the Livoberezhnyi CPAS has an advantage, but this figure is not perfect. With a maximum score of 120 points, the Livoberezhnyi CPAS has only 80. Therefore, the main areas of the concept of the development of CPAS are the improvement of electronic document management and staff training for professional and psychological training

As a result of the research, the model conception of the functioning and development of the centers for the provision of administrative services was substantiated, the approaches to the integrated organization of the activity of a unified system of centers for providing administrative services in cities that have a territorial division and identified promising directions for the development of the CPAS are formulated.

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### **Advantages of powerful territorial communities for promoting sustainable development**

One of the key features of the public transformations in Ukraine is the formation of territorial communities according to the principles of decentralization. Concentration of authority at the local level will allow to improve the quality of people's life, and thus, maintain social, economic and environmental aspects of sustainable development.

Decentralization means the transfer of power from the central government to the local authorities. Decentralization also ensures the right of the community to possess this authority (or power) and be able to use it.

According to the Methodology of formation of capable territorial communities, which was approved by the Cabinet of Ministers, the capable territorial community includes the voluntary association of territorial communities of villages, towns, or cities which can provide the appropriate level of services, particularly in the field of education, culture, health care, social service, housing and communal services, taking into account human resources, financial support and development of the infrastructure of the corresponding administrative-territorial unit [2].

In Europe the decentralization reform demonstrated its efficiency and became a catalyst of the economic growth. This is evidenced by the experience of Scandinavian countries, Poland, the Czech Republic, Estonia, France, Switzerland, etc. Though, it should be noted that the success of foreign countries must be carefully studied and adapted to the national realities.

As a result of the analysis of the local self-government reform in Ukraine, T.A.Prykhodchenko [3] concludes that the policy of regional development in modern Ukraine will not be effective if the following principles are not ensured:

- a clear separation of rights and responsibilities between the regions and the center, and between the internal regional levels;
- financial autonomy or adequacy of local budgets for the implementation of the local self-government initiatives;
- stimulating the development of weak regions and regions with unfavourable natural conditions through fiscal and investment assistance.

M. Pittsik [4] emphasizes that, in order to change the level of life in communities, they should be able to use their rights. It means that local authorities should have financial, labor, and property resources and appropriate legislative support.

The analysis of scientific publications, analytical studies and practical experiences of functioning and development of the Ukrainian territorial communities allows us to determine their main advantages:

- the possibility of transparent strategic planning and identifying of strategic tasks and solution methods;
- attraction of investments for the development of the local economy and promotion of the local business;
- rational use of subventions from the State Budget for the development of the local infrastructure;
- effective use of forms and mechanisms of territorial communities cooperation for solving economic, ecological and social issues of local importance;
- improving the provision of administrative and social services for community residents without unnecessary bureaucratic obstacles;
- staffing of educational institutions, medicine, culture, places for recreation, leisure and sports;
- creation of high-quality transport, municipal and information infrastructure;
- ensuring an effective interaction of the population self-organization bodies with local self-government bodies to make coordinated decisions on the urgent issues of local importance;
- encouraging the most active members of the territorial community to the effective use of local democracy instruments and influence on the local self-government bodies.

Consequently, the effective economic development of territorial communities serves as the basis for their financial capacity to solve socio-economic and environmental problems at the local level, ensuring the achievement of sustainable



development from the bottom up: from the territorial community to the region and the state.

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## Ukraine's GDP growth in 2018: Analysis and dynamics

The real gross domestic product (GDP) growth is calculated as follows: first, nominal GDP calculation - the output of all goods, the performance of all works and services for a certain period, for example, a quarter, at current prices. It is clear that prices are rising, and nominal GDP is growing. In order to calculate the real GDP, consider the deflator, this is an indicator that should exclude price increase and show only real GDP growth.

The real GDP of Ukraine in 2018 grew by 3.3% after increasing in 2017 by 2.5% and in 2016 by 2.4%, according to the State Statistics Service.

Wholesale and retail trade are about 20% of Ukraine's GDP. That is our main driver for the growth of nominal GDP. Agriculture accounts for only 11% of GDP, while industry accounts for 15%, and there is another 10% of construction and other services, ranging from public services to IT services. In the first quarter of 2018 the volume of wholesale trade grew by 8.2%, and retail trade by 7.6% compared to the previous year. While the growth of industry in Ukraine is only 2.4%, agriculture and construction in general showed a fall. It turns out that trade really showed remarkable results, which led to the growth of Ukraine's GDP.

The trade in Ukraine has grown, because wages have increased. In the first quarter of 2018, the average nominal wage in Ukraine increased by 26% compared to the same period of the previous year. And the growth of real wages in the first quarter of 2018 was only 10%. Also, the growth of retail sales is significantly influenced by private currency transfers from abroad. In the first quarter of 2018, about \$3 billion was transferred to Ukraine, and about \$1.8 billion of this amount was exchanged for UAH. This is the effect of the growth of Ukraine's GDP at the expense of migrant workers' money. Ukrainians earn money abroad, but they spend it in Ukraine, as a result consumer demand and retail sales in Ukraine grow, hence GDP increases.

In the first quarter of 2018 retail prices rose by almost 14%, and this is not the limit, by the end of the year price increase can only accelerate. Therefore, the salary in Ukraine is growing, but now the rise in prices does not slow down, and therefore, Ukrainians are increasingly specifying that there is more money, but they can buy less for this money. So GDP growth is good, but it would be better that, in addition to GDP growth, the real purchasing power of Ukrainians grew.

Therefore, citizens of the country should not be confused by the situation with GDP growth. Certain factors must be observed to improve the standard of living and welfare of the people. Factors of such growth should be: investment attraction, continuation of structural economic reforms and personnel renewal, innovations and modernisation of production with allocation in Ukraine, support for small and medium-sized businesses and an increase in exports, cooperation, and creation of joint ventures.

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## **Crowdfunding as an alternative financial instrument of the corporate sector in Ukraine**

Crowdfunding, being a collective financing technology, in which fundraising for the implementation of a particular project takes place at the expense of attracting a wide range of volunteer depositors and is carried out through the Internet on specialized Internet resources, such as crowdfunding platforms, is a promising instrument of the latest funding.

Crowdfunding or "public funding" has gained world popularity not so long ago. The common notion was formulated by journalist Jeff Hou in 2006. In 2009 Kickstarter became the first internet platform for crowdfunding that attracted people who had no funds at the start of their own projects, as well as prospects for getting money from business angels or venture funds. And in 2015 it became obvious that the idea of "public funding" was successful: by mid-2015 the number of projects launched on the platform exceeded 95,000, and the number of people who shared their money in fundraising campaigns reached 10 million.

But, despite the historic prescription of the emergence of "crowdfunding", it gains popularity only now, because the process of "people's funding" is directly related to the development of the Internet.

However, if in Europe and the US this idea is widespread and common, the sites located in Ukraine are not active and attract less attention. Moreover, our legislation still lacks the laws that control the activity of crowdfunding platforms, as well as the activities of the innovators themselves.

The problems of crowdfunding in Ukraine are caused not only by the absence of legislative and legal regulation, but also by a number of other factors considered below.

Firstly, the idea and concept of crowdfunding did not get wide popularity. Crowdfunding and the mechanism of work of such platforms are known and discussed only in limited groups of interested persons.

Secondly, most innovators do not know how to promote their projects, they cannot correctly identify and contact the target audience.

Thirdly, Ukrainian crowdfunding balances between trust in the author's personality and distrust in general to similar calls for fundraising. In recent years in our society distrust of other people has become so firmly entrenched that it is simply impossible to wait for the innovator to trust.

Finally, most investors are betting on familiar domestic technologies with a low risk to have at least some guarantees.

But in case of solving the listed problems, crowdfunding in the field of innovation projects for Ukraine will become an excellent new tool for financing startups due to the low availability of investments for small businesses.

However, it should be noted that, among other things, crowdfunding is not only a potential source of funding, but also the most powerful tool for marketing innovative products and a way of studying markets.

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## **The implementation of Industry 4.0 in Ukraine**

The development of new digital technologies is defined as a leading factor and basis for building a competitive national economy. At the global and European levels, the impact of digital technologies is a strategic priority. The importance of new technologies for society and the economy is defined by the term the fourth industrial revolution or Industry 4.0.

To reach the research objectives, we have conducted a survey of 150 entrepreneurs aged 26 to 45 years old in Dnipro region with small or medium-sized businesses in order to determine the level of development of Industry 4.0. The results obtained demonstrate the following:

- 15% of the respondents implement Industry 4.0, 25% are ready to implement, 60% have not heard about Industry 4.0;
- 72% of the respondents are positive towards the introduction of the digital economy, 22.8% are neutral, and 5.2% are negative;

- 8.3% of respondents believe that the traditional system of economy in Ukraine is correct, 81.6% think it is incorrect, and 10.1% have not made their decision yet;

- 27.8% of respondents agree to invest in new technologies, 69.3% disagree, 2.9% have not made their decision yet.

Restrictive factors for the implementation of Industry 4.0 elements include insufficient understanding of the economic benefits of digitization, lack of competencies in automatization and digitalization, limited financial resources and infrastructure constraints.

To identify the strengths and weaknesses of the digitalization of the Ukrainian economy, as well as its capabilities and threats that may arise in Ukraine at the stage of its functioning, a SWOT analysis is applied, the results of which are presented in Table 1.

Digital economy in the long run can be mastered in Ukraine and become an activator of qualitative changes in the country.

Certain conditions to be provided for the implementation of Industry 4.0 in Ukraine are:

1. As 60% of respondents are not familiar with the concept of Industry 4.0, it is necessary to increase the economic awareness of citizens and entrepreneurs about Industry 4.0.

2. The law enforcement system as for the intellectual property should become more effective.

3. Higher education should be the foundation for the introduction of Industry 4.0 and an effective communicator between theory and practice.

4. The investment climate should become attractive. So, the basic questions must be solved: corruption, taxes, finances etc.

5. Innovative ecosystem is a prerequisite for the implementation of new technologies. The state should have an ecosystem within which it would be possible not only to generate ideas, but also to successfully implement them.

Table 1  
SWOT-analysis for Industry 4.0 in Ukraine

STRENGTHS	WEAKNESSES
<ul style="list-style-type: none"> <li>- accelerating the processes of providing services to the public or industrial sectors;</li> <li>- increasing the competitiveness of enterprises;</li> <li>- capacity building for creating an innovative environment of excellence;</li> <li>- high level of Internet usage;</li> <li>- access to European programmes (Horizon 2020).</li> </ul>	<ul style="list-style-type: none"> <li>- insufficient implementation of the state policy aimed at economic growth based on knowledge and innovation;</li> <li>- low R &amp; D costs and inefficient use of funds;</li> <li>- shortage of personnel, outflow of labour, low level of digital competence and trade;</li> <li>- low level of ICT implementation and use;</li> <li>- insufficient application of modern</li> </ul>

	management methods - lack of knowledge and experience in applying TQM, Lean 6 Sigma, GMP, KPI and others.
<p style="text-align: center;"><b>POSSIBILITIES</b></p> <ul style="list-style-type: none"> <li>- increasing the country's GDP (about 5%);</li> <li>- attracting new investments in technology;</li> <li>-increasing the share of the industrial sector of the country;</li> <li>- increasing access to domestic, European and global markets;</li> <li>- high pace of technology development;</li> <li>- a relatively large number of ICT specialists;</li> <li>-growth of the number of mergers and acquisitions, and strategic alliances;</li> <li>-the emergence of new industries</li> </ul>	<p style="text-align: center;"><b>THREATS</b></p> <ul style="list-style-type: none"> <li>- slow implementation of technological changes</li> <li>- deterioration of the general business environment;</li> <li>- lack of human capital.</li> </ul>

Further research should be aimed at defining the impact of Industry 4.0 on the financial indicators of each region's development.

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### **Civil service in France and Germany and its adaptation for Ukraine**

Foreign experience of public service is of great importance for Ukraine in terms of reforms and modernization. The reforms in public service cover the changes in the system of executive power, personnel recruitment and optimization of its number, conditions of payment etc. The main principles of reforms are: democratization of public administration and civil service; orientation on the final result; profitability of management. The improvement of civil service is based on the ideas of state management. A qualitatively new model of public service, which is called behavioural, is well-known [1].

The analysis shows that the improvement of the civil service process in many countries is determined by the continental system. This model corresponds to the system of career civil service: state officials enter the civil service for the entire period of the professional career during which time they are promoted [2].

Modern France is the country of political stability in the field of public administration and civil service. The French model of public service is characterized

by hierarchical organization of the civil service system, very high level of centralization, insignificant attention to local conditions.

In Germany, there is also the notion of public service. Its main features include the high role of political appointments, the clear organization of the civil service system with the competition at each level of management, a complex multi-level system of recruitment for the civil service for graduates with the best performance, career growth, wages and privileges that depend on length of service [3].

The analysis of the “new state administration” allows researchers to systematize the main trends in the development of the institute of civil service in France and Germany: the development of reform programs; optimization and creation of new organizational structures; existence of special institutes of civil service management; rotation of personnel etc. Foreign experience of civil service is very valuable for our country. Adaptation of their experience to our realities and the requirements of our state will facilitate the reform and modernization of the civil service of Ukraine.

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## **Development of trade entrepreneurship in the conditions of European integration**

The EU Association Agreement provides Ukrainian entrepreneurs with access to EU markets. It is a powerful incentive to increase the competitiveness and quality of domestic products in the world's market. Ensuring the development of trade entrepreneurship is the one of the main conditions for increasing the competitiveness of Ukrainian economy. This is possible through the creation of favorable conditions of doing business and the formation of mutually beneficial foreign economic relations.

The main areas of domestic exports to the EU are products of the metallurgical industry, agriculture, clothing, furniture, aircraft industry etc.

The EU remains Ukraine's key partner in foreign trade activities. The potential of this market is still not fully disclosed to Ukrainian products. There are 508.2 million people within the European Union, which is 11 times more than in Ukraine – 45.49 million people. [1]

The main long-term trend of domestic exports is the reduction of the CIS share from 2011 (from 38.27% in 2012 to 15.99% in 2017) and simultaneous growth of the share of the EU, Asia and Africa. [2] By contrast, the share of EU countries has increased substantially: from 30.07% in 2005 to 40.52% in 2017, which means that domestic products are able to compete in this market.

Recently, the European Union has increased demand for organic product. Therefore, the most promising segment of the Western European market is the market of environmentally-friendly food products.

Summarizing the results of the survey in 27 EU member states showed the following. More than 8 out of 10 EU citizens consider the environmental quality of products as an important element that affects their health and, as a consequence, shapes their consumer preferences. In this case, 55% of the respondents stated they are fully aware of the most important impact of these products on the environment and human health when buying and consuming food. That's why Ukraine has prospect of development of export potential in this sphere. Because of the fertile and environmentally-friendly soils and favorable climatic conditions, the volume of organic agricultural production in Ukraine exceed the demand on the domestic market.

Consuming of the organic food in Ukraine is just starting to develop, and the main part of such products is exported. Every fourth ton of organic wheat in Europe is from Ukraine. There is observed the growth in demand for frozen berries and fruit products (apples). [4]

Export of organic products provides a higher price, which serves as stable source of income for business entities. At the same time, as the authors of the study emphasize, organic exports do not require new trading partners. Existing trade flows can greatly facilitate the formation or expansion of organic value chains.

Currently, information and analytical support of business is required for cooperation with partner organizations from other countries for the assimilation of the European business culture, acquiring managerial skills and modern methods of organic products promotion.

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### **The influence of the external environment on Interpipe Company**

Interpipe is a Ukrainian industrial company, a manufacturer of seamless and welded pipes and railway products.[1] Due to the complex political and economic situation in Ukraine and in the world the company is influenced by environmental factors. The main ones are consumers, suppliers, competitors and the state. [2] To build an appropriate model of organization's behaviour, we should use some examples to analyze the influence of the factors listed above.

The first factor is consumers. All the efforts of the enterprise are directed on them. However, there are certain risks there. The main problem is to find worthy buyers and get their trust. Such large companies as UkrGasVydobuvannya and Ukrnafta are buyers of oil pipe tubes. The main buyer of railway wheels and locomotion tires is Ukrzaliznitsya.

The next factor is the state. It affects the company through the establishment of domestic taxes (VAT 20%, income tax 18%) and fees, the introduction of import and export duties and monetary policy. Other countries also influence the activity. The problematic issues for the enterprise are an increase in duty on wheels; barrier measures for large pipe markets in Europe, USA, Brazil, and Mexico.

The third factor is suppliers. Interpipe produces pipe and wheel products from scrap (scrap - 80-90% of raw materials for the production of round steel billet, which is rolled into pipes and wheels). The main supplier of the round billet is Interpipe Steel. The main supplier of scrap is Interpipe Vtormet. The rest of the raw materials are bought in Ukraine or abroad.

The last factor is competitors. China and India are rapidly developing steelmaking. Their products fill the foreign markets. Competition is growing. Governments of other countries have to set import duties and anti-dumping duties. The main competitors are TMK, OMK, ChelPipe Group, Dnipropetrovsk Pipe Plant.

Interpipe strategy is aimed at developing and maintaining a leading position in the market. The two main keys are price and quality. The company does not need to stop development. It is modernizing the equipment, improving product quality, looking for ways to produce steel with minimal costs, increasing financial sustainability, and constantly renewing certification of the products. [3]

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### **Strategic planning in international corporations**

One of the main difficulties for successful corporations is instability and uncertainty in their development. Strategic planning in international corporations is one of the main components of strategic management. It is in line with the process of formulating the goals and objectives of development, implementing and controlling the performance of strategic directions. In modern conditions, strategic planning is an integral part of doing business for international corporations in order to get competitive advantage.

The strategic planning must operate at the speed of business, providing real-time perspectives for management to quickly understand market situations and decide how to shift resources, respond to events, and take advantage of emerging opportunities [1].

Strategic planning includes the following stages: defining the current mission, goals and strategy of the corporation; analyzing external environment; analyzing available resources; identifying strengths and weaknesses; reassessing mission and goals; defining the clear strategy; implementing the strategy in action; evaluating results.

Successful corporations use a number of strategies. For example, the American public corporation Google in 2018 determined the development strategy for 5 years. Its primary mission is to organize the presentation of information in order to make it accessible and useful [3]. The major mission of the Apple corporation is to become the leading interface in the world of technology [2].

Planning strategy is an important and necessary instrument to help prevent ineffective strategic decisions. The objective of strategic planning is to develop actions, products, services and communication process.

Well planned strategic activities allow Google and Apple to adjust and change their strategies regardless of environmental changes, as they have clear missions.

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## **Management of enterprises: the role of financial controlling**

In modern conditions the operation of enterprises is characterized by complexity, variability, limited financial resources, constant risks and aggravated competition. Therefore, their performance depends on the effectiveness of management system, which can ensure economic independence, competitiveness and stable financial position in the market. The basis for the solution of the problems of economic growth and effective development of enterprises is the improvement of the system of making managerial decisions. The use of a controlling system in the management of an enterprise provides the opportunity to organize high level management in connection with the integration and coordination of the activities of its various services and divisions. The urgency of the topic is determined by the need

to improve the methodological approaches to financial diagnostics of enterprises and the need for further development of the concept of controlling.

The purpose of this research is to analyze the theoretical and practical principles for diagnostics of financial conditions in the controlling system of an enterprise.

Different aspects of the problem of financial controlling have been the subject of meticulous and thorough investigations by A.S. Conspiracy, M.S. Pushkar, I.O. Krivorotko, M.F. Bazas, O.V. Dobrovolskaya, A. Dile, R. Mann, T. Reichman, H. Y. Folmut and others. On the basis of their findings it can be claimed that for efficient functioning of an enterprise in modern conditions it is necessary to clearly understand and predict the directions of its development, possible threats and ways to overcome them. The main reasons for the development of financial control in the enterprise include: the instability of both external and internal factors, the need for a search of new and improved management systems that provide flexibility and reliability of the operation of the enterprise, significant changes in the organization and methodology of the information system.

There exist numerous definitions of the term "controlling" and according to the most recognised ones they can be united into two major groups. Some researchers view this concept as a part of management, giving the right to make managerial decisions, others refer it to the management system that acts as information provision. It is also inherent in the absence of a single interpretation of the object of financial control: some believe that it should be applied to the enterprise as a whole, the rest - to individual management units and to operational control.

On this basis, it can be assumed that financial control is an analytical coordination and advisory system which underlies and effectuates management of an enterprise as a whole and/or a separate part of it. It can be explained as a process aimed at coordinating planning, analysis and internal control in order to make operational and strategic decisions, which can result in the effectiveness and efficiency of an enterprise.

Given this, it can be deduced that the essence of an enterprise management system is to determine its policy for a long-term perspective, to coordinate areas of activity and to solve the main tasks of doing business. The role of controlling process in the management of an enterprise is identified by the value of controlling in the general management system. As a subsystem of financial management, the role of controlling is to support and assist the manager. Consequently, controlling forms the basis for management at an enterprise and integrates into a general enterprise management system.

The main purpose of the concept of controlling is to provide the functionality of the enterprise. In accordance with the goals set before the organization the main controlling functions include accounting, support for the planning process, monitoring the implementation of plans, evaluating ongoing processes and identifying deviations and their causes, and developing recommendations for their elimination and guidance.

In accordance with the set of goals, two types of controlling, namely, strategic and operational can be distinguished. Strategic controlling analyzes the internal and external environment, monitors an enterprise and serves a higher institutional level, while operational controlling explores the economic efficiency and profitability of an enterprise. According to the planning levels, strategic controlling is directed at the institutional level, and operational controlling -at managerial and technical levels.

On this basis, the main methods for diagnosing the strategic position of enterprises can be: the method of diagnosing the gap between the plan and the fact, the method of SWOT-analysis, the method of constructing the matrix, the method of constructing the McKinsey matrix, competitive analysis by Port, diagnosis of the state of enterprises for weak signals, benchmarking. It should be noted that the most popular method is SWOT-analysis. While exploring external and internal environment of the company, it aims to eliminate company's existing weaknesses and risks, and to effectively use its strengths. It does not contain definite information, but it simplifies the process of perceiving information and its analysis.

The methods of operative diagnostics of financial and economic activity of enterprises can include: analysis of financial condition, break-even, material flows, information flows, reengineering of business processes, risk assessment and management.

Furthermore, according to Polish economist S. Marcinany, the classical classification of financial controlling is based on four criteria: the subject of activity, the horizons of time, the sphere of activity and the objectives of the activity.

Correspondingly, controlling plays a very important role in the enterprise management system and is one of the effective control systems. Controlling is identified with the system of economic management of the organization, as it is at the intersection of various management functions and activities of the organization. It occupies a special place in the management of an enterprise, connects all the areas and integrates them.

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### **Labour migration: its causes and consequences**

The relevance of the theme chosen is that more and more people all over the world are searching for better employment nowadays. The objective of the study is to identify causes and consequences of international labour migration. Labour migration is considered to be any targeted movement of people in the international territorial space searching for a place of employment. According to the statistics, the most popular countries among labour migrants are the countries of North America

(23%), Europe (except Eastern Europe) (24%) and the Arab countries (14% of migrants) [1].

Table 1 Fundamental reasons for the emergence of international labour migration

On the part of exporting countries	On the part of importing countries
High population density	Comparatively high wages
Large-scale unemployment caused by closing down of extensive abundance of natural resources and changes of the requirements of one or the other product that the country is specialized in.	Demand for the extra highly qualified labour force.
Low living standards and comparatively low wages	Demand for extra cheap and mobile labour for poor quality job.

The most significant factors facilitating the development of migration processes are considered to be the following:

- simplification of migration legislation and employment process
- rapid development of international passenger transportation;
- development of communications.

International labour migration has both positive and negative socio-economic impact.

Table 2 Impact on exporting countries

Benefits	Drawbacks
As a rule the money transferred are exchanged into the national currency in the banks of exporting countries; foreign currency remains in the banks;	Loss of quality specialists (the attrition problem);
Alleviation of poverty and unemployment problems	Extra budget expenditures on the preparation of new specialists
Rotation, i.e. in the long run homecoming of certain people and emigration of another citizens facilitates the progress of local staff development	Necessity for the search of ways to prevent from discriminating against own migrants; especially against illegal emigrants and secure them from physical and other danger that can occur to them;
Those, who left in the country, are getting more highly demanded job market; their wages increases, respectively.	Certain losses of entrepreneurs from exporting country. To some extent, they lose their opportunity to have a wide range of labour force and specialists in particular.

Table 3 Impact on importing countries

Benefits	Drawbacks
Savings on the preparation of specialists	Additional problems related to social protection of immigrants;
Reducing the input costs through the use of the low-cost labour	Increasing problem of job searches for local people of the country that is an importer of labour force
	Outflows of the national currency by sending cash transfers abroad
	Loss of highly qualified specialists through repatriation of migrants (i.e. after the return of migrants to their motherlands)

International labour migration is one of the key factors in the development of the world economy, in particular, Ukraine is currently a vivid example of a donor country. Labour migration changes the structure of the economies of countries. Studying such trends is important for the state institutions involved in macro-planning of both donor and recipient countries. A clear understanding of the positive and negative factors of this problem will allow to solve the problems of labour migration both for states and for individual workers. According to the Ministry of Finance of Ukraine, in 2018, 8,160 million US dollars were transferred to the country [2]. Such transfers are called private money transfers. According to the Ministry of Social Policy, at the end of 2018, about 3 million Ukrainian citizens work and live on a permanent basis abroad [3].

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## **Manipulative techniques in leadership**

From the moment people are born, they have been both the targets and the producers of manipulative influence. They do not even recognize it anymore as it surrounds them at every turn – advertising messages, politics, the list goes on.

Manipulators are skilled at taking control of anybody who is weak and undisciplined. Yet applying manipulation with extreme care and being fully aware of its possible end result can yield great benefits to everyone, personally and professionally [1]. People can argue that influencing through persuasion is better than using manipulation. However, they are basically about the same thing – changing the minds of people around you.

The most well-known manipulative technique is manipulation through fear or love. If used correctly, it can help create a truly strong leader. The phrase “You get to keep your job” is a tried-and-true example of these technique [2].

On a more global scale, China is an example of a country that is a one-party socialist republic and at the same time it has one of the fastest-growing economies in the world and world’s largest army. Using fear or love correctly can benefit greatly.

Benchmarking can also be considered a manipulative technique. At a workplace, salaries, social benefits and work conditions can be compared. If we take politics, for example, comparing Ukraine to Liberia can greatly boost morale of Ukrainian citizens who begin to think that it is better to live in Ukraine than in Liberia.

Using manipulative techniques in leadership can have different outcomes, depending on the leaders’ ability and the awareness of their employees. However, they should be used with caution, as they can spoil the relationships with employees irrevocably. On the other hand, everything is sweetened by risk. So, “Think for yourself, decide for yourself”.

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### **Critical comments to the use of strategic planning tools**

The matrices and methods developed by consulting groups and scientists in the past are used to analyse the market and choose a strategy. This approach of strategic planning is popularized in academic circles. The question is what results businesses get if they apply the instruments of strategic planning?

The methods of strategic planning include: Porter's competitive advantages method, SWOT analysis, PEST analysis, BCG matrix, Shell/DPM matrix, the Ansoff matrix, the GE McKinsey matrix etc. Most of them were created more than 50 years ago, but are still used in the periodic reports of the marketing departments. Despite the convenience, there are a number of challenges and criticism of the methods in question.

The first problem concerns the choice among all the examined methods. The matrices of Porter and Ansoff are both aimed at developing a strategy. If their results do not coincide, the specialists need to make a choice based on their preferences.

The second problem is the initial conditions of the matrices. For example, BCG matrix shows a comparison of one firm with its closest competitor, denying other market players. The SWOT analysis integrates all factors of the external and internal environment in both absolute and qualitative indicators. It may cause difficulties for the information processing and decision making.

In addition, the matrix-based results are not the final solution to the problem. They only indicate the development direction. The way of implementing the decision is created later.

Most of the methods in marketing and management are based on expert opinion (the choice of cells on the Shell's and McKinsey's coordinates). There is a risk of subjectivity in defining the weight of the unit.

However, the most common problem is misinterpretation. Matrices are very popular. They are given in many textbooks and manuals, and can be presented with the meaning different from the original one.

As a result, it is possible to avoid mistakes in the strategic planning tools usage. After studying the original papers and author's views several methods can be applied and the obtained results compared. If the findings do not have the economic value, the subsequent analysis is better to conduct on the basis of indicators: the balance of demand and supply on the market, as well as price, cost and margin. Demand can be measured with the apparent and actual consumption and investments in the industry. The supply can be presented in the form of companies' production capacities. Price factors, in turn, reflect the profitability of the market under investigation.

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### **Labor management as a key component of enterprise management**

The development of the market relations in the world economic community has led theoreticians and practitioners in the field of management to the conclusion that one of the key components of the organization`s work is the development of a sound competitive strategy for enterprise success. Enterprise prosperity and competitiveness are determined by the development of all the elements of the company`s managerial system, one aspect of which is the management of the personnel.

The efficiency of the labor is characterized by labor productivity, which is described by the number of products produced per unit time or by labor costs per unit of output made (performed work). In many scientific researches labor productivity is considered as an indicator of labor activity effectiveness. And the factors of labor productivity directly ensure labor costs reduction and impact the work efficiency [1].

Personnel management is carried out by various methods of influence on employees but among them motivation has the highest impact on labor productivity. And the well-known HR motivational instruments are a reasonable salary, a financial reward, a recognition program or career development prospects. However, increasing of labor productivity takes place not only due to the employees` encouragement. It is more complicated process involving various simultaneously interconnected factors:

- material and technical (availability of tools and equipment affecting the volumes of production, the product quality and competitiveness:);
- economic and financial (funds invested in business: the higher the capital labor ratio, the higher the ratio of output per worker[2]);
- organizational (the efficient use of working time);
- structural (related to changes in the structure of products and industrial staff);
- managerial-organizational (rights and responsibilities of the management);
- socio-educational and psychological (the development of business ethics).

Therefore, the process of the workforce productivity is a coordinated activity of different structural divisions of the enterprise, which perform various functions. That is why, if an enterprise is interested in achieving positive results, it should develop a long-term strategy for increasing productivity (on the basis of the factors mentioned above) and a detailed program for its implementation.

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**Section 02 Sustainable Management of Ecology and Land Use**

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**The cause and effects of the interaction of the economy and the environment**

The introduction of the latest advances in science and technology, the emergence of new technologies and materials have led to revolutionary changes in society. Humanity has entered the era of scientific and technological revolution, which has aggravated anthropogenic impact on nature. This influence is controversial. On the one hand, the improvement of technologies contributes to a more complete satisfaction of the people's needs, rational use of natural resources, production increase. On the other hand, the environment is polluted, forests are destroyed, people's health is deteriorated, etc.

The purpose of this work is to study the effects of the interaction of economy and ecology in Ukraine.

The last mentioned is mainly based on the relationship between the attraction of natural resources to production and the reverse flow of matter in the form of waste to the ecological system. At the same time, the introduction of natural resources into economic activity is carried out through the operation of the mechanism of nature use as the use of natural resource potential of the territory.

Ukraine has a prominent place among other countries in terms of mineral resources. Occupying 0.4% of the world's land, it owns 5% of the world's minerals with a total value of over 11 trillion US dollars concentrated in 9,000 deposits. This led to the formation on its territory of a powerful industrial complex and related technogeneous and environmental problems, in particular: high degree of man-made load and pollution of the environment, the formation of significant volumes of waste, activation and development of dangerous geological processes, violations of hydrological conditions, losses of minerals, not complex use of deposits.

Despite this, ecology has a strong influence on the economy of the country. According to the Ministry of Ecology and Natural Resources of Ukraine, annual average GDP losses due to deterioration of the environment are 10-15%. At the same time, according to the International Institute of Environmental Management (Switzerland), the level of environmental damage in Ukraine is at least 15-20% of GDP and is one of the highest in the world.

It should be noted that the ecological crisis in Ukraine is not a casual phenomenon, isolated from the state of general economic development, but rather as a regularity and essential attribute of a deep systemic crisis.

Compared to the countries of Europe, in Ukraine 1 USD of GDP brings about 24 times more sulfur dioxide, 8 times nitrogen oxides, and 23 times ammonia. At the same time in Ukraine pollution of water for 1 dollar of GDP is 11 times bigger.

At our time, the loss of working time from environmentally responsible morbidity is an average of 48 hours on 1 employee a year. In the conditions of increasing morbidity in ecologically unsuccessful cities (and regions) there is a need to make an integrated, systematic assessment of the activities of enterprises in terms of their impact not only on the natural environment but, above all, on human health, which requires a state program development, ecological, economic and social security that will be of a complex nature.

In Ukraine, considerable work on the implementation of EU legislation on the protection and preservation of the natural environment, is under way.

Implementation of the EU legislation on the protection and preservation of the natural environment will reduce the losses of the national economy from adverse environmental factors. We can assume that the introduction of European statutory acts and directives in Ukraine will allow, as calculations show, to reduce losses of its economy from unfavorable environmental factors by 5-7%. In this case, the loss of Ukraine's GDP from negative environmental conditions will not reach 10-15%, as it is today, and 5-7%, which will make it possible to increase the state's GDP by 60-80 billion UAH.

Most of the modern environmental problems are caused by anthropogenic interference with nature; therefore, the formation of ecological consciousness, ecological culture: these are the first steps that must stand in the way of a human attitude toward nature.

Increasing the effectiveness of the process of forming the ecological consciousness is possible through the harmonization of content, the introduction of personality-oriented interactive methods of environmental education and that one, aimed at the formation of motivational-value and behavioral and active components of environmental consciousness and behavior.

Favorable for the formation of ecological consciousness is extra-curricular work, because it goes beyond the curriculum, aimed at expanding and complementing knowledge, skills, experience of students. It is possible to resolve the contradictions between the general theoretical nature, the global level of environmental knowledge acquired during the study, and the limits of economic responsibility.

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## **Directions for improvement of the activities of the state fiscal service of Ukraine**

The State Fiscal Service (SFS) is the central executive body of Ukraine, whose activities are directed and coordinated by the Cabinet of Ministers of Ukraine.

The result of organizing SFS in 2017 was improvement the performance of the tasks and achieving positive growth rates of revenue payments to the budget in comparison with the 2016 year [1].

In order to improve the work, in June 2018, the Ministry of Finance published an action plan for reforming the SFS in the tax area [2]. The analysis of this document makes it possible to distinguish both progressive norms and some defects.

Thus, the document contains a set of measures aimed at the substantial expansion of electronic services. There are new services that will significantly improve the quality of taxpayer services.

Such changes will ensure the systematic institutional transformation of the fiscal service into an effective service and this will contribute to improving the business climate in Ukraine and the growth of the economy. However, in order for a radical SFS reform to take place, the plan needs to be finalized.

The project often lacks targets for reform, for example, clear timelines and volumes for increasing the level of remuneration of SFS employees. There are also no clear deadlines for recruiting staff at open competitions and recruitment criteria for changing the corporate culture of the tax service. In the end, there is no detailed plan for creating a service.

The draft plan should clearly state how the tax police will be liquidated and how a new authority will be created.

The project does not include measures to simplify the VAT administration system, in particular, improve the functioning of the system of blocking tax invoices. In our opinion, some of structural changes are necessary.

First, the Department for Monitoring Revenues and Accounting and Reporting Systems should be transferred to the Strategic Management of the Ministry of Finance. It is important to deprive these departments of their unusual functions: the functions of strategic planning and forecasting and the function of normative initiative. Secondly, the Ministry of Finance should be subordinated to the Department of Information Technology with the parallel creation of an independent state data center. Taxpayers and state bodies should be only users with equal rights. Thirdly, the department of methodological and normative work should be integrated with the profile department of the Ministry of Finance in order to stop duplication of functions.

In our opinion, the approval of the strategic plan for reforming the SFS, taking into account these proposals, will make the reform effective and solve the key problems of the agencies that have a significant impact on the state's economy.

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**Prospects in rapeseed use for the reclamation of coal waste dumps**

The accumulation of waste rock dumps is a big ecological problem in mining. The dumps occupy large areas and need reclamation in the future.

The purpose of this research is to study the prospects of rapeseed use for the development of phytotechnologies for coal waste dump reclamation.

Coal dumps are characterized by specific physical and chemical properties and insufficient level of soil nutrients for plant growth. Phytoremediation technologies can be applied for the reclamation of anthropogenically-disturbed soils resulting in the creation of the ecologically balanced system of “soil-fertilizer-plant” through the use of certain types of agricultural crops. Phytoremediation can be achieved by the application of the mineral fertilizers and use of plant growth regulators. However, the use of traditional types of the water soluble fertilizers in dumps is ineffective due to their precipitation as a result of leaching, which leads to groundwater contamination and negative impact on the environment. To solve the problem, fertilizers in capsules can be applied.

In the study presented three options of cultivating rapeseed on the dumps are compared. The first one does not include fertilizers. In the second one the fertilizers are added in the original form, and in the third one fertilizers in capsules are used. As a phytoindicator, the seeds of rape (*Brassica napus*) are used to study the ability for heavy metal accumulation. The main markers are the change in the length and weight of the plant's shoots.

The results of the study have shown more environmentally reasonable application of the encapsulated fertilizers. It can be explained by the fact that encapsulated fertilizers resist to be washed out from the soil by raining. Therefore,

they do not accumulate in groundwater and protect the environment from contamination. Moreover, Rapeseeds are widely used as a source of rape oil for biodiesel production [1].

The study presents the new approach to ecosystem improvement, in particular, phytoremediation of coal mine dumps by planting energy crops (i.e. *Brassica napus*). Encapsulated fertilizers enhance the soil fertility, stimulate the rapeseed growth and protect the environment from contamination.

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**Optimizing velocity of traffic flow within the area of O. Pol Avenue, Dnipro city**

Traffic management is meant as a complex of engineering-technical and organizational measures aimed at the provision of optimal velocity of vehicles, safety and convenience for all the traffic participants, provision of the required traffic capacity of the available road and street network. The developed countries implement following measures to reduce transportation load: provision of balanced and free traffic, reduced traffic intensity and prohibition of freight vehicles through the densely populated areas, transfer of transit roads from residential areas, construction of noise-absorption structures, and green planting [1].

Increase in vehicles fleet and traffic volumes results in more intense traffic; in terms of Ukraine that causes various transportation problems. In particular, traffic delays, frequent stops, and traffic jams within the crossroads result in the increased pollution of the environment with the products of incomplete combustion.

Objective of the research is to study the traffic intensity and traffic flow composition within the area of O. Pol Avenue to optimize motor transport flow and improve the urban environmental situation.

O. Pol Avenue has been observed within two days (observation time - 9 a.m. - 12 a.m.) with the determination of traffic intensity and transportation flow composition.

While forming the traffic situation data, traffic flow intensity, air density, and traffic velocity were taken into consideration. Table 1 represented the observation results.

Table 1

Traffic flow parameters

Measurement number	Vehicle velocity, $V_a$ , km/h	Safety distance, $D_{bi}$ , m	Dynamic gauge, $L_a$ , m	Traffic flow density, $q_i$ , vehicle/km	Traffic intensity, $N_i$ , vehicle/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

Calculation of environmental effect from the traffic flow optimization took into consideration the calculation of carbon oxide emissions. The calculation was performed according to the methodology to calculate emissions of contaminating substances and greenhouse gases into the atmosphere due to the fuel use [2].

While calculating, transportation modes involved into the traffic flow were taken into account: 40 % - vehicles running on petrol, 35 % - vehicles running on diesel fuel, 20 % - vehicles running on liquid gas, and 5 % - urban electric transport which was not taken into consideration while calculating fuel consumption and emissions.

In terms of petrol engines, tabular data were considered for passenger light vehicles and passenger buses. As for diesel fuel, tabular data were considered for freight vehicles and passenger buses. Correspondingly, technical condition of vehicles was taken into account as well. Table 2 represents the calculation results.

Table 2

Traffic flow density of and carbon oxide emissions

Vehicle velocity, $V_a$ , km/h	Traffic flow density, $q_i$ , vehicle/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

The studies have made it possible to conclude that if the drivers keep the velocity of 50-60 km/h, there will be following positive results:



- 1) improved traffic capacity of the crossroad resulting in the non-available traffic jams during rush hours with following reduction on the amount of accidents;
- 2) reduced fuel consumption (approximately, by 2 times) resulting in the costs saving;
- 3) considerable ecological effect – emissions are reduced by 85 % (from 1138.59 t/year down to 176.785 t/year).

Thus, following traffic sign is recommended to set within that area with the range up to the nearest crossroad: 5.30 “Recommended velocity” (50 km/h).

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### **Modernization of mining equipment in the Western-Donbass mines**

Nowadays, coal mining is an expensive business that requires large investments. Therefore, directors of mines are looking for ways to reduce the cost of coal. One of the ways is to modernize old equipment or improve their characteristics since new equipment and new technologies need much more investments and time. The modernized shearers of «Corum Group» company used in the mines of the Western Donbas can serve as an example of successful modernization.

Modernized shearers KA200 are widely used on DTEK miners of shaft management «Heroes of Space» and DTEK shaft management "Pavlohradskoe". All these changes sheerer design increase its productivity and provide more comfort in operation and maintenance, in particular, eliminate the cost of time to eliminate uncoupling combine, and also reduce the cost of mining tons of coal by 1.3 times.

Last fall the upgraded KA200 (serial number 7) was manufactured for the Samarskaya mine to be exploited in lava № 4202 with removable power of 1.05 m. At a result, its resistance of coal to cutting up to 510 kNm. KA80M34.00.000 executive bodies are equipped with radial cutters, and the total power of cutting engines 2x220 = 440 kW in the shearer. A new design of gearbox engagement

mechanism has been applied and the inter-engine attachment has been modernized. Now hydraulic system has improved hydraulic control unit and reinforced screed.

Moreover, the upgraded model has improved design of jacks: instead of two jacks used before there is one interchangeable which can be installed both on the left and on the right side of the combine. The resource of the gearbox is also increased due to placement of the gearbox couplings in the lubricated separate chamber. The hydraulic system has also undergone significant changes: the DAMEL Polish electric motor was used in the combine, which will extend the life of the shearers and increase its productivity.

All the mentioned changes improve the performance of the shearer and increase productivity.

The non-shearing frontal complex KNF is the only modern complex in the world for the preparation of assembly chambers in low-thickness seams (up to two meters), which completely mechanize the process of cutting niches in difficult mining and geological conditions. Its novelty not limited to its the design and operational characteristics only. A new approach was applied in the development: the idea of creating a KNF was totally prompted by our customers. There was a strong outdated KN-78 complex. Initiators of these changes explained elementwise exactly what they needed, and together designer engineering of the company created the concept of this machine. Development, production and implementation of the updated shearers were carried out in cooperation with its consumers.

Since 2013, KNF has been successfully used in the mines of DTEK Pavlogradugol, thanks to which the costs of preparing new lavas for the further work of the treatment facilities are reduced by 30%.

The company's engineers designed the CLS450 in close contact with DTEK's miners, taking into account all their wishes. As a result, a shearer was obtained with the main units located above the conveyor and a frequency converter that regulates the feed rate located in the main frame. The CLS450 shearers is intended for working out thin and medium layers with variable complex hypsometry reservoir. It has a high-power supply in the minimum dimensions.

The shells of cutting gears are a welded construction. In the kinematic group applied new design solutions, allowing to reach optimum balance of power in limited dimensions. This is especially true for the use of the shearers in thin layers.

Modern control and diagnostic system of the shearers allows the mine dispatcher and remote users to see the current loads electric motors, speed of movement, temperature of engines, fixes and visualizes errors in the work of the combine, controls the operation of cutting engines. It adjusts the feed rate so that the shearers reach maximum performance without any damage to the engines. The transmission is designed for overloads, being controlled by the system, and it can work out a field of excavation without overhauling the combine.

As the experience proves, sometimes there is no need to design new machines for underground mining of thin and medium coal beds. It is more beneficial to cooperate with miners as the main consumers of the new mining equipment and

analyzing their needs. Deep analysis of miners' needs can contribute to the successful upgrading the machines being used and save money.

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### **Phytoremediation**

Nowadays there are a lot of toxic organic substances in our environment due to pollution generated by chemical enterprises. Various microorganisms have been successfully used to neutralize them. However, they are not capable of removing such heavy metals as arsenic, cadmium, copper, mercury, selenium, lead and radioactive isotopes of strontium, cesium, uranium and radionuclides from soil and water. In this case, phytoremediation can be used as a solution to the problem.

Phytoremediation technologies are employed to remediate soil and groundwater using green plants. Phytoremediation is an effective and profitable method of cleaning the environment.

The main benefits of phytoremediation are efficiency, low cost, a wide range of absorbed pollutants and environmental friendliness. Being the cleanest and cheapest technology, it can be used in the recovery of certain hazardous areas. Phytoremediation includes a number of different methods that can lead to the degradation of contaminants. This technology has recently attracted attention as an innovative, cost-effective alternative to more dangerous existing methods. Phytoremediation is cheaper than conventional physico-chemical methods, since it does not require expensive equipment and highly qualified personnel.

Another advantage of phytoremediation is an accumulation of metals in plants, which can be further processed after burning biomass and also for creating biodiesel fuel and obtaining thermal energy. The success of the phytofiltration technique depends on the identification of suitable plant species that can hyperaccumulate heavy metals and produce large quantities of biomass.

There are certain limitations of phytoremediation. It can be a long-lasting process, and clearing a site can take several agricultural seasons. Recycling or incineration takes several weeks or months, while it may take several years for phytoextraction or degradation.

Thus, for the sites with a very high concentration of pollutants, phytoremediation cannot be selected as a recovery method. This technology is best suited for remote areas where human contact is limited or where pollution does not require an immediate response.

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### ***Chlorella vulgaris* as a test-object for toxicological experiments**

Toxicological experiments are aimed at checking the safety of pesticides, medicines, cosmetics and other substances. Laboratories which conduct such experiments use both invertebrates and vertebrates, primates as well as non-primate animals. The animals are transported to these laboratories by special organisations. About 100 million animals are used by such experimental centers every year. However, an idea of prohibiting such experiments was introduced in Europe in the beginning of 21st century but it still is not widely accepted nowadays.

Some scientists consider *C. vulgaris* to be a good option as a test-object instead animals. It is already used for checking the toxicity of phenols, nickel oxide, dichloromethane, dichloroethane, heavy metals, pharmaceutical substances, chlorophenols and others.

*Chlorella vulgaris* is a eukaryotic, unicellular green alga with a spherical shape. It is estimated to have been on Earth for more than 2.5 billion years. It contains 16 chromosomes consisting of a range between 0.98 Mb to 4 Mb. *C. vulgaris* is known to survive under certain stressors such as viruses, bacteria, fungi, and many types of pollutants. The reason for these attributes stems from its ability to rapidly repair its DNA. When a break occurs, *C. vulgaris* is able to mutate and assimilate quickly.

One of the important features is its ability to rapidly grow. Such practice usually involves growing populations in photobioreactors. Cultures of these microorganisms are standardized and can be easily grown in the laboratory during all year.

One of the methods used in toxicological experiments is recording differences in optical density in control and tested mediums with *C. vulgaris* culture. It is necessary to cultivate *C. vulgaris* in both control medium and toxic environment which includes certain tested substance. It takes about 22 hours to complete this process. After that time the optical density parameters are calculated and compared. If the parameter shows increase for 30% or decrease for 20% in growth, the tested substance can be toxic for humans as well. The method could give correct result because it is proved that *C. vulgaris* is surprisingly more similar to land plants because red and brown algae contribute no homologous genomic sections in its chloroplast.

*C. vulgaris* can mutate rapidly when something causes damage. Mutation is an unpredictable process, which causes some changes in the DNA of certain cell. So *C. vulgaris* can be observed for any changes. Furthermore, this alga is quite unpretentious to living conditions, able to breed quickly and as the result it is widely spread around the globe and can be easily cultivated in the laboratory.

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**Environmental tax as a component of environmental policy**

The ecological situation in Ukraine can be described as a crisis today. This is evident in the accumulation of very harmful wastes, pollution of the air, groundwater, surface water and land.

In 2010, there was adopted the law of Ukraine “Strategy of National Ecological Policy of Ukraine until 2020”, which in legal form establishes the obligation of Ukraine regarding the greening of the economy and environmental safety [1]. In this regard, Section VIII of the tax code since 01.01.11. instead of national charges for environmental pollution introduced charging an environmental tax [2]. The existence of the environmental tax is due to the necessity of the partial

compensation of the negative impact on the nature of the different kinds of harmful and hazardous factors arising in the course of economic activity entities.

Currently, improvements of the environmental policy of the country caused by both internal problems and external obligations (e.g. integration processes in Ukraine determine the necessity of adaptation to EU legislation in environmental as well) are being carried out. An important indicator is the ratio of the ecological tax income and spending on environmental protection in all European countries except Ukraine; revenue from environmental taxes is significantly higher than government spending on environmental measures. In Britain and Germany the amount of environmental taxes referring to environmental spending is 3 times higher [3].

Thus, in the field of ecological taxation in Ukraine there exists a number of problems, among them: constant change of proportions of the distributions from environmental tax between the state and local budgets as well as between special and General Fund budgets what makes it impossible to form a consistent policy of environmental activities; transfer of funds from the payment of ecological tax for the formation and storage of radioactive waste is being routed to the General Fund of the state budget, which contradicts the nature of environmental tax; part of the environmental tax (except that regards radioactive waste) – 45% is credited to the General Fund of the State Budget of Ukraine, so these funds lose their purpose to correct brought environment polluters; enterprises in Ukraine that pollute environment more than others, have opportunity of preferential leading of eco program, but business sector is not interested in these programs very much.

Solving the given problems requires both a retrospective analysis of the practice of ecological taxation in Ukraine and the consideration of international experience. First of all, one must change the ecological tax, namely, introduce more stringent conditions: increase rates, reduce emission limits and standards.

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### **Stray dogs in Dnipro, threat or pity?**

It should be noted that there are several categories of homeless animals. Most often we hear about the so-called pets of the entrances and courtyards. It is for their well-being that human rights advocates and volunteers are mainly advocating, calling for the use of budget funds to create shelters. Their good-natured neighbors love to feed that kind of good thing, but does not solve the problem of their number.

The most numerous and, perhaps, dangerous for the inhabitants of the category of homeless animals are half wild. This type is quite aggressive. They can live in the city both alone and in packs, look for food in the suburbs, "begging." This type is not so attractive and can be dangerous.

The solution of the problem comes down to the creation of a professional service – animal supervision. Since 2005, several cities in Ukraine have been assisted in a humane solution to the problem by the German Animal Protection Union. They help open special shelters, where the animals are sterilized and sent back to the street. This solves the problem only partially. To effectively solve the problem, it is necessary to sterilize at least 70% of stray and possessive animals. If the quantity is lower, the result will be the opposite.

Starting to solve the problem of stray animals, many European countries work primarily not with the dogs themselves, but with their owners. Irresponsible attitude to the pet often becomes the reason that the animal is on the street. In Germany and the United Kingdom, for example, severe penalties have been introduced for depriving a dog of a house. They reach several tens of thousands of euros. In parallel with the fine, some countries practice taxes on the maintenance of a pet. If in Germany the tax amount varies depending on the number of dogs the owner has, in Sweden only the size of the animal matters. By the way, registration of a domestic dog in Europe is required.

Unfortunately, not all countries and cultures treat animals humanely. In China, stray animals are caught and put to sleep in shelters. Every year, almost 10 million dogs are killed in the country for cooking. And in the city of Yulin in the south-west of China, from June 21 to 30, thousands of animals are skinned at the traditional Dog Meat Festival.

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**Section 03 Energy Saving and Renewable Energy, Effective Use of Alternative Energy Sources**

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**Energy Balance in Electric Circuits with Unconventional Power Sources**

The energy crisis contributed to an increase in interest in new types of energy resources, which were called unconventional or alternative [1]. Their share in the structure of world consumption of primary energy resources is growing noticeably. Unconventional energy sources include the energy of the Sun, wind, tides, sea waves, geothermal and thermonuclear energy.

For unconventional energy sources we will set the power balance. We prove this power balance on the example of DC alternative generator GDC and accumulator battery ACB, which are oppositely connected. Equivalent circuit of a DC alternative generator GDC is represented as ideal source of EMF  $E_1$  with internal resistance  $R_1$ . Battery is represented by ideal source of EMF  $E_2$  with internal resistance  $R_2$ . EMFs of alternative generator and battery are directed towards each other. Depending on the ratio of the EMFs  $E_1$  and  $E_2$  the following operation modes are possible: electrical balance when  $E_1$  and  $E_2$  are equal,  $E_1 < E_2$  – then energy is transferred from the battery to alternative generator,  $E_1 > E_2$  – the energy is transmitted from the DC alternative generator to accumulator battery. To be specific, we assume that  $E_1 > E_2$ . Under this condition, the actual current direction  $I$  coincides with the direction of EMF  $E_1$ . Voltage  $U$  across the external terminals of both sources is less than EMF  $E_1$  by internal voltage drop  $IR_1$  in the alternative generator, and greater than EMF  $E_2$  by the internal voltage drop  $IR_2$  across battery. Delivered power is always equal to consumed one, quod erat demonstrandum. Power loss in ohmic resistance is always positive, i.e. always consumed. Powers of energy sources can be not only delivered but also consumed. To draw up a powers balance it is necessary to take into account the energy source operating modes.

Based on the power balance one can assess the calculations correctness of current and voltage circuit. In the circuit at transition from EMF sources to current sources and vice versa, powers of initial and transformed sources may not equal. In addition, transformed source may change the work mode with respect to initial source.

Nonconventional renewable energy sources for the current day are still inferior to those traditional in their real technical capabilities. It will take a long time before these sources become a real alternative to conventional energy sources.

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### **Increasing the economic efficiency of AC electric drives**

In modern AC drives the power converter in most cases is performed as a two-lane converter with uncontrolled rectifier at the input and stand-alone voltage inverter with PWM. This allows controlling frequency and amplitude of the voltage in one inverter and makes it easier to implement the necessary laws of asynchronous electric drive control. To exchange energy between the motor and the network a capacitor is switched in parallel to the inverter. But such a construction of the power circuit of the converter does not allow realizing energy recovery to the network. The excess energy is dissipated in the form of heat at a discharge resistance, which is switched in parallel to the capacity at the inverter's input that causes large energy losses in electric drives with intense dynamic modes and large inertia masses.

For the implementation of recuperative braking with energy transfer to the network it is necessary to complicate the power circuit replacing the input rectifier with a two-way conductor inverter having the same configuration as the inverter for powering the engine. In this case, however, losses in the supply cables, inverter and transformer are increasing due to the two-way energy circulation between the network and the engine and at peak loads.

A very promising way for increasing the energy efficiency of electromechanical systems is the power supply of controlled drives based on stand-alone voltage inverters from common DC bus with a capacitive storage device. The use of group supply from common DC bus and capacitive storage allows realizing the energy exchange between individual drives or a group of drives operating in different modes. As a result, a significantly smaller capacity storage device is required for energy storage in recuperative braking modes to prevent the circulation of energy from the engine to the AC network. It also reduces losses and eliminates the negative impact of peak loads on the power supply network. Moreover, application of the inverter with double-conductivity and capacitive filter  $C_f$  creating a parallel power active compensator at the input allows:

- flexible management of energy flows;
- reduction of power losses in the input converters and lines;
- solving the problem of reactive power compensation and reducing energy losses;
- minimization of higher harmonics and the achievement of almost sinusoidal network current, while excluding their negative impact on the power system and other consumers;
- short-term compensation of voltage dips at short circuits using accumulated energy;
- prevention of deviations and voltage fluctuations;

- redistribution, if necessary, of the active power between the phases and ensuring load symmetry.

Therefore, an active filter inverter must generate a certain form of current defined as  $I_i = I_1 - I_L$ , where  $I_i$ ,  $I_1$ ,  $I_L$  – inverter current of power active compensator of the first harmonic and the load.

In group power systems the energy stored in the capacitance is reused for controlling the quality of the electric power by means of a stand-alone voltage inverter with PWM, which forms a power active compensator together with the vector-relay control system.

Formation of the control parameter to optimize energy processes and minimize losses in nonlinear and asymmetric systems with reactive load makes it necessary to operate with instantaneous power, which uniquely characterizes the energy-exchange processes occurring in nonlinear systems. This task can be solved on the basis of instantaneous power theory method using generalized vectors of current and voltage of the network in the coordinate system  $I_x, I_y$  ( $I_d, I_q$ ), which rotates synchronously with the orientation on the voltage vector of the network.

Any three-phase system changes, such as a load current, the sum of instantaneous values of which is zero, can be represented by known expressions in a two-dimensional space by a generalized (resulting) vector.

In three-phase symmetric systems in the absence of zero current component the instantaneous power value is defined as the scalar product of the generalized (resulting) voltage vector of the network  $\bar{U}$  and connected current vector  $\bar{I}^*$ , which allows creating control actions for energy management with the help of active power compensator.

In addition, from the point of view of the simplicity of forming control actions proportional to inactive components of full power, it provides a transition from a stationary coordinate system  $\alpha, \beta$  to  $x, y$ , which is synchronously rotated, oriented on the vector of the network voltage. In this coordinate system the three-phase sinusoidal voltage system is already presented by a fixed vector with only constant projection on the  $x$ -axis that simplifies the implementation and synthesis of regulators operating on a direct rather than alternating current.

The transition from one system to another does not cause changes in the angle of displacement between the vectors of voltage and current. However, this procedure greatly simplifies the selection and continuous control of the instantaneous values of inactive components of full power.

In linear symmetric systems both components of the current do not contain variable components that are proportional to the active and reactive power respectively. In nonlinear systems, in the presence of harmonics of current in both components there are variable components, proportional to the power of distortion, due to the non-sinusoidal curves of current and voltage. It can be used in power quality control systems as a controlling influence.

In the absence of a zero current component, the instantaneous value of the asymmetric system power is defined as the scalar product of the generalized vector of voltage on the connected vector of the network current.

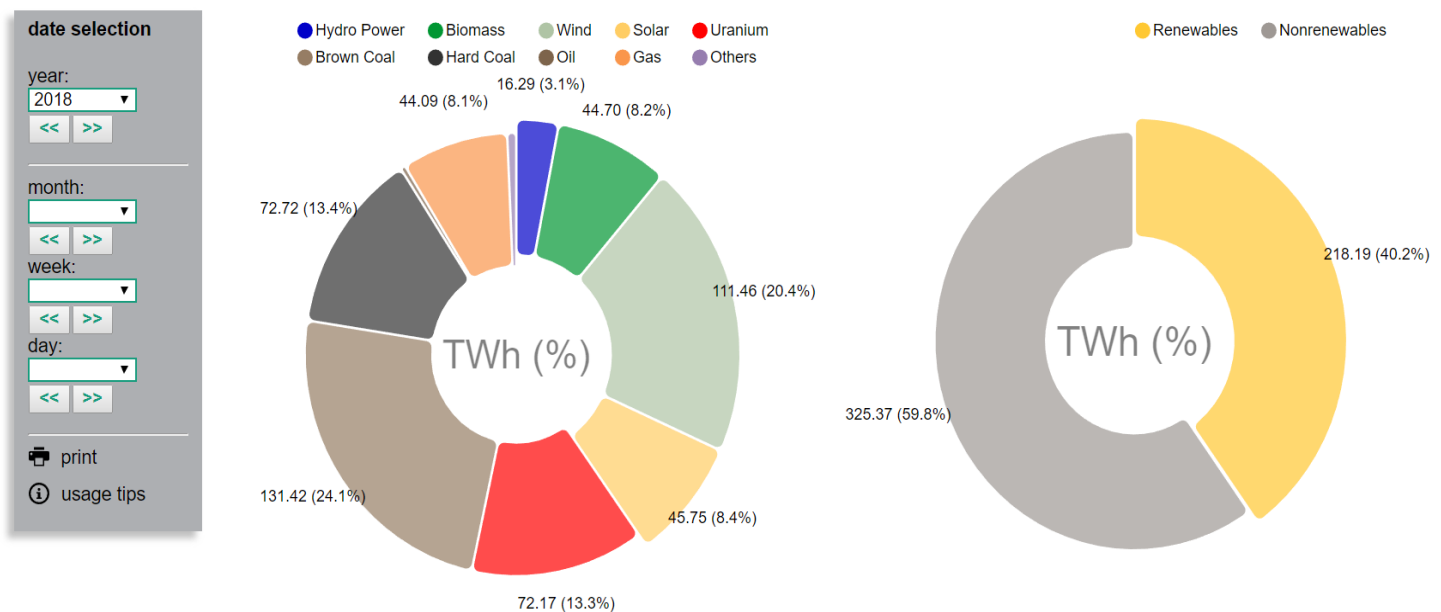
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### Germany Renewable Energy Survey 2018

This article discusses the production of renewable energy in Germany in 2018, as well as the analysis of the solar and wind energy sectors.

Germany is one of the countries in Europe with a highly developed economy and substantial share of clean energy. Also, Germany took the risk of abandoning nuclear and coal generation and implemented it into reality: in 2018 the last coal mine in the German territory was closed, as coal extraction is considered not feasible any more. However, they did not succeed in abandoning coal altogether. Germany stopped producing coal at home, but continued to exploit its coal-fired power plants at the expense of imported Russian, Colombian and American coal. Nuclear energy is planned to be shut down completely by 2022. The following diagram illustrates German power generation in 2018 in more detail.

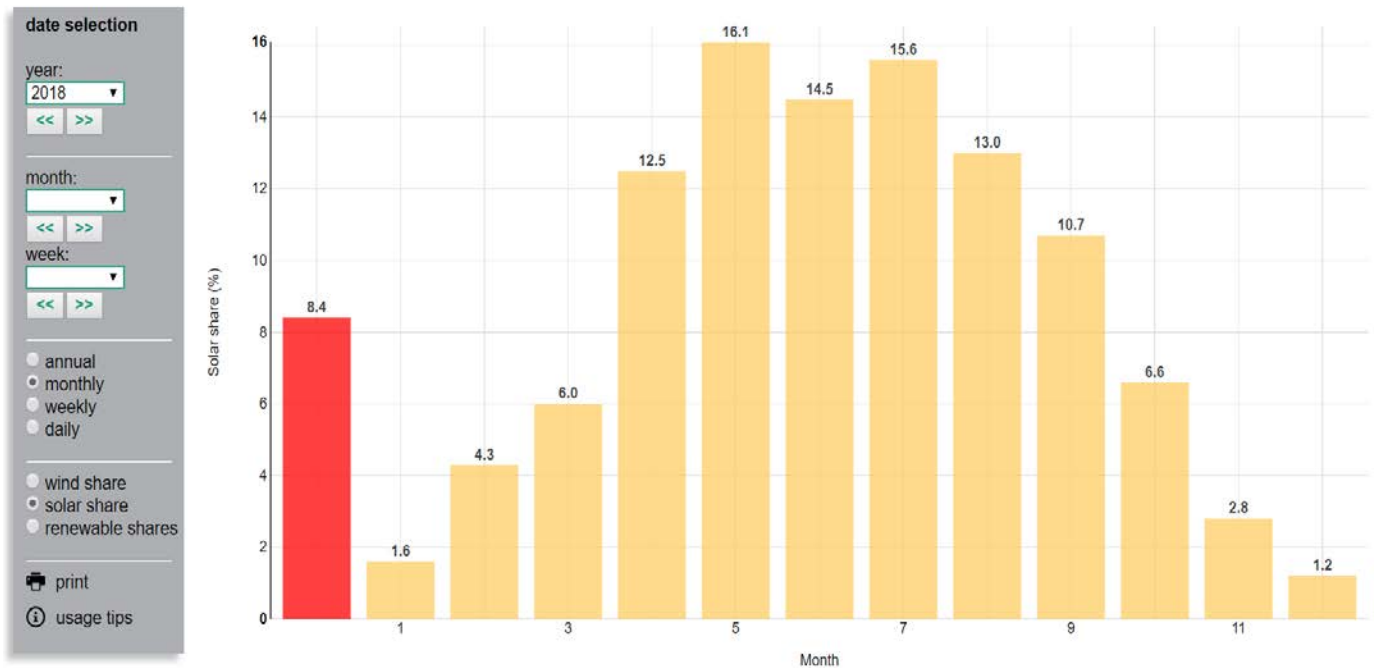
### Net public electricity generation in Germany in 2018



**Fig. 1. Electricity generation diagram in Germany in 2018 [1]**

Now we can consider the solar and wind energy in more detail.

## Monthly solar shares of electricity production in Germany in 2018



**Fig. 2. Solar Production in Germany in 2018 [1]**

The diagram shows that renewable energy sources have a significant share in the power industry of Germany, namely 40.2%. Coal energy is actively losing ground occupying 37.5%, and the share of nuclear energy has dropped to 13.3%.

Thanks to sunny weather, Germany managed to set a record for the production of solar energy at 8.5%. The installation of 100,000 MW household electricity storage system also contributed to this impressive result.

The German Solar Industry Association (BSW-Solar) sums up the long summer, counting how much energy solar power stations and roof panels in the country have produced during this time, the media reported.

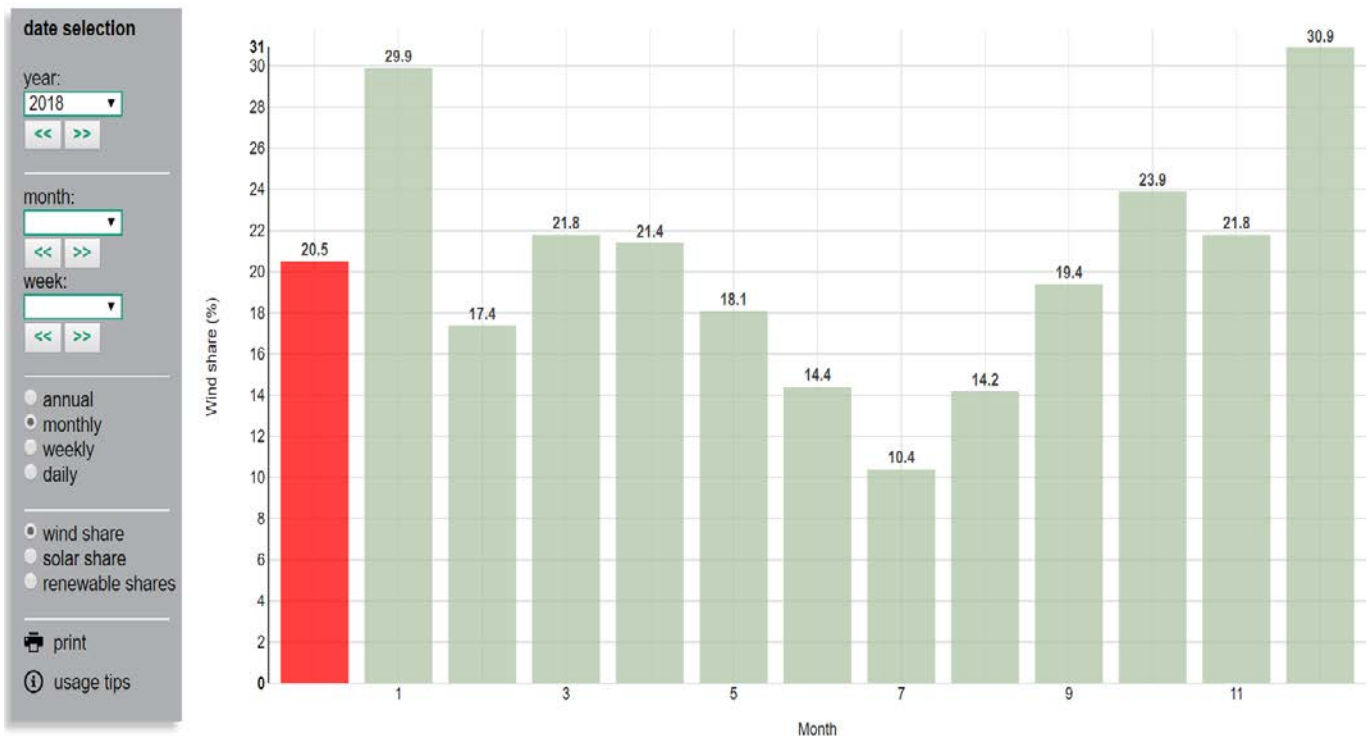
The result since the beginning of the year amounted to about 40 billion kWh, which is 11% more than during the same period last year. At the same time, for the whole 2017, Germany's solar batteries generated 39.9 billion kWh.

“We managed to set such a record, thanks to a huge interest in solar energy, the surge of which we observed this year. One question remains: why is the government still not investing heavily in this industry?” commented BSW-Solar managing director Karsten Körnig.

BSW-Solar has long called for a sharp increase in the annual construction of solar power plants and the abolition of the limit of 52 GW, which limits the issuance of government subsidies for new projects. All this will make it possible to quickly switch to renewable energy and, finally, close coal-fired power plants. [2]

The following diagram shows the trend of increasing the share of wind energy in the production of German electricity.

## Monthly wind shares of electricity production in Germany in 2018



**Fig. 3. Wind power generation in Germany for 2018 [1]**

Wind power in 2010 achieved an indicator of 20.4%, most of which are wind farms in the North and Baltic Seas, and it was found that energy production takes place 363 days a year. [3] Although it is generally believed that although the energy of the sun and wind complement each other, they are not very reliable, because they depend on the weather and the season. On January 1, 2018, Germany started an interesting experiment, it covered 95% of energy needs from renewable energy sources, although it did not last long, just a few hours due to a small demand.

Thus, it is clear that the decision of Germany to switch to pure energy already bears its fruit. I hope that this country will not turn back from the chosen path and will serve as an example of the result for Ukraine.

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### **Efficiency analysis of using bifacial photovoltaic modules**

Double-sided photovoltaic modules are made of photovoltaic cells that absorb solar radiation, both from the front and from the back. They convert the energy of the sun into electricity from both sides. As a rule, the conversion efficiency of solar radiation on the front side of such a photocell is several percent higher than on the back side and reaches a value of 19%. The efficiency of the photocell from the back side is 14-15%. In certain cases, such panels allow you to get an increase in power generation from 10 to 50 percent compared to traditional one-way solar panels.

The amount of additional energy of the photovoltaic system that can be obtained using double-sided modules depends on the amount of additional solar radiation that falls on the back side of the PV-module.

Solar radiation arriving at the surface of the Earth is not completely absorbed by it. Part of the radiation is reflected by the surface, and only the top is involved in the reflection – the active layer of the earth's surface, in which radiation absorption and its transformation take place. This includes the vegetation of the forest, the first tens of meters of transparent and decimeters of muddy water, as well as decimeters of snow, several centimeters of sand and fractions of millimeters of dark soils. The reflectivity of the Earth's surface depends on the kind of objects, their physical properties, color and condition. The ratio of reflected radiation to the total radiation of the sun and the atmosphere is called albedo.

For the analysis of the efficiency of using bifacial photovoltaic modules, a solar power plant with a design capacity of 1 MW was taken as the object of study.

Firstly, the production of a solar power station with one-sided photovoltaic modules was calculated. The solar power station includes 3200 PVM LR6-60 HPH 310 M by Longi Solar. PV modules were connected to inverters Sunny Tripower 25000TL-30 by SMA. The number of inverters was 80.

After that, the operation of a solar power station with double-sided photovoltaic modules was simulated.

LR6-60 HBD 310 M Bifacial Modules by Longi Solar were selected.

Albedo values were taken from 0.1 to 0.8.

The paper also simulates a solar power station with single-axis trackers. To analyze the efficiency of using bilateral photovoltaic modules, the dependence of the production of various types of solar power plants as a function of albedo was obtained.

As a result of the research, various options and conditions for the use of double-sided photovoltaic modules were analyzed.

According to the preliminary findings, double-sided photo modules are advisable to install:

- on a highly reflective surface with an albedo of 0.4 or higher (snow, concrete, white sand, a special reflective coating);
- in small plants to reduce the mutual influence of photo modules.
- at a height of at least 1 m from the surface.

In case of installing double-sided photo modules on standard one-sided solutions, the advantage in energy generation does not exceed 5%.

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### **Biomass and bioenergy**

One of the main problems of the 21 century is waste and trash created by people and our industry. Every year one person produces more than 250 kilos of garbage and this amount increases every year [1]. In Ukraine more than seventy percent of garbage is organic waste, glass is five percent, paper six percent, metal and plastic can reach 15 percent. But instead of recycling, trash is thrown into landfills that grow every year. In addition, during the process of garbage decomposition, methane is released into the atmosphere, and toxins and heavy metals are released into soil and water.

I believe that bioenergy is the way to solve the problem of organic waste. The main part of all garbage is organic waste. Under natural conditions, organic substances decompose with the emission of gases into the atmosphere. Methane produced in the process of natural organic waste decomposition can be captured to prevent its release into the atmosphere [2]. Thus the greenhouse effect can be reduced and the captured methane can be used as biofuel. This can be used to produce methane, preventing methane from being released into the atmosphere. The problem can be solved by construction of special facilities in which the decomposition of biomass will take place, with the subsequent production of methane, where special bacteria process biomass into biofuels or other products more efficiently than in natural conditions [3].

Together with the positive aspects, bioenergy has some problems [4]. The first problem is that biofuels are much more expensive than fossil fuels. The second is that the biomass supply system requires transportation. At the moment, due to the small number of places where biomass can be recycled, this additionally increases the price of the final product. The final problem is that the use of biofuels can cause an increase in CO<sub>2</sub> emissions due to the lower heat capacity of biofuels, comparable to that of fossil. It is not clear yet if the amount of CO<sub>2</sub> consumed in the process of growing the raw material for biofuel is significant for decreasing the total amount of carbon dioxide.

Despite the problems that arise during the processing of biomass, if we want to reduce the amount of waste, it is necessary to begin the process of processing raw materials into fuel. One of the key problems is the high cost of equipment. With increasing demand on the market, the amount of equipment will grow, and the price will decline. Since the reserves of fossil fuels are finite, sooner or later people will have to switch to synthetic fuel and oil production.

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### **Research of state-of-the-art issues of drying fine materials**

The development of the mode and method of drying any object, as well as the design of a drying plant, implementing these modes and methods, begins with a comprehensive study of the properties of the drying object and the laws of changing them at all stages of processing raw materials into the target product.

The main technological indicators of the processes of minerals processing are the output and quality of products, the extraction of useful components, the efficiency of enrichment. Methods of drying materials are divided into mechanical and thermal. The mechanical methods include: suction, filtering, centrifugation, etc. Mechanical methods for changing the pressure are possible only if the drying materials allow for some kind of deformation. The disadvantage is the low final moisture content of the product. Thermal methods of moisture removal have become the most widespread. They are also divided into natural and artificial ones. The disadvantages of natural drying in comparison with artificial ones include: long duration, high dependence of intensity and ultimate humidity on external climatic conditions; for the placement of material, large areas and a complex logistics system are needed.

The choice of drying plants design depends on many factors, namely: on the material properties, the requirements for the dried material, the technological modes of drying, the type of drying agent and its parameters, the method of supplying heat, the coolant type, the installation compactness, the conditions of its service and others.

Let's isolate the way of drying dispersed materials with the help of an electric current, where the electric current is passed directly through a layer of a wet material.

The method allows the drying of moist materials, for example, non-ferrous metallurgical slags and their enrichment products, with a low energy consumption (0.8 to 1.0 kWh per kilogram of distant moisture) [2].

To sum up, the method can be used in various fields of technology, mainly in the mining and chemical and metallurgical industries, for drying such loose materials that are in the wet state as conductors of electric current, that is, they contain electrolyte moisture, or they themselves are conductors of electric current. The

advantage is the prospect of developing a drying method with no environmental contamination [1].

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### **Analysis of generators for wind farm**

Ukraine is one of the most energy intensive countries in the world [1]. One of the most affordable sources of renewable energy is wind power. After hydropower, it is wind energy that leads the way among alternative energy sources in terms of installed capacity and the amount of energy generated. The best wind resources in Ukraine are in the Carpathians, southern coast of Ukraine, Donbass region, and windy areas in Central Ukraine.

The main problem faced by wind power is generation of electricity of the required quality [2]. The fact is that the wind is characterized by a constant change in speed and direction, and this directly affects the parameters of the generated energy – amplitude and frequency. The quality of electrical energy is subject to rigorous the standardization. As a result, the wind turbine generators should be able to maintain strictly set parameters of the generated energy at any wind effect. This problem is solved by means of the system of stabilization of the output energy, created specially for each type of generator. Accordingly, the most important issue when creating a wind turbine is the choice of a generator type.

A serious argument is needed for choosing the type of generator, because the choice will require significant material investments in the organization of their production: scientific developments, creation of new technological processes and equipment, test benches, training of engineering and technical personnel and workers.

Traditionally, one can distinguish the following types of generators [3] used in wind turbines:

- 1) induction generators with short-circuited rotor;
- 2) synchronous generators with electromagnetic excitation;
- 3) asynchronized synchronous generators;
- 4) induction generators with phase rotor;
- 5) doubly-fed induction generator;

- 6) synchronous generators with magnetoelectric excitation;
- 7) permanent magnet generator;
- 8) special synchronous generator.

In the last decade, more and more known in the systems of wind generation, gaining a wind turbine on the basis of a double-fed machine, it is also called an asynchronous synchronized generator [4]. Structurally it is the same induction generator with phase rotor, but the way of its connection to the network is another. The windings of the stator are connected directly to the network, and the rotor windings are usually connected to the network through converter.

In a fixed speed wind turbine, the stator is directly connected to the network. However, in a turbine with variable speed control of the turbine is carried out through power electronic converters.

The reasons for using variable speed turbine are more energy gain, less mechanical load, active and reactive power control, noise reduction and less power variation.

The system with doubly-fed induction generator uses the principle of variable speed. Unlike other generators, such machines provide power to the network through a stator and rotor. The stator is directly connected to the network, and the rotor is connected to the network through power electronic converters. This system has recently become very popular as generators for variable-speed wind turbines. This is mainly due to the fact that the power electronic converter only has to handle a fraction (20–30%) of the total power [4]. Therefore, the losses in the power electronic converter can be reduced, compared to a system where the converter has to handle the total power and the cost of the converter can be reduced. Manufacturers, that produce wind turbines with the doubly-fed induction generator are DeWind, GE Wind Energy, Nordex, Vestas and others [5].

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## **Equivalent Circuits for Alternative Energy Sources**

Any alternative source of energy is a renewable resource; it replaces the traditional sources of energy operating on oil, produced natural gas and coal, which, when burned, release carbon dioxide into the atmosphere, contributing to the growth of the greenhouse effect and global warming. The reason for searching for alternative energy sources is the need to receive it from the energy of renewable or practically inexhaustible natural resources and phenomena. Ecology and economy can also be taken into account.

Two types of alternative energy sources are widely used in modern electric systems [1]; these are sources of voltage and current. To obtain the mathematical models of real (practical, actual) alternative energy sources the concepts of ideal source of electromotive force (EMF) and current are introduced.

An ideal source of EMF is a source of electric energy which delivers unchanged value of the potential difference at the output terminals, its internal resistance strictly equals to zero, so that the output voltage is independent of the current through it.

An ideal current source is such electric energy source that delivers output current with constant value, its internal resistance is strictly equal to infinity and therefore output voltage is directly dependent on the value of the load resistance.

For the real alternative electric energy source will find the mathematical model. The real (practical, actual) energy source can be represented by the active two-terminal network.

Three operating modes of active one-port network can be, it is modes open-circuit, short-circuit and operates at load.

The mode of the power source under the load is the mode when the load resistance is less than infinity, but greater than zero, the output current is limited by the sum of power source internal resistance and of load resistance, and the output voltage of the power source becomes less than the EMF of one-port network by value of the drop voltage across the internal resistance.

Thus, in the circuit, which is calculated, any actual alternative source of electromagnetic energy can be presented by an equivalent mathematical model having ideal source of EMF and internal resistance connected in series or having ideal current source and internal resistance connected in parallel.

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### **The method of utilization of heat of the air conditioning system that ensures the operation of hot water**

At the moment, all over the world one of the most pressing problems is the shortage of energy resources. This is due to the ever-increasing consumption of all types of energy, both in the industrial sector of the economy and in the no less demanded sector of services for modern consumers.

There is a need to find ways to overcome the shortage of energy supply. Such ways include diversification of sources of supply with energy resources. On the other hand, in addition to improving the efficiency of the extraction and use of such minerals as coal, oil and gas, within the country, various types of alternative energy are actively used. So, in Ukraine, solar power industry is being introduced everywhere within the framework of the state program "Green Tariff", solar collectors and wind power stations became common among the owners of individual houses. For building heating systems, heat pumps, mostly ground pumps, are increasingly used. Sources of low-grade heat for heat pumps can be wastewater cooling systems of various powerful units and systems, such as: power transformers of the main sub-stations, turbo-compressors of compressor stations of mines and other enterprises, condensers of thermal power plants. The heat of sewage from cities and towns, water from the main drainage systems and air from the main ventilation systems of mines, etc. can also be used.

One of the promising energy-saving technologies is the accumulation of thermal energy. The most simple and reliable heat storage devices are liquid heat accumulators. As a result, batteries of this type are particularly widely used for domestic purposes, in the schemes of various power plants. Thermal accumulators, on the basis of the requirements of mass use, should be fairly cheap, technologically advanced to manufacture, reliable and safe in operation, accessible from the point of view of the materials and substances used. An effective solution is the use of electric heat accumulators, which operate at the expense of a preferential nightly tariff for electricity. The experience of using electric heating systems in European countries indicates the prospects of this heating method. In cottage buildings, the use of such heating systems will provide savings of 200 million m<sup>3</sup> of gas per year.

Currently, almost all countries of the world, including Ukraine, have found widespread and widespread use of air conditioning systems. Annual sales of household and industrial air conditioners reach more than 100 million products per year. At the same time, one of the negative consequences of using air conditioning systems is a large amount of heat, amounting to millions of GJ, uselessly released into the environment.

In turn, in the energy sector of Ukraine, and not least in the utilities sector, there is an acute problem in the economy of energy resources[1]. Thus, for many years the problem of centralized hot water supply has been standing, which has been disconnected in most parts of the country long ago. In most cases, the population uses electric boilers for hot water supply, which is a very expensive exercise and has a clear tendency to constant increase in prices. The same can be said with respect to gas columns, and, accordingly, the cost of gas.

This paper presents the results of the analysis of an unconventional method proposed by the authors, which consists in the daily accumulation of thermal energy of the air-conditioning system during the warm period with its subsequent use in the hot water supply system.

A pressure liquid-based thermal accumulator based on water was chosen as a battery. In the process, hot water is taken from the top of the heat accumulator, and cold water is supplied to the bottom of the heat accumulator. Due to the density difference between hot and cold liquids, a small mixing of the liquid can be ensured (the “thermocline” effect). The efficiency of the use of displacing heat accumulators is reduced due to heat loss for mixing and thermal conductivity between the volumes of hot and cold water, heating of the body, etc.

The use of such a battery can significantly reduce the temperature of condensation of the refrigerant in the air conditioner (up to 45 ° C) and, accordingly, increase the coefficient of cooling by more than 2 times. Earlier, the authors investigated the possibility of using this scheme for the utilization of heat energy of the air-conditioning system in the warm period for the operation of the heat pump heating system during the heating period. The analysis showed a significant saving of equivalent fuel (up to 39%), however, the optimal volume of the heat accumulator was commensurate with the volume of the building, which imposed real restrictions on the size of the building on the application of this scheme.

In turn, the analysis of the scheme with heat utilization of the air conditioning system for the hot water supply system showed that in this case an acceptable amount of heat accumulator on water is required (from a ratio of 1 m<sup>3</sup> to 200 m<sup>2</sup> of living space). And this makes it possible to apply this scheme not only in individual houses, but also in apartments.

Thus, using the developed methodology, it was determined that the use of this hot water supply scheme during the warm period will ensure that hot water is supplied to consumers at the expense of the air conditioning system, which will spend 60% less standard fuel on its work and water heating than the gas column on the same amount of hot water. In addition, this method allows to justify a rational volume of a heat accumulator based on the changing temperature conditions of the outside air during the entire warm period.

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### **Prospects for development of gas-hydrate deposits of the Black Sea**

Under the conditions of an unstable situation on the gas market of Ukraine, namely the diversification of hydrocarbon sources, an important question arises of the prospects for the energy independence of the state by increasing its own gas production. In connection with the rise in prices of such traditional energy sources as oil, natural gas and coal, it is worth developing alternative energy sources, among which methane gas hydrates are more promising.

Many leading countries of the world, such as the USA, Canada, Japan, China, Russia, are engaged in the development of gas hydrate technologies. Such increased interest is primarily due to the unique properties of gas hydrates. So, 1 m<sup>3</sup> of gas hydrate contains up to 164 m<sup>3</sup> of methane gas. Under natural conditions, clathrate structures are found in continental (23%) and deepwater (77%) deposits. For Ukraine, the Black Sea gas hydrate basin is profitable, which can be divided into three parts: the coastal zone, the continental slope, and the deep-water basin. A promising zone is the continental slope. Development, according to the authors, should begin with the "C" section, since the deposit thickness here is large and fluctuates slightly. The basic equilibrium parameters  $T = 9\text{--}10\text{ }^{\circ}\text{C}$  and  $P = 7\text{--}8\text{ MPa}$  are also determined for this site, which makes it possible to apply a combined method of exposure (pressure decrease and temperature increase), which was proposed by the authors of patent No. 123576 (Ukraine). While using this technology, the maximum productive effect of the activating agent is achieved, which was confirmed by model studies using the finite element method. However, for a more detailed study of the Black Sea gas hydrate deposit, additional studies are needed both in laboratory (the process of gas hydrate dissociation under the influence of sea water) and in natural conditions (core sampling to build a more detailed deposit structure).

Based on the above, the following can be stated:

1) Zone of continental slope of the Black Sea is more promising for the development of gas hydrate deposits, based on geological and thermobaric conditions of occurrence.

2) The production technology proposed in patent No. 123576 (Ukraine) is acceptable for these conditions of gas hydrate deposit, since it was tested under model conditions and showed promising results, but full-scale studies are needed for more accurate results.

3) The development of the Black Sea field requires a comprehensive study, as well as involvement of public and private structures in the industrial testing of modern mining technologies.

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### Proof of safety and energy-efficient of nuclear power stations

The aim of the paper is to prove the safety and necessity of the use of nuclear power plants due to the exhaustion of reserves of organic fuel. The development of the structure is shown starting with the energy-efficient installation "F-1" to modern fast-neutron reactors. The design of a modern nuclear reactor is shown on the example of BN-1000 fast neutron reactor.

The first type of nuclear reactor which could produce energy was built by Academician Kurchatov in 1952. Reactor had a graphite brick-structure with uranium fuel tablets, and controlling pillars. But in spite of non-hermetic structure and low efficiency it didn't produce any pollution and was absolute safe.

Moving on to the upgrading of this type of structure NR, let's look at the problem of nuclear useful fuel. EU countries spend billions on creating nuclear burials ground, which seems ridiculous. So, next step in nuclear reactors structure is solving this problem by reproducing old useful power.

Fast-neutrons reactors reproduce fuel in working time. They have surrounding wall of absorbing, old useful fuel. Naturally, next step in nuclear defense includes solid-wall structure of reinforced-concrete and lead.

In fact, this type of reactor is absolutely environmentally friendly, non-including mankind-factor. It has no pollutions and producing more fuel then it uses at working.

Table 1 – structure of nuclear reactors

	structure before	structure now
main material	graphite bricks	reinforced concrete lead walls vacuum layers
placement	handmade graphite-bricks reactor	onion structure center – new nuclear fuel around – old nuclear fuel and biologic defence
biologic defence	haven't	vacuum cameras, reinforced concrete and leads wall around reactor

Thus, this type of nuclear reactor structure, making more fuel then it uses, is safe and has high efficiency, which is the next step in human science and energy production.



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### **Justification of gas hydrates as an alternative source of natural gas**

Now the world is at the stage of forming alternative energy potential. One of the promising sources of energy is gas hydrate. The extraction of gas hydrates is rather complicated and time-consuming process, which requires a lot of standard and special equipment as well as other production resources.

Gas production with the help of gas hydrates is not only an integral part of mining, but also an alternative source of gas production in the world. Gas hydrates can be mined both in mines and quarries, and gas is produced in specialized laboratories.

Justification of the parameters of gas hydrate formation includes the presence of two main components: fresh water and gas [1]. Extraction of gas hydrates from methane is a complex process, which involves the synthesis of gas hydrates and the products contained in them to obtain high quality energy carrier.

As gas hydrate is a perspective source of energy, the main factors determining the formation conditions and stable existence of gas hydrates should be studied. Special attention should be paid to the research of the following parameters: the composition of gases, their moisture content and phase state, composition of water, temperature and pressure. It is also necessary to consider the development of gas hydrates at low temperatures and production of gas hydrates in special laboratories using special equipment [2].

Gas hydrates are a complete analogue of natural gas. Recent researches have shown that in the nearest future hydrates can significantly strengthen their positions in the energy market. Thus, there is already a need to develop gas hydrates as an alternative to the natural gas.

Productive work is underway around the world to research and study gas hydrates. Scientists and researchers develop and implement new technologies for the extraction and introduction of gas hydrates into the industry.

The main countries to develop gas hydrates are South Korea, China, and the United States. Recently, advanced technologies for the extraction of gas hydrates have also been introduced by Germany, France and Austria [3].

Gas hydrates are developing rapidly and have a good development perspective in Ukraine. This is confirmed by the fact that there are significant reserves of hydrated deposits on the territory of the country.

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### **Simulation modeling of heterogeneous mixture separation in a centrifugal field**

As it is known, in the preparation of compressed air and distribution between pneumatic receivers of production, there is a problem of its constant contamination. When transporting compressed air in an air-line and supplying air into air collectors, it is cooled, that causes oil and moisture condensation. As for primary air, characterized by contamination with mechanical impurities, there is a need for additional training.

The process of cooling and cleaning compressed air in devices such as "Venturi tube - centrifugal drip trap" is directly based on the contact of particles of dust and droplets of spray water, with its subsequent separation.

In the study and design of separation processes in the gas-liquid mixture, the common means of computing are widely used. Typically, mathematical modeling is transformed into a complex task that requires a considerable amount of time and effort, especially if it is necessary to investigate the separation processes in a real industrial facility, which usually has a complex design and significant dimensions.

The use of Venturi tubes in wet gas cleaning has been widespread. This is due to a number of advantages: dust cleaning is both fast and efficient, with a fairly simple design of the machine. The process of dusting is directly based on the contact of dust particles and droplets of spray water, with its further separation. [1].

As an object of modeling, a 20-fold reduced model of the separator was selected [2]. The principle of operation is based on the tangential feed of a heterogeneous mixture into a cylindrical body. This geometry of equipment provokes the appearance of centrifugal force of the stream, which leads to the initial separation of moisture.

According to the results of modeling and research by its means of automated design, a sample model that can be used at a laboratory stand to test the adequacy of mathematical modeling data is developed. On conclusion, let us stress upon on that the research is devoted to substantiation of expediency of use of simulation modeling

as a basis for research of separation objects, which allows to significantly reducing time and resources for the manufacture of research objects.

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### **Evaluation of modern methods for determining the hardness of materials**

In the twentieth century, a large number of ferrous and non-ferrous metals and alloys, rubber and plastic materials, and composites were developed and introduced into manufacturing. The creation of modern high-quality car parts requires the development and application of new materials and technologies. In recent decades, nanomaterials characterized by a nanoscale level of structural components and higher mechanical properties have received intensive development. Production of car parts from nanomaterials allows reducing weight, linear dimensions and volume, energy consumption, vibration and noise, and increasing the reliability of products. However, the introduction of nanomaterials in production is impossible without new reliable methods of quality control. The work on evaluation of methods for nanohardness measuring and analysis of the possibility and feasibility of their application as a quality control for modern automotive parts has been done in accordance with the curriculum for the preparation of bachelors in the specialty 274 Automobile transport.

Hardness is a property of the surface layer of a material to resist elastic and plastic deformation or destruction under local contact effects from another one, more solid and not receiving permanent deformation of the body (indenter). Modern quality control in the production and repair of automotive parts includes various methods for measuring the hardness of materials. Among the methods for measuring macrohardness (when the load on the indenter is up to 30 kN), the most widely used methods are the determination of Brinell and Rockwell hardness. Microhardness regulates the load on the indenter up to 2 N and the depth of insertion of the indenter from 0.2  $\mu\text{m}$ . Measurement of nanohardness regulates the depth of the indenter (less

than 0.2  $\mu\text{m}$ ) and makes special demands on the surface roughness, tip shape, features of elastic and plastic deformation of materials. The most common method for nanohardness measuring is dynamic indentation, analyzing the dependence of the load on the depth of the indenter. The requirements for the measurement of nanohardness are governed by the ISO 14577 standard. The advantage of the method is the determination of the nanohardness of the material before the elastic recovery of the material begins. The disadvantages of the method include the lack of consideration of plastic bulk, which do not allow to correctly calculate the contact area and the value of nanohardness. Another way to control nanohardness is sclerometry - the application and analysis of scratches. The advantage of the method is the smaller influence of the surface roughness. The disadvantage of the method is the lack of standards and methods for performing measurements.

To sum up, there exist numerous ways of evaluating the nanohardness of materials, each with its advantages and disadvantages.

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### **Simulation of linear voltages within power grids of industrial enterprises**

Noisy energy within workshop power grids of industrial enterprises results in the accelerated physical ageing of the applied electric facilities and the increased emergency risk in the context of enterprise. Thus, early estimation of power quality as well as provision of adequate operation modes for the electric facilities under specific conditions is important research and practice problem.

The problem solution involves the number of experiments to be carried under various electricity quality indices, operation models of electric facilities as well as protection of the latter from noisy power supply. However, such experiments at real enterprise result in significant time consumption and financial loss, and in the rise of emergency situations. Development of simulation model of power grid, and its implementation with the help of a computer help accelerate the experiments and simplify them. The technique differs from standard experiments in the following: computer-simulated model rather than object itself is subjected to the effect.

Complexity of the direct simulation of linear voltages within a power grid where electricity is noisy is as follows: all harmonic components have the fixed frequencies of their oscillations on which random variations of amplitudes and initial phases are overlaid. Thus, it is more expedient to simulate amplitudes and initial phases of harmonics, being available in them in the context of their statistical regularities rather than random voltage sequences. For computer-based simulations of regularities of variations in linear voltages obtained during operation of asynchronous

motor with 7.5 kW capacity under the conditions of rolling plant #1 of *Dnepropetsstal* (Zaporizhzhia), random sequence generator has been designed. The generator consists of following units: simulation of uncorrelated random sequence equidistributed within 0; 1 interval; transformers of distribution laws of amplitudes and initial phases of significant harmonics of linear voltages  $U_{AB}$  and  $U_{BC}$ ; and filters forming correlated amplitudes and initial phases of the significant harmonics of linear voltages  $U_{AB}$  and  $U_{BC}$ .

The generator of the uniformly distributed sequences has been implemented within software environment of PPP MATLAB. In this context, to simulate the uncorrelated sequences and to transform distribution laws, inbuilt standard functions have been applied; to implement the forming filters, nonrecursive filtration of input sequence have been used:

$$y_n = \sum_{k=0}^N S_k x_{n-k}$$

where  $y_n$  is  $n^{\text{th}}$  value of output correlated sequence;  $x_{n-k}$  is input uncorrelated sequence;  $S_k$  are coefficients; and  $k$  is a parameter determining drop period of autocorrelation functions and intercorrelation functions.

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### **Gas hydrates: Overview**

There is a set of perspective types of hydrocarbon raw materials in the world. Methane hydrates have the most abundant reserves on the planet, accounting for at least 250 trillion cubic meters by approximate estimates. Gas hydrates are considered to be a perspective power source which can be demanded in the countries which are limited in other energy resources, for example, Japan, South Korea and others.

Difficulties in the extraction of methane from gas hydrates are caused by their crystalline structure. There are production methods which rely on dissociation at which gas hydrates break up into gas and water. Three main methods of developing the deposits of gas hydrates include: depressurization, heating and inhibitor input [1].

Today the most perspective technology used for the development of gaseous-hydrate fields is depressurization. The purpose of this method is artificial pressure decline in a layer around the well which is achieved due to the pressure decline in the borehole.

The next method is rising the temperature by means of the heat carrier injection. Most commonly used heat carrier is water. This technology uses heated

water pumped through special pipes in the closed cycle. Open injection of water is effective only in gas hydrate layers which have thickness over 15 m. Losses of heat at open injection of the heat carrier are excessively big.

One more technique of methane extraction is inhibitor injection as a way of violation of phase balance of gas hydrate and decrease in its temperature. Organic substances can act as inhibitors. The volume of the breaking up gas hydrate depends on the concentration of the inhibitor and injection rate.

Ukraine has promising outlook of the development of gas hydrate deposits due to the considerable resources of hydrate natural gas which has a high potential for internal consumption. Ukraine should follow the example of world leaders in hydrate gas extraction and start its own projects in this sphere [2, 3].

Development of sea deposits of gas hydrates in the waters of the Black Sea and the Sea of Azov will mark the beginning of a new era for Ukraine, which will result in abundance of energy, development of economy and positive changes in the life of each person.

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**Section 04 Smart Solution in IT**

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**Modern trends of cyber security development in Ukraine**

From the moment of the first information had been emerged, there was a need in its protection. At the very beginning primitive people transmitted important information with sounds and gestures, and if strangers tried to learn them or classified the information, they began to fight. Nowadays there is no need to use a rough physical strength, but the need in protection of important data and information is still strong. This paper is a try to analyse modern strategies and to share the ways of providing cyber security measures in Ukraine.

Nowadays cyber security is one of the most important and disputable topic analysed and discussed by IT-specialists all over the world, who are facing the question whether it is possible to implement modern cyber defense programs at the individual, national and international levels. Ukrainian experts are always involved in the process of finding solutions to this global problem.

The aim of modern strategies of cyber security is to provide reliable and secure system, which ensures people that their data is protected. According to Koval, ‘the purpose of the new Cyber Security Strategy of Ukraine is to create conditions for the safe operation in cyberspace, its safe and secure use for the benefit of individuals, society and the state, on whole.’ The main tendencies of cyber security development in Ukraine include the next measures:

- introducing special cyber security law;
- using strong authorization system(s);
- providing multilevel protection of the data by the state divisions;
- defending all servers and apps;
- repulsing cyberattacks;
- making mobile communication applications secure.

It is natural that it takes time to implement all these measures especially in the rapidly developing IT-area. However, small but confident steps forward towards the goal of creating secure informational environment at least at the country level will lead to the global success.

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### **Supercomputers: past, present, future**

It is believed that supercomputers are computers with maximum performance. However, the rapid development of the computer industry makes this concept relative: the machine that could be called a supercomputer ten years ago is no longer defined like this. The performance of the first supercomputers of the early 1970s can be comparable to the performance of modern PCs based on traditional Pentium processors. By today's standards, they do not refer to supercomputers [1].

Supercomputers have repeatedly tried to get universal definitions - sometimes serious, sometimes ironic. For example, somehow it was proposed to consider that a car over one ton is a supercomputer. A few years ago, another definition was proposed: a supercomputer is a device that reduces the problem of computation to an I / O problem. But the latest characteristic of a supercomputer is based on its capability to perform complex operations in minutes and seconds having an extremely high processing speed, due to a large number of microprocessors [2]. Therefore, the tasks that were previously computed for a very long time are currently performed on a supercomputer, but almost all the time now goes into slower data entry and output procedures, usually done at the same speed.

What exactly can be considered an example of an early “computer” is still the subject of much discussion: some experts say that abacus was the first “computing device”, another group of scientists point to Antikythera’s mechanism, while others believe that Charles Babbage’s machine is the first prototype of a computer. However, many scientists believe that only the development of the German engineer Konrad Zuse can be called a “first supercomputer”. Created in the 1940s, Zuse’s machine became the first programmable and multifunctional computers. The engineer collected the money from his friends for the first experimental model called Z1 [2]. Later Mark-I (1941), ENIAC (1943), EDVAC (60s), etc appeared. But whatever the origin of the computer is, over time its qualities have really become super.

Nowadays, IBM has created and released the most powerful supercomputer called Summit, which is twice as powerful as its competitors. The performance of this machine reaches 143.5 petaflops, increasing it from 122 petaflops, which were at the time of its presentation in June 2018. The Chinese supercomputer Sunway Taihu Light, which was previously considered the most powerful in the world, has a computing power of 93 petaflops. Ukrainian scientists are not lagging behind: the Yuzhnoye design bureau in Dnipro has commissioned a new computing center Yuzhnoye SC with the most powerful supercomputer in Ukraine. The peak performance of this supercomputer is 300 teraflops (300 trillion operations per second), which is comparable to the performance of thousands of simultaneously working personal computers [3].



It is well-known that supercomputers can quickly execute various complex and time-consuming tasks, which a usual computer requires weeks to calculate. But they also require special maintenance conditions like large rooms and extremely cool temperature surrounding [2]. Supercomputers are used in situations, where a large amount of information must be processed in a small period of time, with rendering and modeling operations performed simultaneously. So, the common fields of their application are the following:

- quantum physics and mechanics where supercomputers are used to solve complex equations;
- nuclear technology and research where they are able to simulate nuclear explosions and reactions;
- hydrodynamics and Earth studies where supercomputers create complex animated models of molecular structures of various chemical and biological compounds and crystals.

The next step is Exascale computing [4]. ExaFLOPS heavy-duty supercomputers are the next epoch-making milestone in computer engineering. Exaflop systems will have a thousand times higher productivity than petaflops class systems. Scientists predict that exaflop computers will be capable of performing 1 quintillion floating-point operations per second and consume no more than several tens of megawatts. Works aimed at creating exaflop systems are already being conducted in several countries. The computing power of the future ultra-fast German computer can be equal to the total power of ALL supercomputers from the top twenty of the current Top500 rating. And this is more than 500 petaflops [5].

So, the rapid development of the super-computers was a response to the need of the mankind in machines that are able to simulate processes in real time and perform a number of complex tasks. Supercomputers have always been the embodiment of the latest scientific and technological achievements and set the pace and development trends of other types of machines. In the modern world, supercomputer technologies have become a strategic area and an indicator of the technical level of the any state. And without it, the further development of the economy is not feasible.

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## **Cloud gaming. Google Stadia — new cloud gaming platform**

Google Stadia, the most recent platform for cloud gaming, was announced on March 19th this year.

Stadia, as a gaming platform, has the following procedure. Cloud-based servers run the game and stream gameplay video to a player via the Internet. Keyboard, mouse, controller or other input actions are sent over a network to cloud gaming server. That's why the user doesn't need a powerful device to play demanding games. The main bottleneck of this technology is the connection between player and server. Even if the internet connection is fast and stable, the highest ping is around 100 ms according to tests), so cloud gaming isn't suitable for eSports

To use Google Stadia, one need only Google Chrome browser and device, that can play 1080p video and good internet connection. This platform supports 4K 60FPS HDR gaming and will be able to run games in 8K in the future. Google Assistant (virtual assistant by Google) will help the player to pass difficult situations in games by demand. The user will be able to start a game while watching YouTube video with the solution of the problem he faced. Also using Chrome as the client program makes Stadia cross-platform (even ChromeCast can be used for it). Google provides special gamepad, that connects to their servers directly (it reduces input lag). As the games are running on Google servers there will be no way for people to modify games, that means no cheating, no hacking and no piracy.

Google Stadia user will get more power from its server, than from new popular gaming consoles by Microsoft and Sony. Google will use the data centre servers, that are already used for Google Search with special modified AMD GPU. Games will be running on Linux with Vulkan API. Google cooperates with Unreal Engine, Unity, Havok and other developers to provide good optimization for games on their servers. So developers will be able to create games for Stadia using these engines without compatibility problems.

Stadia is being launched in 2019, but Ukraine, Poland and some other countries aren't supported yet. It's possible that we will get this service in Ukraine soon because we have the necessary infrastructure for it (the fast and cheap Internet connection being the most important one).

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### **How to choose a programming language**

From the old times, different nations have their own languages. Their variety caused by different reasons, such as climate, nature, historical background, which played a huge role in their formation. As a result, there are about 6500 spoken languages in the world now. Like ordinary people, software developers also deal with a variety of programming languages which are used for different purposes. For example, you cannot be a full stack web developer or a creator of Artificial Intelligence (AI) using just one programming language. And though it seems easy to pick one language among a couple of dozen, it is not completely true.

First of all, the biggest challenge for a future programmer is to choose a specific area of studying, because it is possible to be a front-end or back-end coder, a developer of mobile applications and games or a software engineer. According to the choice he makes, a programmer should learn the necessary languages.

As for web-design, it is a really popular sector of IT where a developer should deal with images, animation and other front-end elements. It is recommended to master 3 must-have languages for this sphere which are HTML, CSS and JavaScript. It is the starter pack of any front-end developer: HTML is used to mark up a web page with the help of tags and attributes; CSS will help with text styles, images, etc; JavaScript (also known as JS) allows you to make the website “alive” because all animations are created with this language. On the other hand, a professional website needs “brains” to operate, that is a back-end developer. It is a work for those who prefer databases to images and texts. There are three popular programming languages for this area: php, Python and Java. Nowadays, Python is the most perspective because it is easy-to-learn, powerful enough and AI, which is really demanded now, can be developed in this language.

The next point is creating of computer games. According to the programmers’ polling, C++ is the best choice for this field of programming as it is a powerful language used for both computer platforms and gaming consoles. Many famous

programs and games were written on C++. Also, you can try C#, Java or Python as an alternative.

One more area is mobile developing, and though Java, php and JS are still being used for creating of mobile applications, Python undoubtedly beats the opponents. Moreover, many IT professionals admit that Python can be used for coding in almost any sphere because it is a versatile programming language, which is beginner-friendly and cross-platforming with numerous useful libraries for different projects.

Therefore, the choice of programming language mainly depends on the preferences and goals of the developer, but if a person does not know what exactly he wants to develop, Python is a good and universal choice for a start.

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### **Data Mining as a universal solution**

In today's world it is not surprising that most things in daily life, and not only, are going to be replaced with IT unless it is not already replaced. It is clear: we do not need to reinvent the wheel when it has existed for hundreds of years. If we can use scripts, algorithms and codes for solving our problems, it would be silly not to use it. Such countries as Japan, the USA, China and other well-developed countries have already been trying to make people's lives easier with IT. In this article, we are going to provide you with information where such process as data mining is used.



Firstly, according to Data Mining Curriculum, “Data mining is the process of discovering patterns in large data sets involving methods at the intersection of machine learning, statistics, and database systems.” It is primarily used today by large corporations and companies with a strong target audience aiming. They are retail, financial, communication and marketing organizations willing to “drill down” into

their transaction data and determine pricing, customer preferences and product positioning, impact on sales, customer satisfaction and the main thing, profit. With data mining, a retailer can use point-of-sale records of customer purchases to develop products and promotions to appeal to specific customer segments.

In addition, data mining has a great potential in improving health systems. It has already been using data and analytics to identify best practices that improve care and reduce costs. Scientists and researchers use data mining approaches such as many-dimensional databases, machine learning algorithms, soft computing, data visualization and statistics. Data mining, for example, can be used to predict the number of patients in every category. Process is developed in such way that it is obligatory for every patient to have an appropriate care at the right place and at the right time.[2] As well data mining can be used to help healthcare insures to detect fraud and abuse.

Market basket analysis, which is not surprising, also uses data mining. It is not a secret that sites tracing our behavior while we are surfing the internet in order to find something to buy, for example. Market basket analysis is a modelling technique based upon a theory that if you buy a certain group of items you are more likely to buy another group of items. This technique may allow the retailer to understand the purchase behavior of a buyer. [2] This information may help the retailer to know the buyer's needs and change the store's layout accordingly. Differential analysis can help to compare of results between different stores, between customers in different demographic groups.

It is not a big deal to catch a criminal, in sense to apprehend him, but it is a far more difficult to bring out the truth from him. Law enforcement can use mining techniques to investigate crimes, monitor communication of suspected terrorists. This filed includes text mining also. [1] This process seeks to find meaningful patterns in data which is usually unstructured text. The data sample collected from previous investigations are compared and a model for lie detection is created. With this model processes can be created according to the necessity.

Speaking of criminals, it is possible to use data mining in criminal investigation as well. Criminology is a process that aims to identify crime characteristics. Actually, crime analysis includes exploring and detecting crimes and their relationships with criminals. [1] The high volume of crime datasets and also the complexity of relationships between these kinds of data have made criminology an appropriate field for applying data mining techniques. Text based crime reports can be converted into word processing files. This information can be used to perform crime matching process.

To sum up, it is important nowadays to keep up with the time, and to use modern technologies in different aspects of a life as it is happening in well-developed counties. Also, it is great that mostly everyone can use internet-connection and their laptop to learn more about such methods and techniques as data mining, machine learning and others.

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### **Robotic surgery nowadays - usability, advantages, disadvantages**

Robots in surgery gain popularity nowadays. Doctors with her help does different types of hard actions on operation. This tech allows human perform with unbelievable precision and variety. Great thing about this is that robots give us opportunity to act with minimal damage because of tiny cutting. It's usually used in hard operation, for example heart, brain or spine surgery.

The first documented uses of robots in medical surgery was in the 1985, when robotic surgical arm was used in a delicate neurosurgical biopsy. In 1990 the AESOP system produced by Computer Motion has become like the first system approved to surgical procedures.

da Vinci surgery system was approved by the Food and Drug Administration in 2000. Sooner, it was attracted to hospitals around the world for treatment of wide spectre of conditions. The most popular surgical system is a mechanic arm with different instruments. Doctors control it while seated at the control computer console. Unfortunately, but nowadays Ukrainian hospitals does not have these technology, but in near future I think there is a chance to reform medicine. Because in our time people traveling to other countries for cure their diseases and it's really awful. Many of them just can't afford visit other countries because of money and visa question.

Advantages: Most of all, it's safer for people. With robots you can't cause some serious damage. It's allow to act with a minimum staff, and does much less pain and blood waste to a operable. It's protect from infection, and differents types of complications (such as suppuration or relapses). And after operation a patient has quicker recovery. Also great thing is that doctors can act from distance and evaluate situation with high precision.

Popular problem of modern operations is fatigue. It's really hard to work 14-18 hours without a break and robots particularly solve this problem. With robots you don't need to hold scalpel in tense.

However, this technology still has disadvantages. Currently the major problem is money. It's not cheap to set all the medical equipment for each of hospital in each



town. Even if the government allocate money usually it's not enough to upgrade each clinique in town with modern technology. Significant problem too is delay. It means that robots does their actions with some time after instructions of surgeon. With the current level of development doctor must be near the patient.

Great thing is that we live in period of time, where technology is evolving with each year in geometrically progression. I hope in near future all countries in the world will have advanced and modern devices to help people.

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### **Automatic hate speech detection**

Everybody has ever seen hateful posts or comments in the Internet. It is important to distinguish discrimination and intolerance from merely offensive texts. Discriminative texts are called hate speech which is a problem in the Internet and must be detected and filtered. Many automatic detection systems exist but unfortunately all of them are not ideal. A really good system is the one based on character n-grams and has enough training data. The features and the training datasets of detection systems can be listed hereinafter.

Firstly, the performance of character-based and word-based models is comparable. In research done by Tommi Grondahl and others different models were trained on different datasets. After training they were tested on the same datasets. Experiment showed that the performance of all models is roughly equal. Therefore, both model types are suitable for classification.

Secondly, in some cases the performance of character n-grams is slightly better than another one. It was demonstrated by the research carried out by Shervin Malmasi and Marcos Zampieri. They tested the performance of different features and found out that character 4-grams have the best accuracy. Testing n-grams with different number of characters is of great importance and the quantity of characters in n-grams has to be selected.

Thirdly, it should be mentioned that character n-grams are more attack resistant than other features which was proved by the series of experiments. Such attacks as inserting typos in words, replacing letters with numbers, inserting or removing

whitespaces and adding common words to the text have been performed. The result shows that under most of aforementioned attacks character n-grams have the highest performance. Also researchers combined two attacks: removing whitespaces and appending a common “kind” word. In this case the accuracy of character n-grams was significantly decreased while word-based models were completely broken. According to this, it can be concluded that character n-grams are the most preferable features for hate speech detection.

Moreover, insufficient amount of hate speech instances in datasets prevents detection systems from accurate text classification. Most datasets classifiers are trained on contain few texts labeled as hate speech and large number of texts with other labels. Instance quantities in available datasets are shown in Table 1.

Table 1 Number of texts for each class

Dataset	Number of instances		
	Hate speech	Offensive speech	Neutral speech
1	13590		102274
2	1430	19190	4163
3	5013	10796	
4	414	2021	
5	1250	19000	4150
6	2399	4836	7274

Also, experiments have demonstrated a large amount of misclassifications between hate and offensive speeches. Therefore, training datasets must contain a large quantity of instances for each class.

In addition, accurate recognition of other sorts cannot be reached because of the fact that available datasets contain one or two sorts of hate speech. This was proved by experimental work where some models were trained on one dataset and tested on another one. In this case the performance of classifiers became significantly worse and training datasets should contain different types of hate speech.

It is concluded that hate speech detection systems should use character n-grams as a feature and the number of characters in n-gram needs to be selected. Also, the quantity of texts in training datasets should be great enough and equal for each class. Moreover, different types of hate speech need to be included in those datasets. These recommendations are supposed to increase efficacy of hate speech detection systems to disallow hate writers to offend people.

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### **Cybersecurity essentials for small and medium-sized business owners**

The threat of cybercrime to small and medium-sized businesses (SMBs) continues to rise creating the risk for these organizations. But many SMB owners still take false comfort in the idea that they do not really have anything to offer a hacker and there are some much bigger corporations with more valuable assets. However, the National Cyber Security Alliance has noticed that over 70% of attacks target SMBs [1]. And one of the reasons is that valuable customer data and open-ended bank information are protected by fewer security mechanisms in SMBs.

This paper focuses on major areas that SMB owners should address to provide security for their information, system and networks.

The main focus area for hackers is human behavior. To get the information they need, social engineers communicate with employees online, on the phone or in the office. When it comes to online scams, they send phishing emails to get sensitive information. According to Symantec published data, since 2015 the number of spear-phishing attacks against SMBs has been greater than against the other size companies. And in January 2019 the phishing rate increased to 1 in 1281 emails, which is two times higher than in the previous month [2].

Therefore, the main way to protect the company against this type of vulnerability is security awareness training where information security specialists can teach the staff to follow the basic rules of conduct online, in the office and on the phone such as:

- delete any request for financial information or passwords;
- reject requests for help or offer of help;
- not to hurry, as hackers want the employee to act first and think later.

Another important area is information resources physical security aimed at unauthorized access prevention and ensuring the security of critical service information processing. Among popular penetration control tools and measures are using photo ID and building a security culture. For example, photos on the employees' ID cards can provide an additional layer of visual identification, so employees can check nobody is in the building that should not be there.

Emails are also an easy target for cyberattacks just because every company has at least one employee who does not know what he is clicking on. The first protection step requires using the newest anti-malware programs which do not rely on signatures of the known malicious content and contain threat intelligence, reputation services and other near-real-time sources to pinpoint the location of threats. The next step is to block exfiltration with data loss prevention tools. Hackers use emails as a preferred mechanism for exfiltration – the unauthorized transfer of sensitive information outside the business or organization. Data loss prevention technologies can detect and stop this threat [3]. What is more, employees should also regularly check their email addresses on the special sites like LeakedSource or Have I Been Pwned where they can find out if their email was compromised. And if it is, it is necessary to change all the passwords.

When it comes to protecting passwords in workplace settings, enforcing the use of strong passwords should be central to a cybersecurity program, because access to so many services, vendors, applications, devices, databases and industrial systems is now controlled and secured through passwords [4].

Any account stores important personal information about the owner that can be stolen. So, if an employee uses a weak password, a hacker will be able to break it and track sensitive information or get access to other accounts. The six-digit password based on the hometown or birth date can be hacked in seconds. So, strong security measures are required which aim for an 8-to-16 character password with a mix of upper and lowercase letters, numbers and symbols. Such passwords are usually hard to remember, so specialists recommend one good trick: think of a phrase you will not forget, choose the first letter of each word and make sure to use some symbols and numbers.

However, even with difficult passwords, good hackers still have ways to penetrate account security. So, setting up two-factor authentication (2FA) is one more way to protect the company. 2FA gives an extra roadblock to account access if someone gets employee's password. 2FA introduces a second method of proving that you are who you say you are. The first is employee's password (something he knows). The second can be something he has, such as a piece of hardware, or something he is, such as his fingerprint or voice. It can also be a code (usually 4-to-6 digits) that the site sends with SMS. Almost all the sites that can be used in business should have 2FA (or two-step verification). In addition, it is so easy for every employee to implement 2FA and make sure the account is a bit harder to hack [5].

No doubt that cybersecurity measures require essential financial resources. And some SMBs, even being really concerned about cybersecurity, can face a limited budget compared to large enterprises. But the result is that SMB becomes an easy target to attack with the risk of losing valuable data, reputation and money. Therefore, whether you are a SMB owner or an employee, you should always remember about cybersecurity essentials to protect yourself and your company.

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### **DDoS attack as a criminal toolkit**

For more than twenty-five years, denial of service (DoS) attacks have been used by criminals or malicious users around the world, and every year they become more powerful. A similar type of attack, called distributed denial of service (DDoS), occurs when an attacker tries to make service delivery impossible. This is a tool the attacker uses to prevent access to almost everything: to servers, networks, devices, services, applications, and even to certain operations within applications. But while during a DoS attack only one system is sending the malicious requests or data, a DDoS attack is carried out from several systems.

Typically, the main feature of these attacks is the flooding of the system with data requests. For example, so many requests to serve a page could be sent to a web server that it crashes under the demand. On the other hand, it can be an attack on a database with a huge number of queries. But the final result is always the same - an available CPU, RAM capacity or internet bandwidth become overloaded.

The effect of such attacks can range from minor disruption-related problems to disconnecting entire websites, applications, or even enterprises from the network [1].

For the past 7 years, DDoS attacks have increased both in frequency and traffic scale. For example, in 2012, six US banks such as "Bank of America", "JP Morgan Chase", "U.S. Bancorp", "Citigroup" and "PNC Bank" suffered from a series of

DDoS-attacks. Hundreds of hijacked servers launched an attack, each of which created peak traffic levels of more than 60 gigabits per second. In 2014, Cloud Flare security provider and content delivery network was overloaded with the traffic of approximately 400 gigabits per second. In addition, in 2018, PopVote's DDoS attack was aimed at a mass movement in Hong Kong, known as Occupy Central. The attack pushed servers with the packets disguised as legitimate traffic, and was carried out with five botnets. This led to the peak traffic flood of 500 gigabits per second. And at the same year, the popular software development platform GitHub was attacked with a flow of traffic that reached 1.35 terabits per second. It was the highest amount of traffic ever [2].

As DDoS attacks are getting more powerful, it is necessary to understand the reasons underlying them. The research shows that the most popular motives of DDoS attacks include:

- notoriety among hackers;
- unfair competition between different business industries;
- a player advantage – an attack against gaming sites or attacks against individual players to block their gaming experience;
- cyber warfare and cyber terrorism.

Therefore, cyber security specialists are constantly developing advanced measures of protection against DDoS attacks where the most reasonable prevention steps are the following:

*1. Increasing the bandwidth*

One of the most basic and easiest ways to prevent DDoS attacks is to make your infrastructure “DDoS resistant”. It means to provide enough bandwidth to deal with a surge in traffic that can be caused by malicious actions of the attacker.

*2. Setting up network hardware against DDoS attacks*

To prevent a DDoS attack, you can make a series of configuration changes in your hardware. For example, setting up your firewall or router to drop incoming ICMP packets or block DNS responses from outside of your network (by blocking UDP port 53) can help prevent certain DNS and ping-based volumetric attacks.

*3. Deploying hardware and software modules*

Servers must be protected by network firewalls or even more specific web application firewalls. In addition, load balancers should be used to distribute traffic.

*4. Using DDoS protection device*

There are many IT manufactures, such as NetScout Arbor, Cisco, Radware, that offer devices which, being placed in front of network firewalls, block DDoS attacks before they can take any effect.

*5. Protecting DNS servers*

Another way how an attacker can take your web servers offline is DDoSing your DNS servers. That is why, it is really important to ensure your DNS servers have the redundancy for a sudden big volume of traffic. Another good solution is to host servers in different data centers behind load balancers [3].

So, it is obvious that DDoS attacks are growing rapidly and affecting more and more people and enterprises. It is expected that this type of attack against private

organizations and governments will continue to unfold with greater complexity and adaptability in order to gain some “benefit” or distract attention. DDoS attacks are also widely used in cyberwarfare to destroy the country's critical infrastructure. Therefore, enterprises must pay attention to this threat and take various counter measures to mitigate them. They should also properly assess their environment and monitor protection resources against these aggressive attacks. As DDoS attacks continue to evolve, it is imperative not to underestimate their threat and raise users’ awareness of their potential danger.

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### Neural networks as a part of the present

Information technologies are actively implemented at home appliances and industrial information measuring systems. Thus, along with sensors that measure the temperature or pressure, record the fact of contact with the external object and form, as a result, the individual scalar signals, audio and video recorders. On the one hand, this greatly expands the potential capabilities of the devices, on the other hand - complicates the used mathematical the device and significantly increases the requirements for the computing capabilities of the device. One of the most promising mathematical devices is artificial neural networks.

Neural network technologies allow solving successfully some classes of tasks where the usual logic is using weakly. These are pattern recognition [1] tasks, multi-factor analysis, expert systems, and more. However, the scope of using neural networks was still largely inevitable limited because of their high computational complexity. Modern state of the advanced fields of industry makes a demand for solving similar tasks in real time.

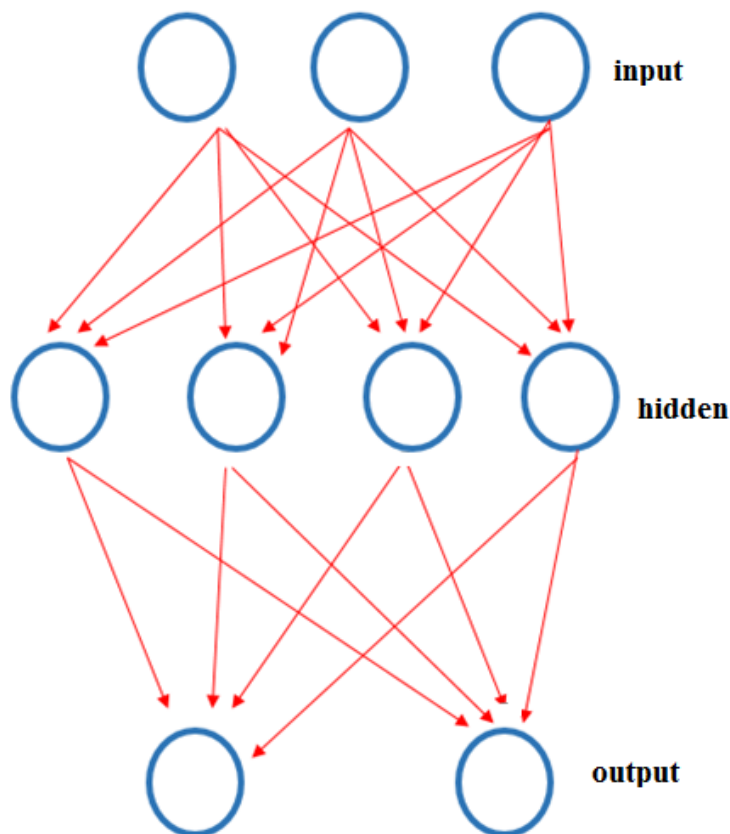
Today the most relevant and promising is navigation and automated control systems vehicles. The construction of such systems requires multiple increases in

the performance of neural networks and at the same time makes it possible to use only such hardware, which can be used as constituent elements of embedded computing systems.

Scientists who participated in the development of original networks, gained inspiration from nature, including human brain. Our brain contains billions of neurons that interconnect with each cell in our body. These neurons also communicate dynamically with each other. It allows our body to function [1].

Artificial neural networks [1] use the data-set minded learning rules. They are best used in interpretations that carry errors well. You will not use a neural network to bake an ideal cake that requires exact proportions. There is another term, closely related to neural networks, that is “deep learning”. This is a term for technologies that use artificial neural network algorithms.

An example of the simple neural network is given below:



Multilayer perceptron is the most famous and very old architecture in which several layers of neurons - an input, one or more hidden layers and an output layers - are successively followed [1]. The main strengths is learning from all sides. The weakness is the inability to work with dynamic processes, the need for a large sample of training.

Regarding the recurrent perceptron, the only significant difference is that its outputs pass into inputs and participate in the processing of the next input vector. The strengths here is that network is very good for working with dynamic processes. However, after the decision, it is difficult to understand if it is possible to achieve better results and in what way.

Associative memory is a broad class of networks that resemble the Hopfield architecture [2], which consists of one layer of neurons. The spy net type of network virtually completely copies the processes occurring in the human brain. Networks of this type are able to adapt to solving various problems. Moreover, in Hopfield's network [2], each neuron appears in all three forms. This network is in a stable state and used as associative memory. From the point of view of topology main types of neural networks are distinguished: networks with direct connections, networks with feedback, in which information from the following layers is transmitted to and regular ones. The Kohonen Neural Network is a typical example of studying neural networks without a teacher [3]. The Kohonen network can be used to reduce the size of data with minimal loss of information. It is necessary to distinguish self-education and self-organization of the neural network Kohonen [3].

Researchers around the world are currently develop comprehensive neural maps [3] to reveal the truth about the brain. Neurophysiologists study brain networks from the point of view of imposing the structure of cells, molecular features and functions of the nervous system. Neurophysiologists study brain networks from different points of view: imposing the structure of cells, molecular features and functions of the nervous system. A lot of time and money is devoting to the invention of the "learning" methods of these neural networks.

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### Why to use C in 2019?

With the rise of the object-oriented paradigm, allowing developers to write more easy-to-understand code, the rate of use of other technologies, including C programming language, has started to decrease. Although, usage of C is not widespread practice anymore, this language has many essential advantages that

makes it irreplaceable even in 2019. For example, the majority of device drivers, OS cores, and utilities are still written in C.

According to Stack Overflow Developer Survey 2018, C is neither top loved nor top wanted language of all respondents. Moreover, C is listed as one of the top dreaded languages of the year. Does it mean that C should not be learned and used today? The answer is not obviously negative. As the same survey shows, C is still one of the top-used languages. So why it came so that C is used but disgraced? One of the main reasons is the complex code structure based on the procedural paradigm.

Actually, C has several features of the OOP (e. g. composite data types), but they are not implemented like in more popular programming languages, which makes it impossible to write more easy-to-read code. Whatever demotivating the results of this survey are, it is still worth getting inside this language.

To begin with, C has the static type system, which implies that program execution will be safer and compilation will result in much simpler machine code. The latter means higher performance and excluding the errors on the build phase.

Further, widely used procedural paradigm requires splitting up the program code into functions, which are described in the isolated code block. Thus, the code is not repeated and program is easy to debug.

Furthermore, low-level memory access is the main reason to use C in order to gain top performance. Unlike the majority of the high-level programming languages, C gives full access to memory via pointers and addresses of memory cells. There are no additional wrappings, so the program execution is pretty fast. On the other side, it is much harder to cope with such code.

Last but not least, the C is a high-level programming language as it is cross-platform technology and doesn't concentrate seriously on how it is implemented in machine code. Every compiler processes the code in different ways according to the destination platform, but the developer does not need to rewrite something.

So, C has both pros and cons like any other programming language. Pros include: high performance; getting insight into how everything works; improving other program's performance through code inheriting. Cons are as follows: complex code; debugging issues and the lack of modern IDEs for C; unsafe functions.

To sum it up, we can say that C is irreplaceable technology when it comes to gain top performance, but it also rightfully deserved controversial reputation for its complexity.



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## **How to protect yourself on social networks**

A social networking site is a web service that allows users to create a public profile, make a list of users for exchanging, viewing and crossing connections within the system. According to the Forbes, the world's first social network was invented by Andrew Weinreich, an NYC-based entrepreneur. Since that time a lot of sites were created, gaining their popularity.

Nowadays, social networks play a big role in our everyday life. For most people, the day starts with checking the news feed on the Internet. All people can be divided into two groups: the first, spending a lot of time on the Internet, apps, and second, considering it as a waste of time.

The advantages of social networks are the following: communication with the world, learning about hot news, advertising, leisure, information sharing, the best source for bloggers, a handy job search platform.

However, social networks are experiencing major disruptions around the world. The Instagram application crashed on the night of January 29, 2018. At the same time 47% of users experienced problems with the news feed in the application, 33% complained about the impossibility to log in to the account, another 18% described the malfunctioning of the web version of Instagram. In the work of social network Facebook and Messenger, in Instagram, Twitter and Tinder there was a major failure that was reported by Downtdetector on Wednesday, March 13, 2019.

Social networking sites have such shortcomings as: the spread of false and unreliable information that causes serious relationship problems, cyber bullying as an increasingly serious problem leading to discrimination in the workplace.

Moreover, blogging in social networks can be dangerous for some reasons.

To solve this problem, one should control posting, invent a unique password for each web-site, be careful accepting "friends" in social networks, avoid going by strange links, try to identify a person.

To sum up, we should spend more time with real people, communicating and doing different activities. As Mark Twain said: "Only two things we'll regret on deathbed that we are a little loved and little traveled."

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### **Data Mining used in vacancies analysis**

As we all know the professional growth goes approximately this way: the first year of your dedicated work in one field gives you lots of experience as long as you are not sitting at the same place. This level can be called Junior.

For the next couple of years on your career path you feel more comfortable and you are performing way better than in the first year. But how much experience you gained comparing to the first year. General case is that you are still growing pretty fast, learning new things, becoming more comfortable with technologies you use at work. But it's not so fast as it used to be in your starting year. This level can be called Middle. As the years are passing you by and you have approx 5 years of experience you are now called Senior. All the things that you have done within these 5 years are already a routine for you and you feel pretty comfortable at your workplace.

At the same time, the more comfortable you are the less professional experience and career growth you get as a specialist. Moreover, the technologies and skills that you learned when you were Junior specialist are most likely not in trend anymore and slowly a specialist becomes unneeded on the job market.

This slowly leads us to the problem of 'Which skills do I need to develop to be always in demand on the job market?' Another question may worry recent graduates 'Which skills do I need to develop to get my first offer?'

One possible way would be to ask your colleagues, friends, friends of friends for advice. However, let's consider a better analytical way for answering the question 'Which skills do I need to develop to be always in demand on the job market?'

The scientific way is called data mining which is described as "the process of sorting through datasets in order to identify patterns and establish relationships to solve problems through data analysis" [1]. And in particular case with vacancies a subset of data mining called text mining will be used. Text mining is a process of deriving high-quality information from text. The following are the steps used in text mining analysis: gathering data, exploring, preparing, analyzing and making conclusions. Gathering data is the most important step in solving any analytical problem. The text analysis can only be as good as the dataset [2].

Here are some important things to remember when gathering data:

- Find out the limitations of the API before using them. For example, some APIs set a limit on the rate at which you can make queries or each query may return only small chunks of data.
- The bigger dataset you are able to collect the better analysis will be performed.
- Make sure that your data samples cover the possible edge cases, not only the common cases [2].

Many companies provide public APIs for accessing some of their public data, in our case the API of rabota.ua.

So we developed a system for fetching vacancies from rabota.ua public API by keyword 'qa engineer' and storing them in database. Rabota.ua API with one request returns only 20 vacancies and with 20 requests 400 vacancies were collected. But these 400 samples contain only short descriptions of vacancies and in order to get details of each vacancy additional 400 requests were made. However some vacancies may not be crafted according to the general structure. Bad quality data will be ignored in our analysis.

Data exploring is about manually checking your data set and collecting some metrics. Number of samples: Total number of examples you have in the data. Number of words per sample: Median number of words in one sample. Defining the structure of vacancies.

Looking through a few samples we noticed that most of vacancies are in English but some are in Ukrainian or Russian. So vacancies need to be translated, programmatically, naturally.

Next thing noticed is the structure of vacancies that consists of 4 sections that are About Company, Responsibilities, Requirements, We Offer. Some sections may be missed - these vacancies will not be analyzed.

From all the four sections the only relevant section with skills is 'Requirements', the other three can be ignored. This is achieved by firstly 'cutting' vacancy from bottom - section 'We offer'. And then 'cutting' vacancy from top - sections 'About Company' and 'Responsibilities'.

So after all the changes each vacancy will have the following format:

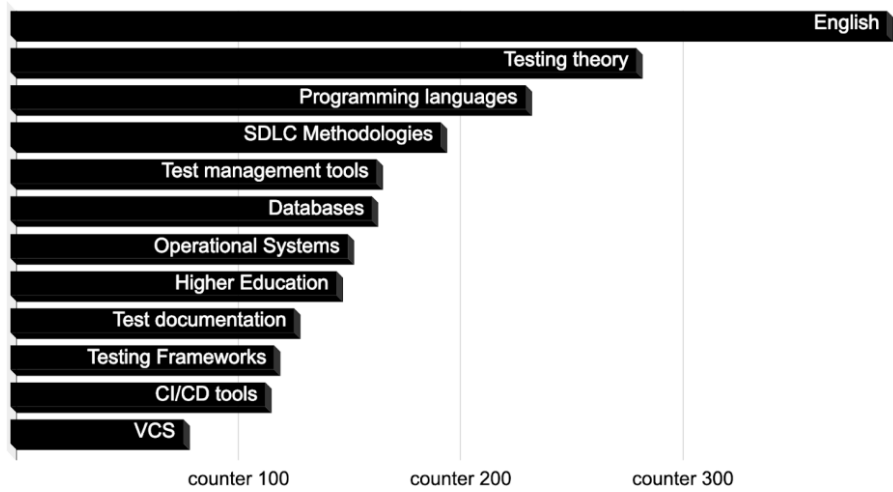
vacancyId	Requirements
7162124	<pre> &lt;/ p&gt; &lt;ul&gt; &lt;li&gt; Higher education. &lt;/ Li&gt; &lt;li&gt; Experience in testing software from the 1st year. &lt;/ Li&gt; &lt;li&gt; Confident understanding of quality assurance and testing processes. &lt;/ Li&gt; &lt;li&gt; Experience in automating the testing process with Selenium WebDriver &lt;/ li&gt; &lt;li&gt; Knowledge of Java Core, SQL. &lt;/ li&gt; &lt;li&gt; Understanding HTML, CSS, JavaScript. &lt;/ li&gt; &lt;/ ul&gt; &lt;p&gt; &amp; nbsp. &lt;/ p&gt; &lt;p&gt; </pre>

This format is not exactly a set of skills from vacancies, but it is already data of better quality with no extra sections and translated in same language.

Last step of data preparation is removing unnecessary HTML tags and splitting requirements into separate lines:

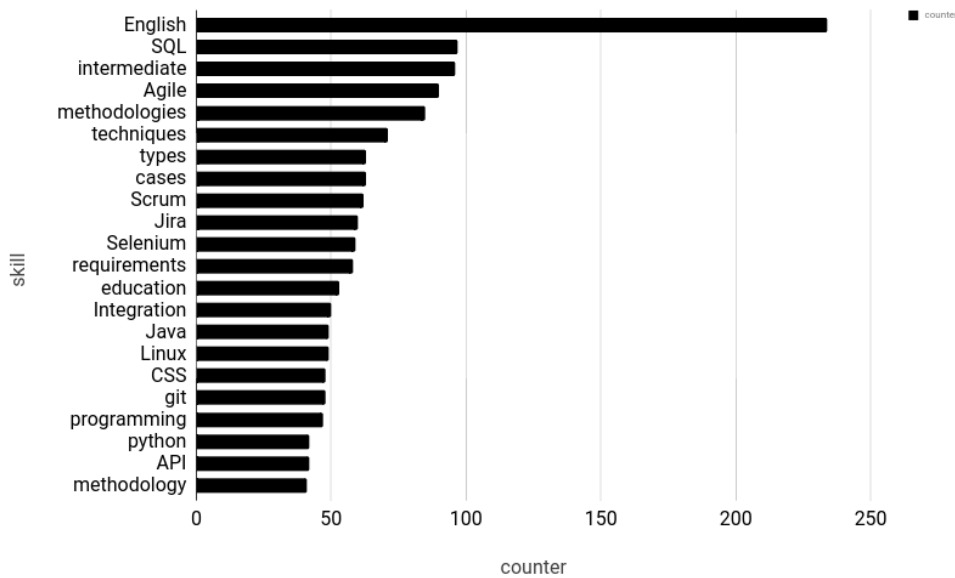
Higher educatio n	Experien ce in testing software from the 1st year.	Confident understandi ng of the quality assurance and testing.	Experien ce in automati ng the testing process with Selenium WebDriv er	Knowled ge of Java Core	SQ L	Understandi ng HTML	CS S	JavaScri pt
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Turning back to the question raised previously, ‘Which skills do I need to develop to be always in demand on the job market?’, as soon as the data is prepared we can analyze the popularity of skills by categories which is displayed on figure 1.



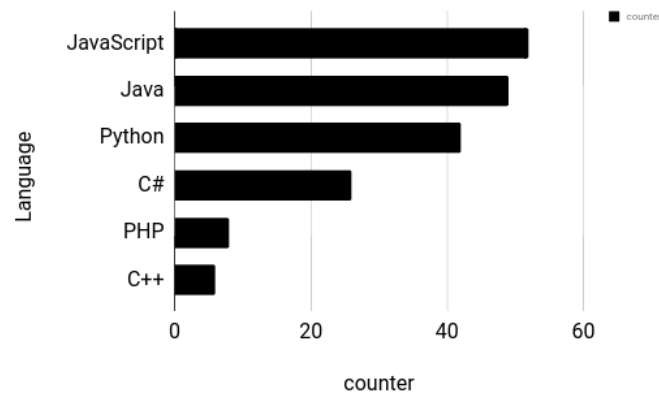
**Fig.1. Popularity of skills by categories**

Popularity of separate skills is shown in figure 2.



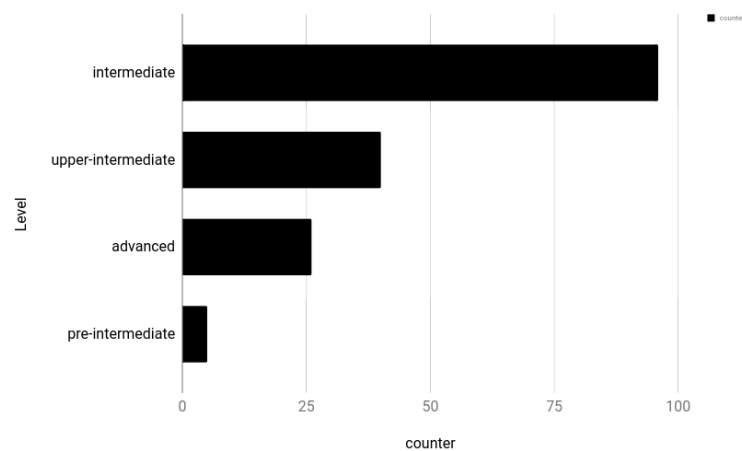
**Fig.2. Popularity of skills**

The popularity of programming languages mentioned in requirements is shown in figure 3.



**Fig.3. Popularity of programming languages**

Level of English fluency required in vacancies is shown in figure 4.



**Fig.4. Level of English fluency**

To sum up the performed analysis I may conclude that the most important thing the test engineer needs to master is English language because all of the state-of-the-art technologies, documentation, guides, forums are in English. Also most of the colleagues and clients are likely to be English speaking. Without this tool the path of mastering other tools and technologies can be not that fast.

Hopefully in the near future I will develop a system that will suggest the career path for engineers based on their current experience and skills. With such system the specialists will always be in demand on the market and feel themselves comfortable with new technologies. It is well known that staying in demand on the job market requires constant development which pays off by having decent salaries, challenging projects and attractive working conditions.

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### **Virtual reality in space exploration**

Information and computer technologies are evolving faster and faster every day, and one of the most progressive and promising industries is the creation and use of virtual reality (VR). Today, VR is used in such industries as: medicine, business (pilots, military and driver training), architecture and design, educational travel, the creation of computer games and space research. For example, one of the confirmations of this is the fact that in 2016, NASA began a 15-year preparation for flights to Mars, claiming that virtual reality technology will be used at almost all levels.

In fact, VR technologies were developed by the NASA Research Center back in the 80s, becoming the first functional in the world, and had a number of limitations. However, through the efforts of private companies, the technologies have been improved, updated and now they are used in modern projects.

For the preparation of future astronauts, the space company uses the “Mixed Reality System” project. The goal is to create a training platform, the costs of which will be several times less than the costs of classical tests in the field. The system is based on a combination of virtual and real world, which provides maximum realism. To create a project, NASA had to sign an agreement with a large computer game development company, Epic Games, in order to use the Unreal Engine 4, which belongs to the company, to create tests. The first simulator was the International Space Station (ISS). The reconstruction took place in two stages: in addition to creating a virtual model, the decoration of the ISS module in its real dimensions was erected in one of the station's premises. To achieve maximum realism, according to NASA, it is necessary to combine training scenarios in the real world and high quality visualization in the virtual.

At the moment, many companies are developing hardware for the full output in BP, the most acclaimed representatives of which are Omni and Oculus Rift virtual reality helmets and goggles, and Google Glass for creating augmented reality. Also, costumes and gloves with built-in sensors already appear on the market. Some models work in conjunction with a PC, some can be used with only a smartphone, like NEODiVR, which works with iPhone.

These were the technologies that are used right now. But what about the prospects? In March 2019, it was announced that the CHEOPS telescope, designed to study the satellites of the planets outside our solar system, was fully ready for launch. Of course, the capabilities of the telescope are not unlimited, but having obtained data on the structure, composition, features of the planet and having its photos, theoretically we could model its copy in virtual reality. And in the future, with the development of technology, we would be able to recreate many planets, so

that everyone could see the simulation of the starry sky from anywhere in the universe.

Why is this necessary? At the 2018 conference, Elon Musk announced that he was going to colonize Mars by 2025. Believe it or not, opinions differ, and many scientists were skeptical about this statement. However, taking into account that SpaceX has gone to this for 17 years, and the goal has not yet been achieved, it can be assumed that technological progress in quality data transfer from other planets beyond the Earth will be achieved before humanity can travel between planets of a hundred or more in the real world light years apart. Moreover, even if these technologies are achieved earlier, until space travel becomes equivalent to a bus ride, not everyone will be able to afford them.

Therefore, virtual reality can play an even greater role in the exploration of outer space than it plays now, and become an excellent means to give our generation what can appear through the centuries - to give everyone on the planet to see the world from the other side and get access to knowledge, previously unavailable.

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### **Blockchain technology for supply chains**

A blockchain is an ordered list of data blocks, where each block is linked to the previous block via cryptographic functions, so that a change in the block sequence or records can be detected immediately.

There are several criteria by which you can classify blockchains:

- Distributed versus local blockchains
- Scripting capabilities of a blockchain
- Public versus Private Blockchains
- Generic versus application-specific blockchains

Distributed versus Local Blockchains: The Bitcoin Blockchain is currently the most popular blockchain and distributed on many machines around the world. Because of the approach of distribution, this concept is also called a distributed register (distributed ledger). There are several thousands of copies of the Bitcoin blockchain distributed around the world, forming a huge peer-to-peer (P2P) system. The structure of the Bitcoin network is similar to other peer-to-peer systems such as e.g. BitTorrent.

A blockchain does not necessarily have to be distributed. It can also exist as an isolated instance that is independent of other instances. In addition, hybrid forms are possible in which parts of the components are installed within an organization and only certain information, such as e.g. Hash values are transmitted in a global blockchain. An example of this is the Guardtime Blockchain.

**Scripting Skills of Blockchain:** The second difference between the different blockchain concepts is the scope of the programming language. The transactions that make up the blocks in the blockchain are not just the data structures, but the blockchain can also contain small programs (also called scripts). Experts discuss how powerful such a scripting language should be within a blockchain. There are different ideas on this point.

For example, the scripting language of the Bitcoin blockchain is very limited. It offers only elementary language constructs. This has been intentionally designed to minimize the size of the blocks in the bitcoin blockchain and thus the computational requirements on each machine.

The Ethereum Blockchain uses a complete programming language, known in technical jargon as a touring complete programming language, in which all common program constructs (including loops) can be mapped. Thus, the Ethereum Blockchain is a kind of object-oriented Blockchain, in which the data and functionalities are put together.

**Public vs. Private Blockchains:** The third major difference between the various Blockchain platforms is the concept of access control. The Bitcoin Blockchain is public (public) and each user can download the Bitcoin Blockchain and start a Node.

The concept of the Blockchain Hyperledger provides that one can define the group of users: private / closed or public user groups or a combination in the sense of a hybrid block chain, in which a co-operation between authenticated and unauthenticated users is possible. In this sense, Hyperledger has been created to develop blockchain based applications especially for businesses.

**Generic vs Application-Specific Blockchains:** The fourth difference between the various Blockchain software concepts is whether the software can be used generically or is designed for a specific deployment scenario. For example, the Bitcoin Blockchain, Ethereum, and Hyperledger are generic, i. You can develop different applications based on these blockchains. However, there are also application-specific blockchains, for example.

The blockchains Ethereum, Hyperledger or Guardtime have similar structures. The differences in the publicly distributed blockchains only come out at the transaction level in the blocks.

With Blockchain technology, a very high level of security can be achieved. On the one hand, blockchain transactions use cryptographic procedures, which offer sufficient protection depending on the length of the keys.

Thus, the SHA 256 algorithm, which is used in the Bitcoin blockchain is considered not currently breakable and is also in today's SSL protocol set. In the future, if 256-bit cryptography is no longer secure, you could increase the key length in the blockchain.

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### **The role of testing in software development**

Testing plays a key role in the software industry as it is an important and helpful stage of the Software Development Life Cycle. Software testing is a really hard work because developers regularly face problems in coding or decoding. And as testing is considered a part of programming, developers had to initially correct errors on their own.

To support the developers, many software companies hire a special group of specialists called testers. The aim of testing as a specific branch in an IT company is to improve the reliability, quality and performance of the final product. With the software being tested, a developer can make sure that the program works appropriately and does not perform unnecessary operations.

There are two types of testing: manual and automated. Testers perform manual testing to verify codes and errors in the software. Automated testing uses computer programs to run the system. In both cases, to reach the testing goals, it is necessary to have a well-trained team of professionals. First of all, it is very important to have testers who can work efficiently in a team. The second important point is to ensure that all team members have sufficient knowledge to test software under development. There are also some other requirements for testers: having visualization skills to understand and imagine how the final product must work; possessing analytical skills to analyze the program in detail; being strict and insistent; being customer focused because communicating with a customer is an essential part of the job.

In the software development life cycle, great importance is attached to the testing stages because they play a significant role in execution and fault rectification. These main stages include: requirement analysis, test planning, case development, environment setup, execution or system testing and test cycle closure.

It is easier to correct mistakes at the initial stage of software development when the cost of correction can be reduced. If the error is not detected in time, the price of correction may greatly increase. What is more, software can become dangerous if it is not tested properly, because hackers can use the system vulnerabilities for personal gain. For example, web-applications without input fields testing can be a subject to such threats as cross site scripting or sql injection. Cross site scripting is a type of attack that injects a malicious code page into a web-based system. Sql injection is one of the most common ways to hack websites and programs working with databases based on the introduction of the arbitrary SQL-code into the query. That is why it is important to turn the final product into a reference.

Therefore, accurate and consistent testing not only makes the product successful but also builds goodwill for the company because product quality plays an important role in the modern competitive world.

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### **Integral part of project management in cybersecurity**

Customer satisfaction is a recipe for success. It is always difficult to bring the client back if there are security violation or data integrity problems in the project. It is quite difficult to manage all projects smoothly and efficiently because there are many repetitive processes in cybersecurity. For cybersecurity projects to be effective, IT professionals and security professionals need to implement robust project management practices.

According to 2018 and the beginning of 2019 statistics, we can highlight the main benefits of using project management in cybersecurity projects, such as Streamlined Project Execution, Strategic Alignment, Optimizing Resource Allocation, Continuous Improvement, Problem Resolution, and Risk Management [1].

Cybersecurity in a company begins with the realization that it is an autonomous process that requires separate resources: human, financial, temporary. If the company's goal is to comply with the trends and standards of information security, then the top-priority task of the top manager is to recruit highly qualified personnel to manage this process. According to a world's practice, a security specialist should supervise an IT specialist. There is a proportion of the cost of

information technology and information security - the ideal budget ratio is 85% / 15%. This is not an axiom, but a level to which it is desirable to strive.

Compliance with the methods and strategies of project management reduces many risks of the company. Many project management practices help the business project to be within the budget [1]. The task of the project manager of cybersecurity is to optimize the allocation of resources, ensuring the critical resources work on critical projects. By optimizing resources, IT professionals have all the capabilities to deliver the best performance.

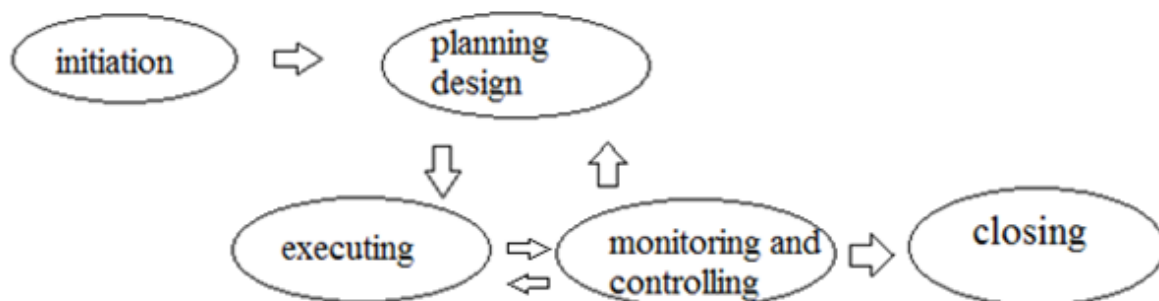
In fact, cybersecurity projects must be consistent with the amount and relevance of the data processed, the level of exposure to threats, the risk involved and the applicability of regulatory requirements [2]. Reliable methods for managing cybersecurity projects can help organizations learn from their mistakes, avoid similar situations in the future, and thereby contribute to the continuous improvement of the various processes in the organization. Such documentation can serve not only high-quality business analysis, but also save time and resources for such projects in the future. Each project manager must be responsible for the behavior of the cybersecurity team members.

Lack of cybersecurity skills has a record level today. Lack of knowledge often increases the risk of hacking. According to statistics, about 45% of reported crimes are related to cybercrime [2].

Finally, intelligent project management ensures proper risk management. Before starting a project, it is necessary to identify potential risks and report them [2].

Once the project has started, a cybersecurity project manager will keep these risks in mind, look out for additional risks along the way and keep all involved parties informed. If any problems arise, the project manager can play the role of mediator between internal teams and resources [2], as well as between the internal and external spheres.

For example, there are some project management's phases:



Following measures can ensure the security of information systems: security systems, settlement of incidents, business continuity management, monitoring and constant audit, compliance with international standards, investigation of incidents

and bringing the perpetrators to justice. Currently, businesses are struggling to keep up with the infinite number of security threats, cyberattacks and malware. This means that protection mechanisms must keep up with the increasing complexity in cybersecurity, because cybersecurity is not a one-time action.

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### **Sound digitization**

What is the sound ? Primarily, the sound is a physical phenomenon which we represent in the form of elastic waves spreading in an elastic environment and creating vibration. That is to say, if we take the source of sound, we will see that it will create the uninterrupted change process air pressure with sound frequency. And exactly this pressure affects our eardrum, and we detect this changing pressure of air as a sound.

The main thing we should know about analogue sound is that each of its parameters is described by a function of time and a continuous set of possible parameters.

And in digital sound all these parameters are artificially limited.

Also, it is important to mention about such thing as Kothelnikov’s theorem. Following it, if we want to send the sound in digital form, the sampling frequency should be twice as the upper cutoff frequency of our signal spectrum.

In general, we hear maximum of 20 kilohertz, based on this the sampling rate should be of 40 kilohertz. Nowadays, generally accepted frequencies of sound recording are 44.1 kilohertz (for recording onto a CD) and 48 kilohertz (for recording video films).

According to the above mentioned theorem, the sampling rate has to be just as 2 times higher as the frequency of the upper cutoff spectrum of our signal to restore the signal with any accuracy.

To sum up, despite the fact that the human ear detects only an analogue signal, our brain perceives information only in digital form. Since the brain is a digital part, it consists of the neurons that perceive only or present of an impulse or its absence. So, it is either 1 or 0. Our brain perceives only digital.

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### **The Internet of Things and information security problems**

The most prominent and driving tendency in the IT sphere of the past decade is Internet of Things (IoT). This technology is uniting, unifying and transforming real-world objects into “smart” virtual objects. The initial aim of creating global, efficient, flexible and fast adapting complex system, such as the Internet of Things was driven by international corporations.

The Internet of Things gathers around and connects physical objects like sensors and complex mechanisms of subway system, traffic lights and different means of communications. Nowadays objects are more flexible, fast-responding and are able to operate without any human interference with the data [3].

The Internet of Things is the new target for cyber-crimes. Possible attacker need not break all security system to reach data on computer or any device storing data. There are many vulnerable targets for cyber-crimes that can be hacked using the IoT flaws. They include industrial and manufacturing sectors of economy, healthcare institutions etc [1].

The most part of the IoT mechanisms use wireless technology and can be remotely operated. This can become major weakness for cyber-crimes to crack into device ecosystem which can lead to unpredictable consequences.

Security principles need to be built up on communication, device and the server levels, and the security system incessantly updated to strike against possible or unknown threats. Management must be built on reliable security practices. Transparency of the IoT devices and ecosystem should be improved and retained by manufacturers, developers and users. Flexible security mechanism for every connected device is a solution for the protection from possible attacks [2].

The IoT has some flaws in implementation: the absence of IoT standard definition and standardization for better integrity and compatibility. In spite of it, the IoT is becoming evolving and significant technology for future progress.

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## Corporate networks

As an organization grows and develops leadership inevitably encounters the problems of creating the most flexible and efficient system of unit management, providing communication between a central office and units as well as ensuring confidentiality of information transmission. The global experience of large companies and corporations suggests that the solution is to create a unified information system based on the corporate network.

A corporate network is a complex system that provides the transmission of various data between different applications used in unified information system of the organization [1]. Typically, it is built on the basis of IP protocols. The construction of a corporate system is the creation of communication nodes connected via IP protocol, which can be located far from each other [2].

Building a corporate network is much more convenient than separate service branches and offices of the organization. This design helps significantly optimize the work of the entire enterprise, as well as facilitates the work of system administrators, allowing them to serve the entire network without leaving a head office. Moreover, corporate network allows creating a single database for all units, and conducting electronic document flow.

Confidentiality of information transmitted is achieved by using VPN technologies (Virtual Private Network). VPN is a common name for technologies that provide network connections (logical network) on top of another network. Despite

the fact that communications are carried out over networks with a lower or unknown level of trust (for example, the Internet), the level of trust in the constructed logical network does not depend on the level of trust in the underlying networks due to cryptography using [3]. It becomes possible to connect remote users without the risk of leaking confidential information.

The presence of a corporate network contributes to the success of any organization as it ensures the confidentiality of information circulating in the system through the introduction of VPN technologies, and allows coping more effectively with circulating information flows in the system between organization employees.

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## **A cyborg or a man: realities and prospects**

Computer technology, having overwhelmed the world of people with an additional layer of digital intelligence, has already created "partially digital version of the person" in the form of e-mail and social networks. Its penetration into different spheres of our lives, including medicine, which uses implants for brain stimulation, restoring hearing and sight, is qualitatively changing people's lives.

That is, modern digital reality, invisibly and unknowingly, has already "included" us in a completely different project that requires a person to develop his/her cognitive abilities. I. Mask, for example, plans to create a technology called neural lace that will deprive a person of intermediaries between his/her and a computer (keyboard, mouse, etc.), replacing them with a neurocomputer interface. Thanks to it, a person will have the opportunity "to download his/her consciousness into the cloud and, thus, perpetuate oneself even after death". But before scholars there are many questions about the possible change in the status of a person who can be on the verge between man and robot.

But realizing into the life of the neurocomputer interface will give the person the opportunity "to use the resources of artificial intelligence directly in the processes of thinking, that is, to exchange ideas without compressing their meanings, without losing quality", as we do it through "language" and "print". Moreover, a person will feel these electronic superstructures as necessary as glasses. And in this sense, a person will inevitably become different - Homo Augmenticus, that is, "a person complemented".

So, a reasonable and well-balanced combination of computer and human efforts - human cyborgism is a promising task for modern computer technologies. But will humanity be able to protect itself by creating new laws regulating relations in the digital world? Is born as a person, a person will remain him/herself?

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**Optimum control in the context of the exhibition stand of a lecturer**

Training of highly-qualified personnel with modern knowledge and skills is one of the most important tasks of any educational institution. In this context, much attention is paid to the improved content, methods, and facilities. Therefore, development of illustrative means, applied by a lector to support foundations of the subject, being stated, is topical problem.

The Department of Automation and Computer Systems of the National Technical University "Dnipro Polytechnic" has developed mobile (in the form of a poster) training stand for a lector teaching "Optimum controlling systems and adaptive ones" subject. The poster is based on Arduino controller. Control objects have been simulated physically relying upon electric RC circuit and series connection of two RC circuit being nonperiodic chains of the first and second respectively. Voltages are input and output values. The applied facilities and developed software



help lecturer vary operation modes of the system remotely during classes demonstrating physical essence of time optimal control systems designed on the basis of maximum principle of Pontryagin. Demonstration of physical processes, taking place within RC chain in the context of different values of the controlling value, supports the known theoretical statement that energy, accumulated by an object by a moment of the control effect switching, is equal to the energy, accumulated by the object with no transient forcing. In this context, the moment of switching control effect, calculated according to  $t = T \ln \frac{kU_{max}}{kU_{max} - U_{output}}$  formula, provides definitely maximum access time without any overcorrection. In terms of the formula,  $k, T$  are control ratio, and time constant of nonperiodic first-order chain respectively; and  $U_{max}, U_{output}$  are controlling value, and controlled value respectively. During classes, control of nonperiodic second-order chain helps lecturer support a theorem on  $n^{\text{th}}$  intervals as well as correctness of calculations concerning controlling effect switching using the method of “sewing together” solutions for the object represented by series connection of the first-order nonperiodic chains. In this context, to calculate control interval one, following transcendental equation system has been obtained:

$$\begin{cases} \frac{U_{output}(1 + 0,01\sigma) - kU}{kU_{max}} e^{-\alpha_1 t_2} - \left(1 - \frac{U}{U_{max}}\right) e^{-\alpha_1 t_1} + 1 = 0 \\ \frac{U_{output}(1 + 0,01\sigma) - kU}{kU_{max}} e^{-\alpha_2 t_2} - \left(1 - \frac{U}{U_{max}}\right) e^{-\alpha_2 t_1} + 1 = 0 \end{cases}$$

where  $t_1$  is duration of the first control interval;  $t_2$  time for output value rise up to its maximum;  $\sigma$  is overcorrection value;  $U$  is a value of the controlling value at the end of controlling interval one; and  $\alpha_1, \alpha_2$  are roots of characteristic equation of the control object.

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### Developments in the field of AI

Over the past fifteen years, artificial intelligence has become a part of our daily life. AI is used when creating computer games, home appliances or personal assistants for mobile phones that recognize voice. In near future, smart technologies will be better adapted to their owners monitoring people’s health, warning them about the dangers and instantly providing any necessary services. In many industries, robots are already doing most of the work [1].

Artificial intelligence is both a field of science and a set of computing technologies. In part, it reminds a human body where the nervous system allows us to feel, receive information, think and make decisions [1-3]. Surprisingly, the concept of "artificial intelligence" does not have one clear definition. However, this does not

hinder its development. In other words, artificial intelligence is a direction of technological developments that makes mechanisms much smarter.

The most successful area for developers of artificial intelligence is education. Both teachers and students constantly use applications to read and study various subjects. The first devices for training began to appear in the 80s of the last century. The systems with interactive simulators for practicing mathematics, foreign languages and many other disciplines are used for the online training [4].

In medicine, AI is used in applications and devices to facilitate diagnosis, monitor the patient's condition and help surgeons to perform operations. The main progress of artificial intelligence in the field of medicine is related to the collection and storage of data. For example, electronic medical records have appeared. They store all the information about the patient's diseases and services given to them [5].

Smart programmes help officials to manage more effectively their budget in critical situations. For example, Illinois social services use modern research to examine pregnant women, identify who is more at risk of having a child with disabilities, and strengthen monitoring for those at risk [6].

The widespread use of AI gives impetus to a new round of industrial automation. However, the development of cybernetics raises a number of questions that still require close attention. To cope with them, the government needs to resort for helping experts who are knowledgeable in technology and can make decisions about the use of AI.

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## **Conditions for the development of quantum computing technologies**

Today each newly invented technology definitely changes or can theoretically change the world in some way. One of the shining examples of it can become a quantum computer (QC), which is currently in the limelight of physicists and specialists in IT technologies. They believe that complete implementation of such type of a computer will significantly optimize the executing process of some tasks. At the same time, many people claim that application of a QC will have a huge impact, for example, on the current cryptographic methods and technologies making them unreliable. So what was the reason for the advent of the quantum computing technology? What does it include? What are the necessary conditions for the development of quantum computing in the modern world?

The present-day computers mainly depend on semiconductors that are used for their microelectronics. The computational capacity of such computers depend on their CPU clock speed and architecture. Today`s CPU clock speed has already reached a few Gigahertz. This point can be defined as a sort of a limit for the criteria. According to Moore`s law, which states that “computer power will double for constant cost roughly once every two years” [1], we can assume that the end of the computer architecture`s rope has already been reached. The reason for it is the transistor size decrease happening with each new microelectronic improvement. Therefore, scientists confront physical limitations. When a transistor reaches a size of a few atoms, which is inevitable in accordance with Moore`s law, specialists will have to operate with computers on the basis of the quantum physics laws. Now it becomes clear that quantum technologies should naturally become a new phase of technological development. Otherwise, it will not be possible to make progress in IT.

A quantum computer is a type of a computer that uses quantum mechanics so that it can perform certain kinds of computations more efficiently than a regular computer can [2]. “Quantum bits” (“qubits”) are used as a minimum unit of information in a QC. The main difference between bits and qubits is that quantum bits can have not only state 0 or 1, like bits, but both states simultaneously. It is possible because of quantum superposition and entanglement in quantum mechanics.

People believe that a future QC will be able to find the solutions to the tasks that are impossible to execute with the help of a common computer. It is not completely true. As qubits can simultaneously have different states, a QC is capable to carry out many various tasks and store a great amount of information in parallel and simultaneously. Therefore, a QC can excel common computer at speed while performing tasks of big data processing or optimization. It will allow us to create complex models, for example, a model of interaction between neurons in a human

brain, a model of molecules of DNA or new chemical compounds. Moreover, it can also be used for higher quality revealing of cyber-threats in information systems.

To date there is still no fully-featured and universal QC which can be put in operation. Scientists use just the models of such type of computers for the development of languages and algorithms of quantum computation. One of the most significant achievements in development of a QC so far is D-Wave 2000Q. This computer was constructed by D-Wave Systems company in 2017. However, this model can solve only specific type of tasks. The development of a universal QC requires specific conditions which scientists and design engineers have not been able to reach yet. First of all, there is a necessity to have special algorithms and programming languages in order to work with a QC. The best programmers of the leading IT-companies in the world are currently engaged in the development of quantum algorithms. These types of algorithms are different in comparison with the classical ones and are based on the following principles: convertibility or calculation reversibility, quantum parallelism, interference, quantum entanglement [3].

Then it is necessary to provide the conditions of the maximally low temperature, which will be approximate to zero on Kelvin scale for the correct work of a universal QC. Any sort of radiation should not have influence on this type of computer, or to be exact – on qubits. Otherwise, qubits can only have state 0 or 1. It means that a superposition principle will no longer work. These requirements are quite specific, and it is difficult to bring them to life entirely.

In order to be able to construct a universal QC in the future, it is also necessary to train qualified specialists who will design, program and operate a QC. Unfortunately, the lack of resources would not make it possible to receive education in this sphere. Therefore, more disciplines concerning quantum mechanics, specific sections of mathematics and basic elements of quantum programming should be added to the university curriculum for IT students. It is necessary to develop and introduce a subject specialism for preparation of specialists in quantum computing at the intersection of physics, mathematics and programming.

As can be seen from the above, quantum computing is really a developing field in modern technologies. And though its further progress requires particular efforts, it can be a particularly attractive perspective for many countries and businesses as quantum computers can help optimize many processes.

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### **Passwords security**

We use passwords every day. Every time we use messengers or any other web-service, our login data is used to give us an access. That is why it is important to create good reliable passwords that will not be easy to guess or brute-force.

However, people often tend to choose something that is easy to remember and it does not matter, if it is safe or not. According to the analysis of about 7.7 million passwords, there is a significant problem in password security [1].

92% of all passwords are not unique. That means that almost everybody has passwords that were previously used by somebody else. This helps intruders to make dictionaries with the most common passwords which can be used for brute-force attacks. 80% of all passwords are shorter than 10 characters. So, the shorter the password is, the easier it is to crack it. For example, on average PC it takes just around a minute to guess 8-character password which consists of lower-case letters (the most common option). 30% of all passwords are among the top 10,000 most popular ones. This means that every third of us use a typical password for e-mail or even banking. Considering this, password should be easy to remember and complicated enough at the same time. Here are a few tips how to create a really secured one. The longer the password is, the harder it is to brute-force it. Eight-character passwords are no longer a good option, so the best idea is to use at least twelve symbols.

You can use the entire phrase that is long enough and easy to remember [2]. The best option is a random sentence, which has some associations for you. However, it is not recommended to use the line from a favourite song because it can be guessed.

You can use emoji. These are just Unicode characters, the same as letters or numbers. One emoji can stand for 2, 4 or even 8 characters, depending on how many bytes of memory it takes. However, emoji is not a cross-platform solution. You can easily use them on smartphone or Mac, but you might struggle on Windows.

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### **Virtual reality: the ways for improving and realizing**

In modern world, a human life is penetrated with information technologies and computer ones. The most popular are the web-resources, which started to perform not only the role of information, but multifunctional portal or app as well.

Today the enormous changes in development of virtual reality (VR) happen more than you can imagine. It is not only for entertainment, but also education, tourism, business, science, etc.

Most specialists can master their skills by means of VR if they don't have necessary equipment and materials at hand. Thus, the wastes are reduced and safe training is guaranteed.

Also, there is a great number of the 'attending' web-resources. It gives a possibility for the user, who can't attend this place any other way, to go on an excursion to a museum or enjoy a picturesque sight here and now without any efforts and wastes. Usually in such cases, notices and comments are designed in the mere VR and you can see them with a help of pointing the object or clicking on it. Sometimes instead of them, it is created a similarity of the quest where you are met by your own guide who conducts an excursion for you.

For example, 'Virtual Singapore'[1] is a full size 3D copy of a real city. This project was created for architecture planning, solving problems of various measure.

A long time ago in an entertainment industry VR got a great demand and popularity due to graphic reflection of reality, the effect of presence and living the life of a game character.

In a trade industry, online commerce is updating intensively by means of the web-resources.

For now, the top of virtual space (VS) elaborating is the augmented reality (AR) [2]. With this type of VS, you don't need to use your own imagination or calculation in real world.

Lots of devices exist for creating VR: glasses for VR, systems for optical tracking, controllers, helmets, exercisers, displays, acoustic systems, gloves, sensors, glasses for VR HTC Vive, Oculus Rift, Samsung Gear VR; systems for optical tracking Optitrack, controllers Kinect, Leap Motion, Myo and many other gadgets. However, the same important constituent are programs as for creating of this space and objects, so for correct work and high quality (HQ). I

should admit that the worldwide leaders of hardware and software systems are engaged with creating VR. For example:

- Google VR SDK (simplifies designing apps and games both VR);
- NVIDIA VRWorks Audio [3] (uses opportunity of graphic processors NVIDIA with technology of Ray tracing. It is a rendering technique, for generating an image by tracing the paths of lights and visual surface. The technique allows to produce a very high degree of visual realism, but needs a great deal of calculating capacity and is capable to make digital noisy this image);
- NVIDIA 360 Video SDK[3] (provides with ability to gluing 360-degree videos in 4K resolution in real time; can process video streams of 32 cameras and stitch them in 360-degree spherical video file, which you can save or it can be shown on air.);
- NVIDIA Holodeck [3] (multi-user VR with the effect of presence by means of sight, sound and touch);
- Microsoft HoloLens [4] (for creating virtual objects in real world with a help of AR glasses, a portable computer of full value, which can work without wires or a smartphone);
- Unity 3D (cross-platform environment of developing computer games);
- Different emulators (specialized for copying functions from one calculating system to another).

Today VR is intensively expanded. So many completely new hardware and software are being created. And in the nearest future these inventions can evolve VR and make it more realistic. Moreover, they are of great popularity throughout the world and have rich outlook.

Both developing of an absolutely different ‘world’ and the visual content quality are in demand among the users. From this point of view, VR expanding will be rather profitable and can bring it up to a new level of improving of computer technologies and holographic images.

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### **Cyber security in a banking sector**

Though banking sector is an integral part of modern life, which deals with saving, accumulating, increasing and distributing funds, more and more attention



should be paid to preserving and ensuring the safety of money and personal information of depositors in this sector. Security of funds should be at a high level, because forerunners are constantly improving the ways of fraud.

In fact, there are many options for fraud: from winding up subscribers through fake social networking pages to multimillion-dollar losses due to providing information to third parties. Such threats can be considered external, since bank clients are related to them. But there are internal security threats that may lead to information leakage and large losses for banks.

The most frequent well-known internal threats are the following [1]:

**Insufficiently encrypted data** – one of the wide spread reasons of data leaks that makes it easier for fraudsters to get hold of information.

**Unprotected automated technologies** — any equipment that is used without proper protection can be used to harm.

**Vulnerable third party services** – the use of third-party or cloud servers that may not be sufficiently protected can lead to the fact that the attackers can easily intercept information and use it for their own purposes.

**Unprotected mobile banking** - as that the popularity of mobile banking is growing, it is becoming a popular target of scammers, because generally less protected

**A constantly changing threat landscape** - the landscape of cyber threats has changed dramatically. Criminals have stopped cheating on small sums and are moving to a larger scale. The number of violations affecting the financial sector has led to an increase in the number of fraudulent transactions.

**False Positives** - one of the main problems of banks in the field of monitoring fraud. This means identifying difficulties that are not really fraudulent actions. It takes time from a security professional while hackers can enter the system.

**Big breach** is a violation keeping banks awake at night. Great amounts of important financial data are under growing pressure to protect customer data from scammers.

**New forms of hacking** - currently, hackers are able not only to delete but also modify or hold data for further use. Each time, hackers use new ways to attack financial services that causes new problem for banks.

**Ignoring a potential hacking** – the system inability to warn of a potential hacking is a major part of the modern cybersecurity strategy.

**Personal clients' accounts are** the most vulnerable entry point to the banking systems. Hackers can use a minor detail to access an account.

**Ruthless opponents** - It is necessary to understand that the threat to security is not a technological problem, but a real crime. The attackers work much faster than the system and do not reckon with the rules and laws.

Consequently, the end user (a client), who is very similar to the employee of a financial institution, is the weakest link in any field of security. They face a huge number of attacks: phishing (email, VOIP), malware (“driving” or “targeting”), security vulnerabilities, etc. But, let us look at possible solutions which can help banks confront these security problems.

The first is communication and intelligence. It comes down not only to technology, but also to people and processes. It helps to replace cybersecurity



analytics that are largely focused on cybersecurity technologies and tools, with an analyst who understands business and can talk to customers.

Structural exercises and scenario testing are also one of the options for protecting the financial industry from cyber threats. Making everyone gather around the table and analyze different scenarios to understand where the gaps are and what needs to be built into the cyber and sustainability processes. Such exercises need to be done by all employees of the organization: lawyers, compliance specialists, business and cyber specialists, operational and technical staff, and even colleagues.

Another tip is to keep the cyber system secret known only for a limited number of people. Today, attackers do not use the vulnerable link in the chain. They try to find the whole areas with a potential for hacking. This means that the system should work together as a single organism that can protect all its vulnerabilities.

Financial and banking sectors require more effective insights for people within business units. This allows them to quickly turn into actions, especially this is important in the sectors where security violations occur.

Banks also need to make perimeter security changes for in-depth multi-level protection. It is important to understand that sooner or later there will be penetration into the protected perimeter and it is necessary to prepare as much as possible for all possible outcomes.

As can be seen from above, information security in the banking sector is an essential aspect of the entire banking system functioning. As ways of fraud are evolving day by day and becoming more complex, banks must have qualified employees who can find vulnerabilities and fix them. The experience shows that providing proper protection is cheaper than reimbursing losses from a scam hit. So, banks should not only work on internal security, but also talk about potential threats to their customers. After all, if the client knows about the methods of fraud, he will not fall for the trick of fraudsters.

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### **Why is the future of e-commerce for voice assistants?**

According to ComScore analytical agency, 65% of smartphone users do not install any additional applications, but use those bundled with the operating system. At the same time, 42% of users spend most of the time inside a single application and do not switch between several ones. According to Mark Armstrong, a managing director of the Progress Software platform, the future belongs to personal assistants, thanks to whom the user will not need any application: over the next five years, we will evolve to an era without applications, in which smart agents will serve as dynamically changing interfaces [1].

Traditionally, the main function of voice assistants is playing music (97%), news and weather reports (92%) and notifications (87%). Only 55% of smartphone owners use voice assistant for calls, messages and emails. On the other hand, 67% used a voice assistant to make a purchase at least once. In the USA, Amazon Echo allows you to say “Alex, order shampoo, as usual”, and your order will be delivered to you, which helps to save time. According to OC&C, electronics, leisure goods and products fall into the category of the most popular purchases through voice assistants.

Even though the voice assistant as a sales channel is just beginning to evolve, it has already developed a number of certain advantages.

- ◆ **Reduce the burden on operators.** It will be able to advise on prices and characteristics, answer popular customer questions and immediately place an order. For example, some western companies have been testing the Kik voice messenger for two years. Using H&M bot, you can create the preferred outfit, pick up the right combination of items and order it immediately. Sephora has integrated a similar system and the list of companies using the Kik bot is constantly growing. Hoff uses a voice assistant for customer feedback. So, it allows the business to save on a market research team.
- ◆ **Collect customer information and fill out a card in the CRM system.** The voice assistant can request customer data or an e-mail and enter the history of his interaction with the store into a personal card. This is how most chat bot sellers work - the order will not be processed without necessary information. For example, Google Assistant, if desired, can transfer information about the client to CRM (Customer Relationship Management).
- ◆ **Increase sales.** During the time of purchase a voice assistant offers a couple of goods that could make a set with a thing to be bought, or offers analogues if the product is not in stock. For example, Amazon Alexa will offer you instant print camera cartridges. Another useful feature, the Amazon Alexa Assistant can report products from the “recommended” section, and 61% of the online

store customers are inclined to believe reviews and recommendations of the sites.

- ◆ **Increase loyalty.** The ability to quickly and easily make a purchase and receive assistance on a given question positively affects the mood of the buyer. While such technologies for online stores have not spread everywhere – it is possible to attract buyers to the site with this opportunity. The favour of the operational response, which is exactly what the voice assistants and chat bots provide, was proved in Inside Sales. It was found that a response to a customer within five minutes increases the likelihood of a purchase 100 times.
- ◆ **Increase engagement.** The voice assistant places the order on-the-fly and does not allow the client to change his mind, plus the buyer does not have the opportunity to be distracted by other sites. According to the research of Amazon analytics, the shorter the client's path to the purchase, the higher the involvement and the higher the likelihood. So, Amazon Alexa makes a purchase instantly when being activated with a code word - the entire way from the request to the registration takes no more than a minute. Thus, it is possible to increase sales due to quick purchases.

However, in the Ukrainian market voice assistants for online shopping are used less frequently. And it is not surprising as 90% of all purchases by voice assistants are made through Amazon, which is not operating in Ukraine. On the other hand, Google and Apple are currently introducing the functions of voice assistants in the Ukrainian market. Their functionality is still very low, but since the beginning has been made, it means there is hope that in the near future other technological giants will introduce their services to our market as well.

In addition, the smartphone market is growing and the product lines with voice assistants from different manufacturers appear in various price segments. According to the forecasts, in 2023 60% of all smartphones in Ukraine will have the function of a voice assistant and about 50% of all requests will be made by voice. So, Ukrainian retailers need only adapt to the rapidly developing technologies. Most digital users are millennials who will soon become the overwhelming audience of stores. And to keep with them up, businesses need to fit the era.

Therefore, the future of the voice assistant will be completely different permeating various aspects of our lives including shopping. Amazon CEO Jeff Bezos believes that stores and other public places will be equipped with voice assistants which can recognize us and tailor their answers to our needs [2]. Thus, it will be possible to get rid of the consultants in the shops and make them fully automated.

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### **Choice of Programming Language for Working in Unity3D (Choice of C#)**

If you want to create a game, you should at least know one of the programming languages available for Unity: C #, JavaScript, or Boo.

Despite the fact that Unity can use the standard Mono implementation environment, there are its methods and techniques for accessing the engine architecture. In this section, we look at how objects created in the Unity editor are managed from scripts, and also detail the relationship between the Unity gameplay.

The behavior of game objects is controlled by the components that are subsequently joined to them. Although Unity's integrated components can be very versatile, we will soon go beyond their capabilities to realize your own gameplay features. Unity allows us to create unique components using scripts. They allow us to activate game events, change any characteristics of components and respond to user input.

By default, Unity will use MonoDevelop, but we will be able to select another editor in the Unity settings.

The script interacts with the internal mechanisms of Unity, creating a class inherited from the built-in class. Each time we attach a script component to a game object, a new instance of the object is created as defined by the plan. The class name is taken from the name we specified when creating the file. The class name and file name must be the same so that the script component can be attached to the game object.

For clarity, I note that under C ++ I will understand unmanaged code, and under C #, managed code. The article was able to compare manageable and uncontrollable, but it would be less useful in practice.

Criteria will be compared, giving each conclusion based on general practice, fundamental principles and known experience of use.

So, key benefits for me from use of Unity in general and C # in particular:

- Using the .NET Framework and C # (for me personally, this is very convenient)
- Ability to perform build on the iPhone and for the web player (standalone builds do not deceive me for several reasons beyond the post)

- C # allows you to start development faster, which allows you to quickly get a prototype solution. The speed of development in C # at the initial stages of the project is significantly higher compared to C ++. However, when the project's infrastructure is created, the main approaches and libraries are chosen, and the build is set up, the development speed in C ++ and the development speed in C # become approximately the same. Thus, in short low-cost projects, C # will have an advantage in development speed, but in long and relatively expensive projects this advantage will be insignificant.
- Already ready scripts of behavior on C # can be reused, for example, when creating a game port on an XBox using XNA (with changes, but still)
- In the complete self-sufficiency of applications there is neither in C ++ nor in C #. For C ++, runtime is somehow needed, and for the C # .net framework. However, I would like to note that C ++ runtime, like any other library, can be static linked into an executable module, so an executable module can contain everything necessary for work and due to which it becomes self-sufficient, in the case of C # it is standard Funds not feasible.
- Building C ++ projects is noticeably more complicated than building C # projects. However, it should be understood that greater complexity provides additional flexibility, which sooner or later may become useful to you. True to this point will only increase the cost of your time.
- user-friendly interface and not too voracious editors
- Reasonable price

Findings:

This is not to say that there is a universal answer to the question "Is C ++ or C # better for another project?" Nevertheless, we can say that it is better not to consider C ++ as the best choice, now in most cases it is better to use C #. However, for fast Windows C # prototyping is the best solution for C ++.

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### **Object-oriented programming**

Object-oriented programming is a popular widespread programming paradigm, which is widely used in the development of modern applications. This concept is present in most of programming languages because it provides programmers with particularly useful tools for team development of complex applications.

Before the invention of this paradigm, the key issue of programming was logic implementation instead of data definition. The object-oriented programming heavily leans on objects and data. It is much more convenient for an ordinary developer to consider a programme as a linear operation that yields the result of work based on input data.

In this approach, the key task of the developer is data modelling. At this stage a developer needs to determine and identify all business entities. The next step of the development is to divide all identified objects into separate categories or in other word classes. Every class defines what kind of data its objects contain. Besides, it determines the logic operations for data manipulation. Such logic operations are called methods. The main point of methods is that they affect only internal data of their entities [2].

The key principles of paradigm provide developers with great benefits that increase performance efficiency. For instance, the idea of a data class allows the developer to derive new subclasses from the main class. Thus, it makes possible to classify other objects that include some or all properties of the parent class. Therefore, this feature encourages the developers to conduct a detailed analysis and write cleaner code, which is important for team development. Furthermore, other object-oriented programmes can use the appropriately defined classes.

The second benefit of the approach is that a class determines the properties that it can affect. Thus, it cannot accidentally influence the part of the program beyond the class's area. It is exceptionally useful for teamwork as it simplifies localization of bugs. As a result, it improves code security and simplifies code debugging [1].

There are many programming paradigms, but comprehension of object-oriented principles is an indispensable skill for a developer. Not only is this paradigm convenient for team development, it also makes code cleaner, easier to understand and enhance.

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**Unmanned aerial vehicles**

The UAV is an acronym for Unmanned Aerial Vehicle, which is an aircraft with no pilot on board. Officially, the term 'Unmanned Aerial Vehicle' was changed to 'Unmanned Aircraft System' (UAS) to reflect the fact that these complex systems include ground stations and other elements besides the actual air vehicles. The term UAS, however, is not widely used as the term UAV has become part of the modern lexicon. UAVs can be remote controlled aircraft (e.g. flown by a pilot at a ground control station) or can fly autonomously based on pre-programmed flight plans or more complex dynamic automation systems.

Some early UAVs are called drones because they are no more sophisticated than a simple radio controlled aircraft being controlled by a human. More sophisticated versions may have built-in control and/or guidance systems to perform low level human pilot duties such as speed and flight path stabilization, and simple prescribed navigation functions such as waypoint following.

UAVs are currently used for a number of tasks. They are subdivided on:

- *Target and decoy* – providing ground and aerial gunnery at target that simulates an enemy aircraft or missile;
- *Reconnaissance* – providing battlefield intelligence;
- *Combat* – providing attack capability for high-risk missions;
- *Research and development* – used to further develop UAV technologies to be integrated into field deployed UAV aircraft;
- *Civil and Commercial* – specifically designed for civil and commercial applications like fire control (Emergency services), zone patrols (Police), monitoring of crops (Agricultural enterprises), forest protection and monitoring of fisheries (Forestry and Fisheries), mapping, photo and video (mass media), deliver rescue equipment.

The military role of UAV is growing at unprecedented rates. Rapid advances in technology enable more and more capability to be placed on smaller airframes, and increase the number of military air force being deployed on the battlefield. As the capabilities grow for all types of UAV, nations continue to subsidize their research and development leading to further advances enabling them to perform a multitude of missions. UAV no longer only perform intelligence, surveillance, and reconnaissance (ISR) missions, although this still remains their predominant type. Their roles have expanded to areas including electronic attack (EA), strike missions, suppression and/or destruction of enemy air defense, network node or communications relay, combat search and rescue (CSAR), and derivations of these themes. These UAV range in cost from a few thousand dollars to tens of millions of dollars, and the aircraft used in these systems range in size from a micro air vehicle (MAV) weighing less than one pound to large aircraft weighing over 40,000 pounds.

UAVs are not burdened with the physiological limitations of human pilots, they can be designed for maximized on-station times. The maximum flight duration of unmanned aerial vehicles varies widely. Internal combustion engine aircraft endurance depends strongly on the percentage of fuel burned as a fraction of total weight (the Breguet endurance equation), and so is largely independent of aircraft size. Solar electric UAVs hold the potential for unlimited flight, a concept championed by the Helios Prototype, which unfortunately was destroyed in a 2003 crash.

Autonomy is commonly defined as the ability to make decisions without human intervention. The goal of autonomy is to teach machines to be ‘smart’ and act more like humans. The keen observer may associate this with the development in the field of artificial intelligence made popular in the 1980s and 1990s such as expert systems, neural networks, machine learning, natural language processing, and vision. However, the mode of technological development in the field of autonomy has mostly followed a bottom-up approach, and recent advances have been largely driven by the practitioners in the field of control science, not computer science. Similarly, autonomy has been and probably will continue to be considered an extension of the controls field. In the foreseeable future, however, the two fields will merge to a much greater degree, and practitioners and researchers from both disciplines will work together to spawn rapid technological development in the area.

Autonomy technology that will become important to future UAV development falls under the following categories:

- *Sensor fusion*: combining information from different sensors for using on the vehicle board;
- *Communication*: handling communication and coordination between multiple agents in case of incomplete and imperfect information;
- *Motion planning (also called Path planning)*: determining an optimal path for vehicle while meeting certain objectives and constraints, such as obstacles;
- *Trajectory Generation*: determining an optimal control maneuver taken to follow a given path or to go from one location to another;



- *Task Allocation and Scheduling*: determining the optimal distribution of tasks amongst a group of agents, with time and equipment constraints;
- *Cooperative Tactics*: formulating an optimal sequence and spatial distribution of activities between agents in order to maximize chance of success in any given mission scenario.

To some extent, the ultimate goal in the development of autonomy technology is to replace the human pilot. It remains to see whether further developments of autonomy technology will be presented in the nearest future.

So, further development of autonomy technology, unmanned aerial vehicles in particular, are very important for humanity, as such technologies have found a wide application in various fields of people`s life providing their protection, monitoring and control in military, civil and commercial services.

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### **Information technology in modern manufacturing industry**

During the process of developing modern production and creating modern industrial enterprises many entrepreneurs underestimate the role and potential of modern information technologies. That is why the formulation of the main directions of the IT-sphere to which the modern entrepreneur or manager should pay attention in order to properly use the capabilities of modern IT-technologies in their business is of great importance.

Modern IT technologies cover almost all areas of industrial activity and key aspects of organizing the manufacturing process where information technologies to be applied can be listed as follows:

- management decision support;
- computerized accounting;
- interaction with customers;
- systems of technical control and robotization;
- information computer security.

Modern management decision support systems are able to perform multi-factor analysis of external market state of industrial energy and enterprise human resources, duration and features of technological cycles in manufacturing processes and, based

on the results of this multi-factor analysis, develop a set of recommendations of control actions to solve optimization problems, such as:

- increasing enterprise profit due to the output growth or cost reduction;
- enhancing the efficiency of working time of enterprise employees;
- optimizing production stocks and supply logistics.

When developing recommendations for control actions, the following main information technologies are used: information search, data mining, database search, reasoning based on precedents, simulation, evolutionary computing, genetic algorithms, neural networks, situational analysis and cognitive modeling [1].

Computerized accounting at the enterprise implies collecting information about various aspects of the processes taking place at the enterprise, including accounting for finances, accounting for resources, accounting for working time, and so on. This data can be used both for delivery of state report and for building internal decision support systems and interaction with partners.

Interaction with customers involves many aspects, ranging from classic CRM systems and ending with online sales in popular social services, networks, messengers, etc. The main task solved by the subsystem of interaction with customers is increasing sales and forming a favorable image of the enterprise.

Systems of technical control and robotization are almost the most important in the manufacturing process, as they allow partially or completely replace human work without significant loss of quality and its improvement in some cases. This class of systems includes telemetry systems, automated system control programs, specialized firmware for robots and so on.

In terms of the innovation model of the economy, which operates in most developed countries of the world, the key points are the use of knowledge-intensive high-tech manufacturing processes, which may be a commercial secret of an enterprise. In addition, a well-developed IT-structure of an enterprise, which often has a distribution character, may be the subject to informational influence from outside. Therefore, information and computer security designed to ensure the security of an enterprise's commercial secrets and the proper functioning of its information systems is of significant importance.

It follows from the foregoing that when building a modern competitive production, entrepreneurs and managers should carefully study and correctly evaluate all aspects of the use of modern information technologies in production management processes. This will allow building an enterprise capable of competing in the global economy.

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## **Unexpected cyber threats and tips to protect against them**

IT development has made everything from irons to cars smarter. Unfortunately, hackers can still find the ways to take science achievements to commit crimes.

This article will focus on the most spread and sometimes unexpected cyber threats that private users face.

1. Malicious subtitles. In most cases, malicious subtitles are created and distributed to users automatically, bypassing a security system, what allows criminals to control the device. Subtitles are written by many authors. Then creators upload them to the shared online repositories where the subtitles are indexed and ranked. However, hackers can control this process. In result, users may automatically download the infected file giving a criminal control over the delivery of subtitles without users' intervention.

2. Voice hacking. There are various forms of voice hacking. Often the target of the criminals is to copy an individual's unique "voiceprint" or to use hidden audio commands to target a speech-controlled system. Voice hacking is based on the deep learning or AI that, by listening to a recording of a person's voice, can imitate it creating new conversations that the original person does not know about. Its allow hackers to log in to the sites which use voice authentication.

3. Fax machine. Thanks to the researchers of the Check Point Software Company, HP fax machine vulnerability has been discovered. This vulnerability allows hacking the device that is connected to a HP all-in-one printer. Hackers send a fax message with a harmful code that looks like a normal image file. In result the system file, which is stored in this message, allows the attackers to access your system.

4. The car. There are practically no automobiles without wireless weaknesses. Criminals can use any vulnerability (for example, a navigation system) for criminal purposes. Another potential threat is connected with stealing data and private information collected by the car manufacturers about fuel level, GPS locations, etc.

5. Wireless mouse. Wireless mice from some famous companies (for example, Dell) use unencrypted signals to communicate with devices that allow an attacker to send unencrypted traffic to the key, posing as a keyboard, and leads to keystrokes. Firmware update may solve this problem.

6. Social networks. Social networks contain a lot of personal information that can be stolen and used by criminals. Even photos you post can be dangerous.

7. IoT (Internet of things). Using your 'smart' device hackers can send emails that contain a virus. To avoid this problem it is strongly recommended to change the factory-provided password.

8. The baby monitor. A baby monitor can run wirelessly that allows you to keep the track of your child and an attacker to keep the track of you, especially if there is a camera attached.

9. A Barbie doll. Attackers can hack a new Barbie, which can listen to kids and answer like a Siri. It has a microphone to record children and uses Wi-Fi to send information to the third parties for processing to be able to respond like a living person. Thanks to this, hackers are able to spy and listen to the conversations.

These examples prove that using technological innovations requires raising awareness. Here are some tips how to protect yourself and recommendations that can help make your devices more secure:

- Log out of all your accounts and lock your computer before stepping away while working in a public place. Logging out should be a mandatory operation.

- Regularly update passwords.

- Secure your Wi-Fi network and do not use Wi-Fi in public places for business operations and money transfers. If you want to offer a free Wi-Fi in the hall for your clients, use a separate password protected network. If you use a public Wi-Fi, make sure the security software is updated.

- Follow the link in the letters sent only from the reliable sources.

- Download information from reliable sites. Otherwise, hackers are able to infiltrate your system.

Therefore, IT developments not only make human life easier and more comfortable, but also create a lot of new and unexpected threats. That is why, the users must be aware of these threats to be careful with the innovations they use. “The internet is powerful, but it is not safe. As ‘smart’ devices proliferate, the risks will get worse, unless we act now” [5].

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## **Artificial Intelligence: best friend or worst enemy**

In the modern world we have hundreds of people-helping systems managed by AI and implemented everywhere. But can we be sure that AI systems are friends for us and modern technologies will not replace humans in the future?

According to MarketsandMarkets Research Private Ltd., a global market research and consulting firm, the AI market will grow to a \$190 billion industry by 2025 becoming an integral part of our life [1]. Other US researchers expect that

- 38% of U.S. jobs could be at a high risk of automation by the early 2030s, higher than Germany (35%), the UK (30%) and Japan (21%). People will mostly be replaced by robots and automatic systems. At the same time, new technologies will create around 9% of new jobs in the USA [2].
- 63% of businesses will have to use AI because of cost reduction pressure [3].
- Labor productivity will boost by up to 40% with the impact of AI [4].

What is more, young developers worldwide are increasingly turning to the study and development of AI as their first projects. Businesses are trying to implement AI everywhere from a toaster to ships and airplanes. 72% of respondents in the media and telecommunications industry expect AI to have a significant impact on product offerings in the next five years. Medical workers also expect the success rate of bot interactions in the healthcare sector to be over 75% in 2022. In the banking sector the rate of bot interactions could reach over 90% in 2022, while 80% of sales and marketing leaders say they are already using chatbots in their customer experience or plan to do so by 2020 [5].

Therefore, we should admit that AI development and integration is an irreversible process as 83% of businesses indicate that AI is a strategic priority for their businesses today because the growing needs and technologies are forcing manufacturers to follow trends and innovate their systems.

Looking at these statistical predictions it is evident that some people can get into the risk zone because the development of technology will remove the need for the particular professions. For individual workers, the key differentiating factor will be education. For example, the estimated potential risk of automation is as high as 46% in the UK for low-level education jobs, but this falls to 12% for those with undergraduate degrees or higher. Therefore, we should expect the replacement of human capacity by the power of computing systems and robotic technology at enterprises.

But the question is whether we should seriously take some experts warnings about the potential danger of AI and stop developing it in order to save future generations from unemployment, poverty and extinction.

The world history remembers several moments when new technologies replaced hundreds and thousands of workplaces but later the technological development, in turn, created more jobs and even provoked a huge economic boost in the long run. At least, we should remember the mechanization of the British textile industry in the 19<sup>th</sup> century that emerged as a part of the Industrial Revolution. Though it is difficult to know for sure now what new professions may appear in the nearest future, we can imagine that AI could open a new era of space exploration for the mankind developing various professions connected with space technologies [2].

So, helping humanity, simplifying the life and considering the AI as an element of the natural evolution of humanity is the "friendly side" of the issue.

On the other hand, we have big companies that rule the world. And the main danger of AI is that no one regulates the built-in AI algorithms in such companies as Google, Facebook or Microsoft. They do not have independent auditors who could prove the integrity and security of the hidden systems that preserve and analyze information received from the users. So, these companies can easily develop and even sell technologies that pose a risk to the humanity.

Another problem is the rapidly growing population of the planet and the expected reduction in the need of human labor. Investors and ideologies of artificial intelligence refer to the art and philosophy answering the question of what people will do in the future when AI will inevitably supplant most human professions: AI technologies will let people make more efficient use of their time and do what humans do best – create, imagine and innovate new things. However, AI today can successfully imitate the human mind. That is why, in the future, there may be no need in people to create works of art, music or cinema because dozens of AI can cope with this no worse. For example, AI has already learned to replace faces of the actors in films, which means that soon it will learn how to create films and even personalize the color of the eyes of the “actors” based on the person’s preferences.

Summing it all up, we can say that a technological breakthrough and a turn in the history of mankind are inevitable. AI is a powerful technology that we have mastered for over several decades, but which can destroy the Earth’s population in a matter of years becoming uncontrollable. So it depends on us only to make all these changes benefit the planet and future generations and not become the point of no return for the history of life on the Earth.

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### **Biometrics as a way of information security**

An important element of ensuring integrity, confidentiality and availability of information is the protection against unauthorized access to resources of information systems that causes the necessity to create reliable and convenient access monitoring systems. For this purpose, the system gives access to the system objects on the basis on their identity, i.e. it performs authentication.

Particularly valuable are ensuring secrecy and possibility of distant monitoring access systems in various spheres of their application, for example, in banking, administration of networks, power systems etc.

The need for person identity authentication is caused by the active informatization of modern society and an increase of confidential information flow.

The analysis of modern access monitoring systems testifies to the fact that there is the obvious shift towards the use of biometric methods that are convenient and reliable.

The biometric characteristic of the person is his/her measured physical or personal behavioural traits. Recognition procedure involves the comparison of those. Biometric technologies contain methods and technical means of the problem solution of two significant modes: identification and authentication of the person [1].



Biometric authentication applies characteristics and traits of a person. They are divided into static (connected with the person's unique physical characteristics) and dynamic (connected with the features of performing any action by a person). The former, for example, includes fingerprints, a shape of a palm and an arrangement of veins on the outer side of a palm, an eye retina, a shape of a face, the thermogram of a person etc. The latter, for example, covers a rate of typing on the computer keyboard and handwriting.

Biometric identification system includes four steps: information acquisition - a physical or behavioural sample is captured by the system; pre-processing - received information is produced for the follow-up action; pattern matching - matching a sample with the stored in database user's template; authentication - the system solves, if the sample matches the stored template [2].

At the present time, experts highlight the following main directions of biometric technology application: the safety of society and state; information security; access control; setting-up of major projects of identification systems; accounting the working hours.

Advantages of biometric security systems are obvious: unique human qualities are good because they are incredibly difficult to forge. To leave the person's fingerprint instead of someone's or make an iris of the eye similar to somebody's is next to impossible.

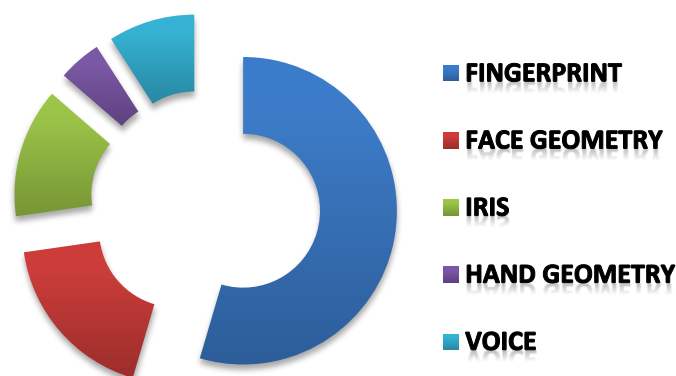
As opposed to the paper identifiers (passport, driving license, identity card), password or personal identification number, biometric characteristics can not be forgotten or lost because of the uniqueness, and they are used for prevention of theft or fraud.

Application of biometrics in the modern world could considerably simplify our life. There will be no need to carry around plastic cards or work permits and remember passwords. You will be the password, the code, and the admission.

Obviously, biometric has weaknesses. Even if the thief has not access to the protected property, the possibility of surveillance and attack on the carrier of biometric identifiers for the purpose of gaining access still remains.

If the text password is stolen or lost, it can be canceled or changed. In contrast, biometric can not be changed. If templates of any person were stolen from a database, the new ones can not be issued.

Biometric systems are characterized by the « false reject rate » parameters (when authorized users are categorized as imposters), and « false accept rate » parameters (when imposters are categorized as authorized users) [3].





In addition, hackers should not be forgotten. By means of computer network they are capable of hacking database server with biometric codes which can tell them a lot about a person - from inborn characteristics to the acquired ones.

Despite some vulnerability, biometric systems are widely applied in the leading countries. In a large number of European border control posts the equipment that pull information off the microchip in a few seconds, unlike long paper documents verification has been installed.

An essential feature of biometric systems is the capacity to ensure the security of protected object. Biometric systems have been applied in the financial, military and industrial fields, they have been also equip even in hotels and important strategic locations. For example, one of the Swiss banks uses a biometric access control system based on three-dimensional facial and iris recognition technology which completely excludes risk of loss, theft or unauthorized access to the use of keys.

Using biometrics in ATMs and terminals reduces the level of fraud while withdrawing.

In the end, for the social adoption of biometrics should be taken into account many factors. One of them is that the system needs to be simple to use and at the same time reliable and accurate. But use of biometrics will allow everyone to feel safer, because its main objective is fight against crime, terrorism, protecting personal information and an increase of comfort levels of citizens.

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## **Functional programming**

If you have ever written programs, you must have used variable data (or variables) so that you could change their state during the program running. That is what imperative programming is able to do: it has subroutine functions which can change the program state. These functions lack referential transparency, which means that the same language symbols can result in different values at different periods of time depending on the state of the running program. Sometimes it is really useful because you can give different values to a limited number of variables.

But what if you cannot change the state of variables and have only constants in your program? For example, you get some value from the console and then do not change it till the end of the program. Or you do not change any data in functions, only making calculations and returning result so that the state of the program stays stable until you get some data.

In this case you need to follow the principles of functional programming: it makes functions that do not change variables and each other [1]. The usual function (or method in Java) can get some arguments, make calculations with it, change some outside data that is not a part of this function and then produce the output. But in functional programming you have like a cut version of a function, it means you cannot change any outside data, and even use this data in your calculations, except for the cases when you get them as an argument. That is why functional programming is called 'clear function', and it allows the developers to easily find bugs and miscounts in the program. For example, if you have lots of variables changing all the time and you exactly know what value it gets in the specific time of a program running, you can find a mistake using the time reference. Another situation is when all your variables have the same value all the time. In this case you can find in which function you made mistake and correct it even faster.

The origin of functional programming derives from the lambda calculus, a system developed in the 1930s to study computability, resolution, function definition, function application, and recursion. Lots of functional programming languages can be viewed as elaborations on the lambda calculus [1]. Another popular declarative programming paradigm, logic programming, is based on relations.

Functional programming languages have mainly been used in education rather than in commercial software development. However, specific programming languages that support functional programming, such as Common Lisp, Scheme, Clojure, Wolfram Language, Racket, Erlang, OCaml, Haskell, have been used in commercial applications by a wide variety of organizations [2]. JavaScript, one of the world's most widely used languages, has the properties of a dynamically typed functional language, in addition to imperative and object-oriented paradigms. Even

widespread domain-specific declarative languages like SQL use some elements of functional programming.

Programming in this style can also be possible in languages that are not specifically designed for functional programming. For example, the imperative Perl programming language has been presented as an example of some functional programming concepts in some books. This is also true about such popular languages as C++, Java, and C#, PHP etc. All of them can be used in functional programming. An interesting case is that Scala makes something average between functional and imperative languages due to the presence of side effects and changeable states.

So, what characteristics of functional programming attract the users? The main advantages of functional programming over imperative are the following:

- 1) Most functional languages provide a protected environment, somewhat like Java Language does. It is good to be able to catch exceptions instead of having Core Dumps (files that can help you repair program in case of blue screen of death) in stability-critical applications [3].
- 2) Functional languages ensure safe multithreading. Immutable data structures are not subject to data race conditions, and consequently don't have to be protected by locks. So, if you allocate new objects instead of manipulating the existing ones, the locking can be hidden in the Garbage Collection system.
- 3) Functional programming is characterized by easier testing. Subprograms are very similar to mathematical functions. If they ensure the right result now, the same situation will happen in the future [4].

So, we can conclude that functional programming is an important element of software developer skills because of its advantages over the OOP and other imperative branches of programming. It is used in situations where we have to perform lots of different operations with the same set of data. A good example is Lisp, one of the advanced FP languages, which is used for artificial intelligence applications like machine learning, language processing, modeling of speech and vision, etc.

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## **Difference between a framework and a library**

When coding the program, there are moments when programmers want to save their time and do the program cleaner and more structured. It is time to frameworks and libraries. Libraries are referred to as a set of codes that can save time by already implementing the necessary functions. Though frameworks are like libraries, there are some differences, which will be described in this paper.

With the growing of requests to create web-projects, the DOM (Document Object Model) manipulation must grow too. To solve the problem with multi line and complex codes, John Resig released jQuery, a library for learning and updating DOM. In the course of this, multi-line tasks could be solved in a single line now. It was also a feature of jQuery that he was independent of how, when and where it was used. Adding it to the code did not need to change the existing code. In essence, this is just an abbreviated entry for executing common JavaScript templates.

Frameworks are just like libraries, but there is not only the difference in their names, but in their capabilities. If compared with libraries, frameworks will do a task easier by creating a basic structure for an user. A similar reaction to requests and emerging problems in web development also found a solution in the form of frameworks such as React, AngularJS and Vue.js. They, like jQuery, offer a variety, time-saving abstractions for manipulating the DOM, but in that case a programmer must learn frameworks and all the concepts applied inside it, because they provide programmers with several places to plug a developed code. The developers in general tend to use the terms “library” and “framework” interconvertible. It is undeniable that both of them are code written by someone else to help you solve common problems. The technical differences between these terms are described in detail by Wozniewicz (2019).

To sum up, frameworks and libraries are abstractions released by someone to solve the problem of level of difficulty in creating some functions. The main difference between libraries and frameworks is that the framework runs your code, and, in general, controls its own environment; while the library is something that you use from your code, controlling your environment yourself.

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## **Is the future really behind quantum computers?**

In the modern world, news of new discoveries and new technologies hasn't surprised us for a long time, but some of them really deserve our attention and today. So, it will be interesting to find out about a completely new and not fully implemented technology.

Quantum mechanics describes everything that happens in the quantum world. In 1980 the idea of quantum computing was proposed by ukrainian scientist Yuri Manin wich lived in Simferopol.

In 1981 the simplest model of a quantum computer was proposed by american physicist Richard Feynman in his famous lecture: Modeling Physics on Computers.

In 1982 the concept of a quantum Turing machine was introduced.

British theoretical physicist David Deutsch proved that the computational power of computers using the manipulation of atoms and molecules can exceed the capabilities of classic computers.

in 1994 author of works in the field of quantum computing Peter Shore discovered an important algorithm that allows quantum computers to quickly factor large integers,

In 2000s the first working 5-qubit computer at the Munich Technical University - the leading European higher educational institution of that time was demonstrated.

In 2007 the Canadian company DIVIDE presented the first 16-qubit quantum computer.

Such a computer can instantly perform calculations and work with a large amount of data 100 million times faster than a standard computer.

The reason why they are so powerful lies in the principle of their work.

A quantum computer (as opposed to the ordinary one) operates not with bits (capable of accepting either the value 0 or 1) but qubits that have both 0 and 1 at the same time. Theoretically, this allows all possible states to be processed simultaneously.

Quantum computing applications:

1.IBM WATSON artificial intelligence and ibm cloud blockchain will help prevent smuggling of diamonds.

2.Medicine and molecular modeling. Quantum computer helps create new drugs and simulate chemicals.

For example, google has already been able to simulate the energy of hydrogen molecules.

3.Supply and logistics. Quantum computers help you find the best solutions for efficient logistics and supply.

4. Financial services. A quantum computer will be able to simulate different financial situations and prevent risks with a large number of random scenarios.

5. Weather forecast. Creating climate models for disaster prevention and modeling of the human impact on the environment.

And this is not all the possibilities of a quantum computer.

Quantum programming problems:

-to work you need to learn new programming languages

-physical elemental base will a quantum computer be built as a result

-it is very difficult to create a large quantum system where elements will interact with each other and at the same time will be well protected from the environment that can destroy them

-quantum computer stability. The interference of any vibration violates the vibration of atoms creating nonsense. This is the main problem: even the passage of particles or a truck under the window can disrupt the calculation process.

99% of the power of a quantum computer is spent on error correction and only 1% on solving problems.

Quantum computers will allow us to raise our understanding of the biological systems structure and the course of various processes in organisms to a new level.

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### **Internet of things: future is near**

Over the past 20 years, technology development speed has accelerated incredibly. It leads to many innovations in our everyday life. One of these innovations is the Internet of Things, which is successfully integrated into the daily life of a large number of people.

The Internet of Things (IoT) is an Internet connection between physical objects through which electrical devices can communicate with each other, transmit information and be controlled from a distance. For example, to control the state of the body, a large number of people use a wrist bracelet that monitors the pulse, body temperature and other things. So, this bracelet can be used as a sensor for the Internet of things to transmit information to devices and thereby automatically put them into action and rationally adjust to the state of your body. The air conditioner will make the optimum air temperature, the moisture dispensers will start to work in accordance with your body, even the food from the restaurant can be automatically ordered by the system.

The system allows you to significantly reduce the number of your actions and time for making decisions, which in turn allows you to use your free time more efficiently.

But there are also flaws in this system, such as cybercrime. Cases of cyber attacks have already been reported one of the worst of which occurred in 2010 in Iran and was named Stuxnet. The uranium enrichment controllers were hacked, thousands of centrifuges were stopped, and because of this, the development of the Iranian nuclear programme was delayed for a year.

Despite the cases that have occurred, the development of IoT continues, huge amounts of money are invested in it and continue to spread around the world. Measures are being taken to cybersecurity devices. In 2017, the US Congress passed a law on the Internet of Things that ensures that the device is protected from the security vulnerabilities, and users have the right to change passwords.

It can be summed up that the Internet of Things has both advantages and disadvantages. Despite the disadvantages, people are increasingly using this system. By 2020, more than 20 billion devices will be connected, not counting computers, tablets and smartphones.

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### **Machine learning can help predict earthquakes**

Information technologies are being introduced in many areas of modern life and help us live in comfort. But they can not only provide people with conveniences and make their lives easier, but also save them. And one of the areas where it is used for life safety is earthquake seismology.

Seismic activity has always been a big problem for humanity. Over the years, more and more information has been accumulated about this phenomenon. But it is difficult for a human brain to process and analyze this amount of data. That is why seismologists began to use machine learning (ML). This technology can forecast sophisticated patterns in earthquake activity, understand and interpret them with the help of digital data processing methods.

According to the Seismological Research Letters journal, more accurate prediction, identification of earthquake centers, characteristics of seismic waves as well as their difference from other types of ground “noise” are done through ML [1].

But how does this technology work? Machine learning is a set of algorithms and models that allow computers to identify and extract patterns of information from large databases. ML methods are based on data analysis, without reference to the real-world and physical mechanisms represented by the data. In result, it becomes possible to save all aspects and details of the earthquakes occurred. Because the media resources on which these data are recorded gradually degrade, computer technologies are in a race against time to protect this valuable information giving a helping hand to seismologists who explore and predict earthquakes.

Seismologists can also imitated tectonic activity in the laboratory. Such a study was conducted using a seismic test facility at the Los Alamos National Laboratory. Scientists used ML on the basis of the "random forest" method to determine the factors preceding the occurrence of an earthquake [2]. This method was based on decision trees, each of which predicted the time to the nearest oscillation.

Another effective factor in the prediction of a laboratory earthquake was low-frequency sounds made by blocks before the collision itself. These sounds are emitted by waste mud, a clay-rich soft rock, during a fracture when the earth masses are moving. This “noise” helped to predict the time and the power of the earthquake.



In addition, ML technology can scrutinize the seismic data and, using algorithms, forecast earthquake aftershocks, track the movement of tectonic plates, mark the deformation at the boundaries where megathrust earthquakes may occur, and describe volcanic activity [3].

It can be concluded that ML makes the work of seismologists easier and human's life safer, as it can identify the earthquake location and predict seismic activity in the environment. And the ML potential has not reached its limit yet. The development of this technology can open new opportunities for the life safety.

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### **Future of 3D printing**

Not so long ago, 3D printing was looked at as something completely new. However, in those times the technology was not developed enough: the printing speed was too low, the material was expensive, very heterogeneous, the hardware was too expensive to be widespread used. Everything radically has changed in just a few years. Today, 3D printing is used everywhere and is of interest not only to scientists but also for ordinary users. So, what the situation is now, why 3D printing is better than the other types of materials processing and what is a 3D printer, in general, are in the focus of this paper.

A 3D printer is a device that uses the method of layer-by-layer fabrication of a physical object from a virtual 3D model. The first printers of this type appeared about 30 years ago, and today are represented by a dozen different types. The principle of operation of the 3D printer is simple: the dispensing head on the surface of the cooled base platform squeezes out the drops of the material in the heated state. Freezing fast and sticking together, the drops form the layers of the object. That is the way how voluminous object is produced.

There are several reasons for using 3D printing. Consider the foundry industry. In the traditional casting process, the mold can be made manually or by machining. However, it is impossible to implement some forms manually, especially for manufacturing the others, using a five-axis CNC machining centers. This method significantly increases the possible variety of forms and decreases the costs.

This way of producing castings is feasible for mass production. In the small and medium series it is not economically feasible - here the use of 3D printing is more rational. One of the tasks the technologists facing is minimization of labor-intensive machining operations. 3D printing allows to speed up the process, bypassing the traditional steps in the technology of manufacturing castings. The manufacturer can obtain the required model or form in one operation without the cost for additional raw materials.

3D printers provide unprecedented freedom in design and production, which is rather limited when forging and rolling. Thanks to an extensive selection of standard metal alloys and new high-tech materials, they allow to achieve the highest accuracy and density in the smallest products. One of the main advantages of 3D printers is the possibility of obtaining high density metal products. Thanks to the SLM technology (selective laser melting) and a huge choice of materials, the density is only 10% lower than when rolled. 3D printing methods make it possible to achieve a very fine granular structure and create products of the highest accuracy and clarity. In this regard, traditional methods are far behind. Thus, additive technologies are ideal for printing with metals in the production of small (and especially the smallest) parts and geometrically complex objects.

Machining is not inferior to 3D printing. When it comes to complex parts and components, the manufacturing process imposes certain limitations. The methods used in the refinement of objects may not be sufficiently thin for details of sophisticated design. 3D production processes make it possible to implement almost any design solution, regardless of its complexity, in moreover, in a reasonable time. This allows not only to eliminate additional assembly steps that are required for traditional methods, but also provides more freedom for design decisions. Human resources are also saved: only the design and production departments are involved, and logistics and assembly units are excluded from the process. Finally, one of the key advantages of the technology is that financial costs in production are reduced.

All the advantages lead us to the conclusion that the prospects for volume printing will expand. The use of 3D printing finds itself in the most unexpected areas of human activity, which once again underlines the importance of this technology. Despite the relatively slow start, the concept of 3D printing was finally gaining momentum and popularity among manufacturers and customers. A lot of advantages of 3D printing, including a shorter production cycle, more complex design and improved quality can be mentioned the peak of popularity and functionality of this technology is still ahead. The question of what opportunities 3D printing will provide us is still open.

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### **Simulation of infectious disease spreading**

Infectious diseases are a threat to human health and are considered to be as one of the leading causes of premature death on Earth. Therefore, searching tools to analyze and assess the risk of an infectious disease spreading among people is an important socio-economic problem. Developing simulation models may be useful to predict and analyze infection extension and result in searching localization methods as well.

A multi-agent approach can be applied to simulate the spread of infectious disease and is considered to be as a fundamentally new method to solve these problems. In the contrast to the classical methods where deterministic algorithm is defined, in multi-agent technologies the solution comes automatically as a result of the interaction of many independent elements that are called as agents [1].

Multi-agent systems are designed to solve various tasks of artificial intelligence where several participants are interacting with each other. These systems are capable of reproducing complex processes that take place in real life.

There are many platforms suitable for creating multi-agent systems. The most popular platforms are NetLogo, Repast Symphony, Eclipse AMP, JADE, and Jason. All these platforms are implemented quite differently: from separately developed environments and libraries to built-in plugins. The simulation model of infectious disease spreading was developed by NetLogo. Its performance can be described in a following way:

The model simulates people behavior during the epidemic:

- an infected person appears among healthy people;
- a healthy person becomes infected when meeting an infected person;

- the immune system of infected people decreases;
- the immune system of healthy people increases;
- an infected person can be recovered in the hospital;
- a person dies when the immune system is equal to zero.

The agent in the developed model is a person who can be infected and under certain conditions infects other agents. The agent can be in one of three states: healthy, sick or dead.

Running simulation model is shown in Figure 1. Infected people are shown in red color, healthy – in white color, and hospitals – in yellow color. Each agent has the immune system displayed as a constantly changing number. The immune system of the healthy people increases by 1 after each movement (not exceeding the upper limit of 200). The immune system of the infected people decreases by 3 after each movement. Simulation speed can be changed by a slider located above the window of the agents "virtual world". The running of the model stops when either healthy or infected people remain in the model [2].

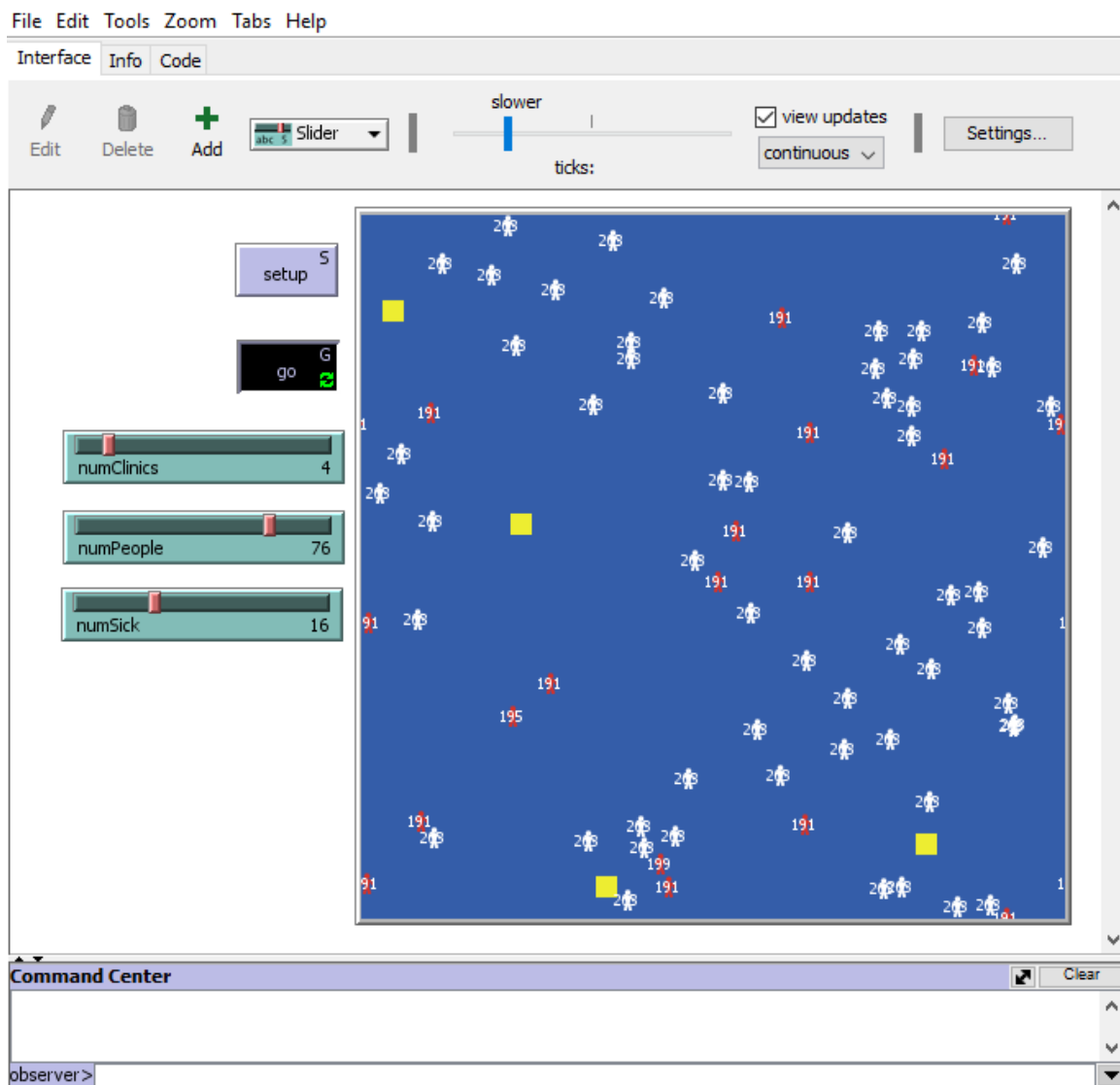


Figure 1 – Running of the model

It should be concluded that a multi-agent approach is the most promising one in the field of epidemic simulation, since it allows observing visually the spread of infection among people. The developed simulation model of infectious disease gives the possibility to conduct an epidemic situation analysis. Moreover, a developed model can be improved by adding more detailed statistical information. For example, information about the chances to recover and/or get infected depending on person age can be involved as well.

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## **Google Stadia: the first step into mighty new future**

In 2019 Cloud have gain the biggest potential since its inception in 2006. Just for a decade it has evolved from cloud storages like Google drive and Dropbox to the services that have no limits in computational power. A lot of programmers nowadays use these services and save a lot of money by paying a fixed monthly price instead of updating their PC with new video cards and CPU every five years. And now it merges with one the biggest business spheres - video games.

It is predicted that Sony’s annual gaming segment revenue is going to be record 21.4 billion dollars. In 2016 and 2017 it rose 10% annually, so it is obvious for the majority of big corporations that gaming is an extremely good sphere for investments. Google, which has not made its big step into the video gaming business yet, is planning a big revolution in this sphere to outshine the success of its competitors. On March 19<sup>th</sup> on GDC 2019 Google announced Google Stadia, a new cloud gaming platform allowing the users to play games with the best graphics on any device that has Google Chrome. The power of this platform is 10.7 teraflops, while the power of XBOX One X, the most forceful console, is 6 teraflops.

The biggest advantage of this platform is flexibility. The only thing you need for a proper work is good internet connection, but nowadays it is not a big deal. To run a game in Full HD and 60 fps, Stadia needs 8 Mbit/s, while in Ukraine, for example, you can get 100 Mbit/s Internet for only 50\$/year. The less obvious problem, but more important is a signal delay, is ping. After the conference many people considered that ping in Google Stadia will be bigger than ping in XBOX One

X and Playstation 4, and there are a lot of reasons to think that way. But the results of digitafoundry.net tests have already shown that Google's new platform has 166 ms ping, like their competitor's XBOX One X if the display's delay is counted (without display's delay being counted XBOX has 145 ms ping). The last argument in the discussion about ping is the new controller that was developed especially for Stadia: it is not connect to the device, which you are using, but it is connected directly to Wi-Fi, so it minimizes the delay of game on Google's server reacting on users' actions.

The next important question is the business model. Google representatives said literally nothing about how Google Stadia will be monetized. There are some variants like Google taking money for using of its servers or customers paying the full price for games. Google can also take interests from game sales as big distributors like Steam do nowadays, and, therefore, will not take money from customers.

Even though Google Stadia has its problems, this platform open up a door to the new gaming future, where a user does not need to have a big PC or powerful laptop to be always ready to work with a big amount of code and data or just to relax while playing games or watching videos. This platform is one small step for Google, and one giant leap for our lifestyle.

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### Understanding code forking in Open-Source Software

Open-source software (OSS) is a type of computer software in which source code is released under a license in which the copyright holder grants users the rights to study, change, and distribute the software to anyone and for any purpose. Beyond the obvious implementations such as computers and smartphones, open source software can be found in things like TVs, fridges, washing machines, cars and in almost all smart devices.

The topic of code forking is notable mainly by its absence. While an in-depth discussion of its definition will come later, a very general interoperation of what forking means is copying an existing program and distributing a modified version of it. This is something that one cannot do with proprietary software for numerous reasons, including copyright protection and restricted access to the source code.

As much of the extant literature on code forking is to be found outside of academia, it would be remiss to exclude it from this study. Existing literature can be divided into 3 general categories, as visualized in Table:

1. Peer-reviewed research papers (papers included in this dissertation are excluded from the table);
2. Books and practitioner guides, commonly by people whose work is either in, or related to open source software development;
3. Other sources, including news websites, blogs, discussion forums, and other sources of a similar nature, and commonly written by developers or other members of an open source software development project.

Forking, and indeed even the mere existence of the right to fork, affects open source software profoundly. While forking can be seen as the invisible hand of sustainability within open source, forking is also paradoxical in that it has at once the potential to both save and destroy an open project.

Developers consider the right to fork the central or open source, and a right that must exist regardless of their opinions about specific cases in which it is used. Forking is considered unproblematic and favorable when it is done for the good of the code. This can be the case in a number of different ways, among them are reviving an abandoned project, experimenting with new ideas, or customizing a program for a particular need. Furthermore, should the governing body of a program be a single programmer, a group, or a corporation that are obliged to make decisions going against the interests of one or more of the programmers, the right of fork servers as a means of protecting the software and its community's interests through taking the work done so far and continuing it in the direction of their choosing.

Discussing the issue of defining a fork, one developer noted that he didn't think programmers themselves were very clear on its definition. Indeed, when asked about specifics and details regarding what constitutes a fork, developers sometimes pondered the question, seemingly forming their opinion as they answered. While starting a new project based on an existing one is quite a different endeavor than merely contributing to an existing project, GitHub defines the term fork broadly enough to encompass both.

The answer to the question of when a fork is a fork seems to be: that depends on whom you ask. The implications of these findings are that future research with a focus on a code forking must be mindful of the very real risk of different interpretations. Specifically, studies should be designed to minimize variations in the interpretation of fork in interviews and questionnaires. Otherwise, researchers run the risk of collecting data on somewhat different phenomenon erroneously categorized



under the same name, potentially invalidating comparisons between multiple studies or even multiple study participants.

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**Development of additive manufacturing**

Additive manufacturing is a class of promising technologies for customized production of complex-shaped parts according to a three-dimensional computer model by successive deposition of material (usually layer-by-layer). In recent decades, additive manufacturing has begun to gradually penetrate into our lives, displacing more familiar technologies. This type of production is gaining popularity due to some of its features, which we consider below.

The first is the environmental aspect. The industry causes enormous harm to the environment. Greenhouse gas emissions during production, the use of water resources (for industrial needs), the dumping and disposal of industrial waste instead of recycling are only a small part of the environmental problems of industrial production. With the advent of additive manufacturing, it became possible to reduce significantly this problem. According to the research carried out within the framework of the ATKINS project, an exhaustive comparison was made between AM and other production processes in terms of water consumption, waste disposal and use of primary materials. Project results indicate that, in terms of environmental impact, AM has clear advantages. Similarly, AM technologies have significant potential in reducing greenhouse gas emissions by optimizing product design and reducing material loss.

The next aspect that needs to be emphasized is the economic side. A joint study of the European Aviation Defense and Space Company (EADSC) and the EOS Innovation Center showed that raw material savings using AM can reach 75%, and the optimal design (which can be created using additive manufacturing) should give a 40% reduction in weight and material savings. An analysis made within the framework of another study conducted by ATKINS shows that a one hundred kg reduction in the mass of the main aircraft by partly replacing conventional parts with parts manufactured using additive manufacturing during the entire life cycle entails fuel costs savings of 2.5 million dollars USA. Thanks to all these qualities, AM,



compared to traditional production technologies, has significant potential for reducing the cost of raw materials.

One of the most important aspects is the production one. The main advantage of AM over conventional production is that the parts are made directly from a computer file containing a 3D model, virtually cut into thin layers, which is transferred to the AM system for the layer-by-layer formation of the final product. AM technologies provide flexibility that enables the rapid production of complex custom products and spare parts that either cannot be manufactured using traditional production technologies or are required in small quantities. A complex configuration (for example, the presence of internal cooling channels in a part), which cannot be obtained by machining, can be easily reproduced by selective application of the material.

The advantages of digital models include not only the arbitrariness of the form, but also the possibility of their instant transfer to anywhere in the world, which allows to organize a local production on the global scale. Another important feature of AM technology is the proximity of the resulting product shape to a given one, which significantly reduces material costs and production waste.

Already now, additive manufacturing is being actively introduced into such industries as: automotive, architecture, aviation and aerospace, consumer electronics, industry, medicine and others.

In North America, 3D printing technologies are being actively implemented in the aerospace, defense and automotive industries. In recent years, the number of start-up projects in these and other areas has increased dramatically.

The introduction of additive technologies in Europe and the Middle East is slower than in North America. The main focus here is on the use of 3D printing based on laser technology in the shipbuilding industry and in industry. At the same time, in recent years, there has been an increase in investment in 3D printing technology from automotive companies.

China will widely apply 3D printing for the mass production of components for the aerospace industry.

Although now AM is at its early stage of the development it has the following advantages:

- reduction of the time and cost for launching the product into production due to the absence of the need for specialized tooling;
- the possibility and economic feasibility of small-scale production;
- operational changes in the project at the production stage;
- functional product optimization (for example, the implementation of the optimal form of cooling channels);
- economic feasibility of producing customized products;
- reduction of losses and production wastes;
- the ability to simplify logistics, reduce delivery times, reduce inventory levels;
- personalization of design.

It becomes clear that additive production in the future will prevail over other types of production.

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### **Neural networks: tool or weapon**

Technology advancement nowadays doesn't stop even for a second and sometimes it can be exciting and dangerous at the same time. Especially it considers neural networks. For most people such term as neural networks sounds familiar but yet unknown. Neural network is a framework for various machine learning algorithms which are working together to perform a certain task.

For instance it allows such network to understand what is depicted on photography by learning on huge amounts of pictures where certain object are shown. So basically machine learning is similar to human's. The longer you do something the better you are at it. At first glance there is nothing wrong about it, but sometimes purposes of neural networks are much more questionable.

For example in January 2018 was launched FakeApp, based on GAN (generative adversarial network), which allows users to swap faces on photos and videos. As a result anyone can easily make high quality fake which depicts person performing actions that have never happened in reality.

Luckily, neural networks can be used not only for such unworthy causes. In March 2019 Nvidia has presented it's GauGan, artificial neural network which changes rough paint sketches into photorealistic pictures of nature or artificial creations. Now there is no need to climb high mountain for beautiful photo of horizon, it can be made right on your desktop without sweating and suffering. It leads to logical conclusion that now the only thing that you need to become an artist is ability to dream and fantasy.

Another example of using GAN for good is ChAIr project which was taught by 20<sup>th</sup> century chairs. For now most of furniture which was created by ChAIr is rather uncomfortable, even impossible to use, but it is likely that in a few years you will be

able to by a chair designed by AI in nearest Ikea. Still I would recommend you to see what this project can do now, at a very least it is rather funny.

In times of globalization anything that happens in the world affects Ukraine as well. Perhaps, it will take a while before all those technologies could be used in our country, however those will be more stable and safer versions, so you can be shure that your ChAIr will be as comfortable as possible.

All in all artificial neural networks are not bigger evil than hammer. User is the one who is responsible for how such networks are used. Sometimes even one and the same GAN can be used to create both illegal content and great artworks. So I would say that even the greatest tool can be used as a weapon and even weapon can be used in purposes of art.

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### Software distribution in IoT

Imagine you come to the door of your apartment, look up to face recognition camera, hear “Welcome home” and the door opens. As you close the door behind you and hang your coat, you hear “You’ve been wearing this coat for three weeks already. Don’t forget to pass it to cleaner and pick other one from the wardrobe”. Your watch buzzes and as you look at it, you see “Tea is ready” on it so you proceed to kitchen. This sounds like a pretty short path for a person, but a long path for technology. How soon we will end up there? And how long ago technology for it started? What challenges we’re facing along this path?

Let's start with the concept of "Internet of Devices"(IoD). We live in IoD world for a couple of decades, where electronics connected through Internet. But a lot of things we interact with are left aside from being connected, so, at some point, we connect things with devices by inputting some data into computers manually, for example. Meanwhile Internet of Things (IoT) represents a vision in which the Internet extends into the real world embracing everyday objects. Physical items are no longer disconnected from the virtual world, but can be controlled remotely and can act as physical access points to Internet services. An Internet of Things makes computing truly ubiquitous – a concept initially put forward by Mark Weiser in the early 1990s [1]. But IoT also raises a specific challenge among others: since a lot more different real-world objects become parts of it, how distribute software for them?

Containers are a solution to the problem of how to get software to run reliably when moved from one computing environment to another. A container consists of an entire runtime environment: an application, plus all its dependencies, libraries and other binaries, and configuration files needed to run it, bundled into one package. By containerizing the application platform and its dependencies, differences in OS distributions and underlying infrastructure are abstracted away [2]. In particular, Ubuntu Core and Snaps are already pretty widespread way of distributing software across manufacturing machines, so let's review their advantages and disadvantages.

Among potential advantages:

Publisher can handle dependencies without considering OS app will run on.

Snaps allow the installation of different versions of the same package.

Self-contained apps bring more security to both OS and apps themselves.

Let me expand a little on last one: software distributed in self-contained way can be easily explained by sandboxes. Each single app thinks it's the only app, that exists in OS (along with dependencies), while OS itself is just playground supervisor for all sandboxes, providing toys (interfaces for network, printers, displays, etc.) for sandboxes so they could act properly.

Some of disadvantages or limitations:

Security issues with specific interfaces.

Bigger memory (both physical and virtual) consumption.

Relying on publisher's competence to package and deliver apps properly [3].

After reviewing pros and cons, you may notice one confusing thing: sandboxing apps and providing interfaces is both security advantage and disadvantage. That's because of nature of software ecosystem: the concept itself has potential to be far more secure for whole OS and userspace, if implemented properly, but due to variety of standards and approaches to software development it ends up with issues, that originate from concept itself. After all, snaps already found their user, so let's look for some advocates of Ubuntu Core and Snaps.

First advocate is Mike Bell, advocates for security of devices: "With a server, you care about security on every platform, but with an IoT device, that device is physically vulnerable as well... In enemy hands, the container approach is more robust than conventional apps -- or at least any weaknesses can be dealt with more

quickly and in an organized way”. Jason Shepherd, director of IoT strategy and partnerships at Dell feels optimistic about snaps: “We knew we had to pick a Linux OS because there is so much of IoT that is spinning up on the Linux side of the house compared to the PC space where it's more predominantly Windows. It's the right approach when you want to have a very bare OS running on the box and then only add what you need to make your solution work, because then you minimize your attack surface” [4].

Self-contained apps, such as Ubuntu Snaps are not only one of the ways to shape software distribution across different devices, but also a reflection of IoT evolution. I think in a half of a decade they will be spread enough, along with more IoT devices for comfortable solving of both everyday tasks and developing and manufacturing problems.

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**Big Data**

Buying tickets, online shopping, ordering a pizza, calling a taxi - all these are situations when you send very sensitive personal information to the World Wide Web - passport data, full name, home and work address, map of regular movements around the city. Unfortunately, you do not know where this data goes, who stores and processes it and for what purposes they may be used. That is why an attempt is made to explain what Big Data is, analyse why old data storage technologies do not work, identify what a cyberattack is and predict what protection methods cybersecurity experts may provide in future.

Technology develops evolutionarily, until it reaches a certain limit, and then there is a revolution, a paradigm shift. Many approaches that seemed universal lose their relevance, and new concepts arise in their place.

Even if a person does not have any accounts in social networks, the universal transition of commercial services to online almost forces you to leave "digital traces". The more information about the user is available to the security officer, the more

accurate their profiles. Behavioral analysis in corporate systems will inevitably take account the actions of an employee outside the company and its business processes. It leads to large-scale data collection and analysis technologies be developed (Big Data).

Big data is various tools, approaches and methods for processing both structured and unstructured data in order to use it for specific tasks and purposes. Huge amounts of data are processed, so that a person can get specific and necessary results for their further effective use. Regular databases are outdated; they cannot store and process unstructured data. Big data solves this problem. It successfully stores and manages unstructured information of large amount. Structure information coming from various sources (video, images, audio and text documents) into one single, understandable for all.

The modern average employee has many accounts in a variety of systems - corporate email, several public email services, instant messengers and cloud storage. As a rule, the actions of a person in each individual account look innocent, but their comparison instantly creates an obvious picture of the planned violation. The problem is that for the majority of modern systems all of this is scattered information, from which a person is forced to manually fold a single picture. If all this information about each employee were not summarized in a single personal dossier, the information security service would most likely have missed the incident.

After all, a security officer in a company of about 500 people receives hundreds of notifications of potential violations every day. In such a flow of information, it is almost impossible to single out the “same” notification, especially if by itself it does not look critical. When it comes to manually comparing the logs of various systems, the task becomes overwhelming.

Similarly, big data is used to protect employees against external cyberattacks. For example, one of the employees at some point began to behave unusually – s/he began to turn to corporate resources that s/he had not used before. Such a deviation from the standard profile of his/her behavior is an excuse to be wary, by convention, the “yellow” level of threat.

The data from various sources, collected together, made it possible to identify the cyber attack and, most importantly, take timely measures to counteract it. However, while analyzing big data poses several major problems. The first is that its storage and processing requires large hardware capacities. Even if we discard this problem, the fact remains that the aggregated information about users is very heterogeneous. These are videos, images, geotags, text and more. Technologies for their automatic analysis and search for correlations are still very imperfect.

The new concept of information security is based on monitoring human actions, rather than information movements, and now it is obvious that it will become the driver of the development of many technologies that are now at the very beginning.

Today we are on the verge of an information revolution all over the world. With the advent of new technologies and the world wide web, more and more people leave personal information online. In order not to get confused in this amount of information, we are obliged to structure this data, which conventional databases

cannot handle, our solution is Big Data. But even here new problems appeared: confidentiality and cyberattacks.

The analysis of big data provides unique opportunities for the predictive analysis of the conduct and, as a result, the possibility of a preemptive, rather than after the fact, reacting to information security threats. To protect ourselves and others, we are obliged to invest the maximum amount of effort in the development of this technology.

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### **How websites understands our interactions with them?**

Every website, like social networks, have a logic to makes us possible to interact with other users, share our emotions, photos and opinions. This logic is called business logic.

Understanding our actions for website is possible by saving our data and data segregation. So, to use it in a proper way, websites should understand what data should be shown.

There are many architectural solutions for implementation these princips, but one of the most famous in this field called MVC, which stands for “Model-View-Controller”.

Model, View and Controller are basic units to communicate with user.

Model is responsible for raw data. It knows, for example, what is User, what is Post, which relations they have, etc. So, Model could return us full data about small units like user, post, user followings, user ‘likes’ and anything about it.

Hovewer, Model works only with data. It can not know, which exactly data should be represented.

So, we move to another unit - Controller. Controller is responsible for making requests to Model and Controller understands which Model relations should be called from Model.

When user clicks on some link, for example, link “All my friends”, Controller takes this user request, then it makes request to Model User with ‘low-programing’ logic request to show all users, who are friends for our user.

When Model data passed to Controller, Controller makes wrapping for that data, to make it holistic. And then this data should be represented to user.

View is the unit to visual representation. View is just a HTML file, which filled with data, which came from Controller. So, when Controller makes a wrap for data, it passes it to View. And View understands the only one thing - where is this data should be placed on web page.

Wrapped data is so compact for View unit, so view never cares of relations of this data with another data or anything like that. It just produces proper visual representation.

This is brief explanation of sites logic. This explanation does not includes many other things like how user requests comes to website logic. But this way of data representation could make us take a look at websites with fresh eyes. Understanding of the work of basic things makes this world more interesting.

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### **Finding your specific area in IT industry**

Working in the area you like is a key to your future success. IT industry is one of the most demanded in Ukraine. Here, the main difficulty is that there are many different areas in IT, and it can confuse anyone, when s/he is looking for the area they want to work in. All IT industry can be grouped into the following categories: *development, management, analytics, quality assurance and technical support*.

The first aim is to choose the category, then to think about occupation in this category. The second target is to choose the most suitable profession based on the skills and wishes of a potential employee. A short review of every category made in this paper may be useful for specialists to define the most suitable one for them.

1. Development is a process of creating software including designing, analyzing, programming and debugging the product. Developers can be divided into three groups: front-end (user and program, interaction), back-end (program and server interaction) and mobile developers. To be a developer there is a need to know program languages, Databases, OOP skills and ability to work with frameworks.

2. Management is a process of controlling the project, including communication with customers, keeping documentation, market research and team management. Managers in IT can be divided into team leaders, product and project managers. To become a successful PM, one needs high communication skills, understanding development of product lifecycle(s), excellent English skills.



3. Analytics includes analyzing in different IT related spheres (business, data, market, etc.). Analyst must have analytical and solution-oriented thinking, understanding the developmental process, strong English skills.

4. Quality assurance (QA) is a process of removing and/or preventing all defects and problems in the product and preparing product for a user. People working in QA can be divided in QA tech leaders and QA engineers. Necessary skills for them are knowing program languages, working with version control systems, API level testing, knowing software and bug lifecycle.

5. Technical support. The main aim of technical support is to provide assistance to all computer systems and hardware as well as to company staff and users. They must know a lot about computer hardware and software, have good communication skills. Technical support includes system admins, technical writers and other.

This brief review of every category can serve as a checklist of the skills you have. To choose a job to your wish, all you need is to self-assess yourselves and make a right choice.

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### **Multiband fractal antennas**

A multiband fractal antenna is an antenna whose active part has the form of a self-similar curve or some other similarly dividing or similar segments of a figure [1].

The functional purpose of these antennas is that with relatively small geometrical dimensions, they are broadband and multi-band due to the large number of resonant frequencies, thus they are economical and small-sized, while their gain is higher [2].

A unique feature of fractal antennas is a theoretically infinite compaction of a limited region of space with the antenna geometry, and as a result, additional resonant frequencies in the working wavelength range, often exceeding the external geometrical dimensions of the fractal compact structure. Since effective lengths play an important role in antenna design, fractal packaging can be used as a viable aspect of the miniaturization technique.

Antenna includes from one to ten related segments. The iteration number determines the number of connected elements of the antenna. The first iteration has one element. The corners of the antenna segments are rounded that reduces the connection between adjacent elements [3]. The presence of connection between closely spaced segments in a fractal antenna leads to a decrease in its effective length, that is, to a deterioration of signal reception at low frequencies due to an upward shift in the resonant frequency and to passband narrowing. A feature of fractal technology

allows significantly increasing the resistance of frame antenna at frequencies lower than resonant one, simplifying coordination of radio direction finding and frequency monitoring.

Nathan Cohen, a future professor at Boston University, realized that the antenna, made from a fractal pattern, has high efficiency and covers a wider frequency range compared to classical solutions. Due to development of the theory of fractal antennas, further research has led to their wide practical use in mobile devices. Their compactness and broadband properties made them indispensable in wireless communications, in Bluetooth, Wi-Fi and GSM standards. The performance of fractal antennas in the television range was also noted. Many other microwave devices also use fractal structure.

In general, the fractals interest in the theory of antennas played a productive role and enriched its mathematical apparatus describing the form of radiators, simplifying and refining the simulation of antenna systems properties in their design. It also led to reducing dimensions that gave positive perspectives for their applying in telecommunications [4].

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### **Robots: terribly frightening or deadly cute creatures?**

They can do a lot: assemble furniture, print metal constructions on a 3D printer, clean up, and even fly. They can do even more, but what is a robot? There are many definitions of this concept. Traditionally, a robot is a machine that perceives, thinks and acts. You can add the ability to communicate to these three characteristics and then we may say that a robot "perceives, thinks, acts and communicates".

We are used to watching videos about robots on TV or reading articles on the Internet, but we do not even suspect that robots are already among us. Refrigerators that control the freshness of products and can independently make orders in stores. Washing machines that can do any work being controlled remotely. Microwave ovens identifying the type of a product and making decisions which cooking method to choose. All these examples are the Internet of things in action, which seemed just a crazy experiment 10-15 years ago. Whose mind talks to household appliances and gives commands to instruments?

Even sockets and light bulbs, scales and fans gradually acquire “smart” functions. Sockets can turn the electricity on and off on command. They automate the work of devices, connected to them, and save energy. Light bulbs have a similar story: controlled via Bluetooth, they can change the brightness or use the lamp as an alarm clock, setting a specific time to turn it on.

In general, everything goes to the fact that soon home gadgets can be combined into a single “ecosystem” controlling their work with the help of a smartphone, a tablet or by voice commands.

However, not only domestic tasks fall on the shoulders of these mechanical creatures. In fact, in the modern world, robots are used in completely different spheres of life, which many of us may not even guess.

One well-known field of their application is medicine. A major breakthrough has been achieved in this sphere since bionic prostheses, which a person can manage with the help of his own nervous system, began to be used. In June 2017, the deaf-blind 59-year-old was successfully implanted with a cybernetic retina. The device displays a picture of pixels and the patient sees the surrounding objects in the form of black and white outlines while special exercises allow the brain to recognize them[1].

No less successfully robotic systems are used in the field of security: devices with special sensors quickly detect flammable situations and successfully prevent them [2].

There are also military bases where they use robots that mimic the actions of the enemy. Such training mechanisms can reproduce human habits. In addition, there are reconnaissance and combat models [3].

Despite the fact that the above information develops a positive attitude towards robots, there are also huge shortcomings in robotization:

- Energy consumption - the performance of the mechanisms depends entirely on the power sources, and the volumes of energy consumption are quite high;
- Unemployment increase - the replacement of personnel with robots can lead to a reduction of a large number of people working in factories.
- Degradation - there is an opinion according to which modern robots and their use can adversely affect a person in the future. If all the hard (and later - mental) work is performed by artificial intelligence, a person can stop developing.

However, the development in the field of robotization is happening faster and faster. And this year their cumulative speed and, most importantly, the synchronicity

of changes, perhaps, got an obvious sign of the approaching changes. Or, as some theorists call it, technological singularity – “accelerating progress in technological inventions that will make ordinary humans someday be overtaken by artificial intelligence” [4]. In fact, some experts predict that if the artificial intelligence (AI) continues to develop at its current pace, “the singularity could come about in the middle of the present century” [4]. So, the transition will not happen next year but, perhaps, we must begin to prepare now.

Therefore, a great attention should be drawn to the relationships between humans and robots. They are so complex that they have spawned their own domain, known as the interaction of a man and a robot. It is easy enough to adapt robots to get along with people — to make them “soft” and give them a sense of touch, but the problem is to teach people how to get along with machines.

So, whether we like it or not, machines promise to change almost every aspect of human life, from health care to transportation and work. Should they help us drive? Absolutely. They will, nevertheless, have to decide to kill somebody sometimes, but the benefits of accurate driving far outweigh the risks. Should they replace nurses and policemen? Perhaps not - a human touch and support will always be required for certain types of work.

One thing is clear: machines have arrived. Now we need to figure out how to handle the responsibility for inventing the completely new “creatures”.

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## Different mobile phones for different needs

It is believed that new mobiles have lost their original role, and now they are mainly used for business and entertainment due to the rapid development of IT.

The functionality of the first phones was very limited. In 1973, the first prototype of a portable cell phone, the Motorola DynaTAC, was released. DynaTAC

weighed about 1.15 kg, there were 12 keys and no additional features, and it did not have any display. The battery provided up to one hour of talk time and up to eight hours of standby mode. By today's standards, this phone did not have any advanced features and capabilities that a modern phone has. However, a modern user faces another challenge: how to choose the phone that suits you best. This paper offers some recommendations which can be useful in this case.

First of all, you need to know which class it belongs to. Most smartphones are used for mobile access to both documents and the Internet, reading all sorts of literature, etc. For example, there is a class of smartphones that can be used as a communicator or PDA. Traditionally, phones are divided into three categories:

- low cost or budget phone (characterized by simple functions and strict design);
- multimedia devices (such models are usually equipped with cameras, have an attractive design and a large list of digital entertainments);
- smartphones (equipped with higher resolution cameras, a huge set of functions and increased operation time without charging the battery).

It is worth noting that the working time of phones of all three categories is approximately equal, despite the various capacities of the batteries. This is due to the different number of functions: smartphones consume much more power than phones in the budget category. The advantage in terms of battery volume can only be highlighted in standby modes. The most energy-consuming parts of the phone are a screen and a camera. It should be remembered that the larger and the brighter the screen is, the higher energy consumption will be. Another feature distinguishing these categories is memory. The budget phones have a very small volume of internal memory and there is no possibility to increase it.

The next quality phones possess is the ability to wirelessly access other devices. In budget models often use an infrared port (IrDa) and Bluetooth v 1.1. Using these wireless protocols, it is possible to transfer information on a short distance (from port to port for IrDa and up to 5 m for Bluetooth) between phones and establish a connection with a computer. Multimedia phones use faster Bluetooth v2.0. And smartphones support Wi-Fi, which makes it possible to establish a network channel between phones, computers or a corporate network.

The final important difference is the support of communication standards. Budget phones support the maximum GSM network standard of 1900 MHz. Modern phones support 3G or 4G which can provide high-speed Internet access and video calls.

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### **Areas of using “face and emotion recognition” technology**

Face and emotion recognition systems can be used in various fields of activity, monitor and process the results of recognition, generate statistical reports in a given subject area. Examples of applications include gaming, transport and commerce, medicine, neuromarketing, biometrics, robotics, virtual and augmented reality technology, social testing, education, psychological experiments.

Consider the most promising areas in more detail:

1. Safety and security. Installing cameras in large crowded places allows you to track people's faces and compare them with the database. This can be useful when it is necessary to detect criminals or lost, missing people. The technology of recognition of emotions in this case allows you to track the emotional state of people and when signs of nervousness, panic, or other manifestations of suspicious behavior are detected, inform the police. The system allows you to determine the possible danger and helps employees respond to the incident in time.

2. Neuromarketing. Neuromarketing is a field of marketing that uses knowledge of neurophysiology and cognitive psychology, which studies customer behavior scenarios, methods of influencing this behavior, as well as emotional and behavioral responses. The system of face recognition in neuromarketing can be used to determine whether visitors belong to “VIP clients” or “Black list”. In the first case, the client may be offered an individual consultant, special purchase conditions and the like, in the second case, the system notifies the security and more closely follows the object, fixing theft from the shelves and objects left by the person.

Another case of use is the so-called "heat maps", which are the routes of visitors, as well as various calculations of the time spent by visitors in various departments and locations of the store.

Recognition technologies can be used not only for external, but also for internal tasks, for example, access control and time keeping for store personnel, monitoring actions and tracking movements.

An evolving case of use is also the possibility of recording persons who entered the store, determining gender, age, building a purchase history, conducting behavioral analytics, analyzing emotional reactions to certain products or their categories, creating a table of preferences, issuing suitable recommendations or decisions, adapting advertising to the preferences of a particular person.

3. Game industry. Monitoring the player's emotions, as well as feedback, allows, depending on the situation, dynamically influence the game content. For example, if a player is not scared enough by a horror movie, additional monsters are released onto the stage. Using effects that cause fear and harsh scenes, depending on the degree of calm and fear of the player, you can achieve a stunning effect. You can

also change the complexity of the game depending on the reaction of the user, or use the emotion recognition system to animate facial expressions and character customization.

4. Robotics. Neural network technologies with deep learning, as well as computer vision technologies in the future may allow the creation of robots with artificial intelligence. The integration of emotion recognition technology into robots will provide feedback and the ability of the robot to better interact with other people, as well as, while learning, demonstrate emotions in response.

5. Sphere of communications. The use of avatars and masks, depending on the user's emotions, is perfectly used in webcam software with advanced entertainment functionality, as well as in instant messengers. Glasses that can recognize emotions of listeners will help lecturers to quickly track emotional state, as well as the audience's reaction to the course of the lecture, allowing to relax audience or change the presentation style.

6. Sphere of transport. Recognition of the emotional and physical condition of the driver to stop the car, through braking and turning to the side if the condition of the person does not allow controlling the vehicle. Sleep, inhibited reaction to traffic situations, affect, intoxication and other states of the driver can lead to an emergency on the road.

Face and emotion recognition technologies can be used in various fields and areas of life and activity. These technologies are still in an active stage of their development, but their significance and usefulness for science can hardly be overestimated.

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### **Smartphones with a folding screen**

The first folding phones appeared as early as 2000. Until 2007, the cell phone market abounded with all sorts of exotic clamshells, such as the Motorola Razr and the Sony Ericsson Walkman with flip up music buttons. Nokia went even further, it created completely “wild” projects, such as the round button telephone 3600, the N-Gage “taco” phone, and the N93 - which was positioned as a mini-camcorder.

About TVs with curved screens today already know everything. But about smartphones with curved screens could already be forgotten. In 2013, LG G Flex and Samsung Galaxy Round were released. Why was all this unnecessary and expensive stuff released? Yes, for the sake of one important goal - to work out the production technology of curved screens in order to be able to fill all the bumps on the way to the production of screens that can roll into a roll. What, for example, Sony spoke openly back in 2011. The result, I hope, you already know: the sales of the first roll-up TVs will begin this year. In general, flexible displays will still show themselves, although today they are being used with might and main, for example, a curved huge monitor is a really useful solution. And the flexible screens themselves are where to apply in practice.

Years down such a giant like Motorola presented a smartphone bending in half. The folding design can be used both in tablets and smartphones, which is great, since it is not always convenient to carry around a constantly large 8-inch tablet. The first folding smartphone was recently announced by Samsung, which will lead to a rupture of patterns on flat big screens, and in the future will switch from working on a large display to a smart compact folding device. The new Samsung will be equipped with a screen with a diagonal of 7.3 inches, its display folds inward and transforms into a more compact smartphone.

The biggest problem that prevented the creation of folding displays was glass. Glass does not bend. Flexible displays are largely based on existing display technology known as OLED (Organic LED) or AMOLED (Active Matrix Light Emitting Diode). Traditional AMOLED screens use organic compounds that create their own light source when current flows through them. Since OLED pixels create their own light source, they do not need a backlight, like LCD display technology.

#### *Pros*

New user engagement concept.

The rear camera can also work as a front camera, thereby increasing image quality.

The screen size due to the new technology can be adjusted to the desired size for more comfortable use.

More powerful equipment can be integrated into the smartphone.

It is possible to use more applications at the same time.



*Cons*

However, technology is still under development.  
Lower frame rates due to folding display.  
More expensive screens than conventional smartphones.  
These smartphones will be a little thicker.

Samsung is not the only handset maker working on folding devices. According to the latest news, Huawei plans to release a folding phone in the next year. Lenovo and Xiaomi have also begun to tease with reports of their own prototypes, while LG is working full-length on flexible OLED displays and TVs that can roll up. Ukrainian companies are not infused with the trend and start producing a new generation of smartphones. Thus, Ukrainian companies for the production of smartphones immediately entered the market, and their resin products would be competitively capable, at first.

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**Drone delivery system**

A delivery system based on drones is actually a system which uses unmanned aerial vehicles (UAV) to deliver goods from one point to another. This kind of systems is going to spread across the world during a few upcoming years and is going to face some development problems which solutions will have to be found by developers of the system itself and the services meant to be used in the purpose of its proper work.

The first issue which is going to be put under current review is the algorithm of the shortest way searching. The trajectory of the UAV should come as closer to the linear one as possible. If the drone is not able to continue its moving (probably in the case of a high object ahead: buildings, mountains, etc) it should either increase its height above the ground or move sideways using the shortest way to continue the moving by the linear way. Also the algorithm should take into account the need to get

goods from some specific points and process cases of delivering them to the destination points.

The other problem is the algorithm of landing the UAV during the delivery process and during the getting of the goods from the specific points.

Also the system must have a service of registration its users and making them able to buy needed set of goods and make the system to identify the user during the delivery process.

The next problem is the way of protecting the system from hacker attacks, stealing and replacing data. And also protecting the vehicle itself during an unwanted situation.

Although the concept of the drone delivery still has a lot of issues it's already found purposes of its usage. They are: goods delivery, such as post and food delivery, medical purposes such as medicine transportation and portative ambulance inventory that can be delivered to the medical assistants during a situation. Also they've been used for military purposes.

As for the food delivery there's a lot of those who tested this kind of system and have tried to introduce its exploitation. The first people who were spreading the rumors that they were using delivery drones for the purpose of food delivery are the members of the team of Star Simpson who introduced the "Tacocopter" which was a food delivery system for tacos which was planned to use a mobile application for making orders. But later it had been revealed that the team hadn't produce any delivery system which uses a mobile application for managing its work.

The very next year a company named Domino's UK had had tests on their new project named "The Domicopter" which was a part of their advertising program. There were also experiments on using the delivery drones for the postal purposes. One of them was launched by Jeff Bezos, the founder of the Amazon Corporation. The project was called "The Amazon Prime Air" and it was designed for delivering light weighting goods using the flying delivery drones. The project mostly was going to be used for the commercial purposes. Even though the concept seemed to be fine and maybe was going to work it faced a lot of criticism. The main issues about it were about the government approval in some countries and also some safety issues. Also, meanwhile there were launched scientific experiments on using delivery drones for bringing medicine to the needed point.

There was also one interesting project which required usage of the unmanned aerial vehicles. The project was launched by the Dutch student named Alec Momont and its purpose was bringing needed inventory as an emergency drone. The inventory had to be sent to the medical assistants taught to use it. One of the best sides of this project was the ability of the drone to speed up to sixty miles per hour and bring the medicine quickly to the point of an accident. That system could be useful for the cases of cardiac arrest as it could bring the needed inventory quickly to the scene and save a human's life. A lot of people (about one million per year in the European Union) die because of delay of the regular ambulance and the project may speed up the process up to ten times and increase the ambulance efficiency in such cases. The

paramedics become able to bring needed defibrillators to the scene which is reducing the survival chance up to ten times (from eight to eighty percent)

In conclusion it should be said that drone delivery system is being improved step by step during every day of our lives and they are definitely going to make some revolutionary changes to the logistics and healthcare in the near future. Although the concept is still facing a lot of development issues there are still lots of the teams of developers working on finding the solutions for each problem. The idea of using the unmanned aerial vehicles in the purpose of business is actively spreading across the world and finding lots amounts of those who's ready to make investments to assemble strong development teams and get the development toolkits needed for such a kind of project.

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### **The development of nanotechnology in medicine**

The number of scientific publications and patents is steadily increasing. With the advances in nanotechnology as a whole, as well as nanomedicine in particular, implantation of nano devices in the human brain will be possible, increasing the knowledge of man and speed of thinking many times. Of course, there are also problems - the biocompatibility of nanomaterials and those that are not studied, the possible consequences of the introduction into organism of nanoparticles and microprocesses are harmful to human.

Nanomedicine - tracking, correcting, constructing, and controlling human biological systems at the molecular level, using nanoparticles and nanostructures. Medical nanorobots will be able to diagnose illness, deliver medications and even carry out surgical operations, they will be able to destroy the disease even at the time

of their birth. In addition, it will be relevant to find nanorobots in the nervous system to analyze its activities, as well as the ability to correct their own DNA.

Management of nanoparticles can be accomplished both with the help of a pilot, and autonomously, with the help of programs. Pilot control is easier to implement, since autonomous control can be implemented in many ways: Artificial Intelligence, “Modular control”, “Separate control”, and complex algorithms.

In addition to medical nanorobots, There are other technologies developed for nanomedicine..

Address delivery of drugs to sick cells, diagnosis of diseases with the help of a number of quantum dots, laboratories on a chip, new tank-tricycles, implants.

Quantum dots. Diagnosis of diseases with the help of quantum dots is based on tracking the movement of different substances within the human.

Chips allow to conduct complex analysis very quickly and get the extremely necessary results in critical situations for the patient.

Nanotechnology is the future, but it is worth making an effort to implement it. The main problem for our country is the transition from scientific laboratory studies to economically viable industrial production.

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### **ELM as modern view on development of web application**

Today's world is built in such a way that every customer is interested in the reliability and high efficiency of his web application. Because of this, developers, including Ukrainian developers, need to find the best way to implement a specific web application. So many companies and programmers have started to focus on this little-known and ambitious programming languages. Currently, ELM is the optimum

language for reliable web applications. Developed in 2012, the language became known to the wider IT community only in 2014, but it continues to gain momentum. According to analysts from RedMonk, collected from sites such as Stackoverflow.com and GitHub.com, in June 2014, the popularity of ELM in these resources was 12%, and in January 2019 - 27 and 57%, respectively. That is, in less than 5 years we have an increase of 15 and 45%, which already speaks for itself.

The reasons for the growing popularity of this programming language lies in its advantages.

- 1) Speed. Compared to rivals such as Ember, React and Angular. ELM has the highest performance.
- 2) The small size of the bundle.
- 3) Also, when writing code, based on the fact that it is a statically typed type with a type output using the compiler, companies using ELM do not get “runtime exception” during execution. And in case of error, the compiler will show you where you are mistaken.
- 4) The Elm batch system. It provides a semantic version change based on the changes in your package. The system warns that the changes violate the backward compatibility and will not allow modifying only the minor version, but will require changes in the major version as well.

However, ELM has its own disadvantages, namely:

- 1) It is not suitable for databases realizations. Because it's a lot of work to make a server or database your "one source of truth", as Elm makes you write endless JSON parse boilerplate to talk to the server.
- 2) Elm doesn't have type classes which means some code needs to be duplicated. A fix in a function that needs type classes means all of the duplicates need to be fixed too
- 3) Adds an additional layer of abstraction. Users claim that Elm adds an additional layer of abstraction, meaning that it is one more hurdle between the brain and the product.

But this is not a big problem. Since the number of opportunities offered by ELM overlaps most of the shortcomings, and that is why business is beginning to pay attention to it. For example, we can take two American companies and one Swedish start-up, which started using Elm for web development and do not regret their choice. This is: NoRedLink, Realkinetic and AHEAD. Also, when using ELM it is possible to reduce the staff of programmers due to the extremely high reliability of the developed application, and the difficulty in writing a bad code in a functional approach. And the saved funds send to the ads of the same application. This will give us an even greater user experience and, accordingly, an increase in company revenue. Confirmation of reliability is one of the main concepts of this programming language - Make impossible - impossible. It is to reduce the volume of business code by examining all types. Do everything to prevent the impossible situation.

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**JPEG Algorithm**

JPEG (Joint Photographic Experts Group) is one of the most popular raster graphic formats used for storing photographs and similar images. Files containing JPEG data usually have extensions ‘.jpg’ ‘.jfif’ ‘.jpe’ or ‘.jpeg’. However, among them ‘.jpg’ is the most popular on all platforms. MIME type is an image / ‘jpeg’. MIME (Multipurpose Internet Mail Extensions) is a standard that describes the transmission of various types of data by e-mail, as well as the specification for encoding information and formatting messages in general, so that they can be sent over the Internet.

The JPEG standard provides two basic ways of representing encoded data. The most common, supported by most of the available codecs, is a sequential JPEG presentation of data, suggesting a sequential bypass of the encoded image of 8 bits per component (or 8 bits per pixel for black and white half-tone images) block by block from left to right, from top to bottom.

The above-described operations are performed on each image-encoded block, and encoding results are placed in the output stream in the form of a single ‘scan’, that is actually an array of encoded data corresponding to a sequentially traversed ‘scanned’ image.

The extended mode alongside with sequential also allows progressive JPEG data presentation, image encoding of 12 bits per component / pixel and arithmetic coding of quantized DCT coefficients.

In the case of progressive JPEG, compressed data are written to the output stream as a set of scans, each describing the image completely with increasing detail. Such a progressive representation of data turns out to be particularly useful while

transferring compressed images by using low-speed communication channels since it allows you to get an idea of the entire image after transferring a small part of the JPEG file.

The JPEG algorithm is most suitable for compressing photos and pictures containing realistic scenes with smooth transitions of brightness and color. JPEG format is most widely used in digital photography and for storing and transmitting images over the Internet.

JPEG format in loss compression mode is unsuitable for compressing drawings, text and character graphics, where a sharp contrast between adjacent pixels leads to noticeable artifacts. It is advised to save such images in lossless formats, such as JPEG-LS, TIFF, GIF, PNG, or use the Lossless JPEG compression mode. JPEG (like other loss compression formats) should not be used in cases where even minimal losses are unacceptable, for example, when compressing astronomical or medical images. In such cases, JPEG compression mode Lossless JPEG or JPEG-LS compression standard can be recommended.

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**Section 05 Latest Achievements in the Earth Sciences (Geology, Cadaster,  
Geodesy, Geography, Archeology etc.)**

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**Sulphur content of h<sub>9</sub> seam of “Tsentrosoiuz” mine**

Sulphur is the most detrimental coal impurity. While coal burning, much sulphur turns into sulphur dioxide which affects human health, pollutes the air, and causes metal corrosion.

Sulphur concentration within coal seams takes place at peat stage of their development. Dissolved in peat water sulphates is a prime source of sulphides.

“Tsentrosoiuz” Mine of “Sverdlovskantratsit” SE mines hard coal of h<sub>9</sub> seam of C<sub>2</sub><sup>3</sup> series. The seam is of complex two-multizone structure; its thickness is 0.95 to 1.1 m.

Forty samples from the mine were analyzed, and probe holes were tested within the area under study of h<sub>9</sub> seam. Results analyzed show following regularities:

Sulphur content within h<sub>9</sub> coal seam varies inside of 0.7% – 5.32%. Coal sulphur content depends on sulphur type:

1. Pyritic – 0.65% – 4.3%, (1.82% upon the average). Pyritic coal sulphur is evenly distributed in a finely dispersed form, and in the form of noddles and lenses in a lower part of plies. Pyritic sulphur prevails in a total sulphur composition; its content is 70 – 76%.

2. Sulphatic – 0.02% – 0.32% (0.06% upon the average). Sulphate sulphur is a result of pyrite oxidizing. In coal, it is available in the form of thin leather coats.

3. Organic – 0.01% – 0.76% (0.42% upon the average). Organic sulphur is evenly distributed over coal.

Sulphur balance in coal may be represented in such a way: pyritic sulphur → organic sulphur → sulphatic sulphur.

The greatest sulphur content is in upper ply. They are associated with clay roof shales.

Areas of higher sulphur content are located in the central part of the mine field as well as in the form of small east and west elongated zones.



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### **Features of loess soils in the construction of buildings**

During last decades the construction of buildings in Dnipro city faces various challenges, among which – subsidence of loess soils. That is why there is a need to discover and analyze methods of subsidence control. The purpose of the paper is to describe features of loess soils in the area of construction of buildings and to share the main findings of their study. To illustrate the main findings one case is given in detail.

In hydrogeology, the loess soils are referred to as sedimentary rocks of light yellow colour. Loess is characterized by large porosity, the feature that could cause subsidence of soils, sometimes rather large and dangerous.

The latest research of hydrogeology engineers has discovered that subsidence of loess soils can be easy to control and prevent, using mechanical and chemical compaction of soils under the building(s).

Mechanical compaction, the destruction process of nature and making new structure of loess rocks, is one of them. It is characterized by lowering porosity and increasing contacts between mineral particles. There are some kinds of mechanical compaction such as heavy ramming, vibration compaction, making cushions from loess soils, blasts etc. Heat treatment of soils, silicatization, fortification by solutions and gases are considered to be chemical compactations.

The problem of subsidence of a new building “Slavniy” located on Simferopolskaya street, Dnipro city, is taken as a case study to show how mechanical compaction works and when it is necessary. After pipeline failure flooding under the new building, people who live in the building noticed cracks on the walls. After examining the building, it was concluded that the cracks are the result of subsidence that brought to the building leaning of 53.7 sm. On the basis of the options reviewed, it was decided that redistribution of loads from residential sections could be appropriate in this case. Under these conditions, the method of cementation of loess was applied. This model brings to the decision of loess compaction and freezing of the ground.

One of the important factors, which hydrogeologists need to check before their surveys are nature conditions and possible environmental impacts. The described method is only one to be used to prevent further loess soils. It can be recommended for the other objects of construction in the hydrogeological conditions similar to the described.

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### **Anthropogenic impact on groundwater**

Water and its movements are just one branch of ground geology, having been shaped over billions of years. Hydrogeology examines groundwater, its distribution and movements through rock formations and in soil deep into the Earth's crust, and its interactions. Groundwater engineering creates water supplies, drainage and irrigation. It is also interested in pollution and contamination risk, conservation of limited supplies and sustaining water quality for human use and consumption.

Unfortunately, the exploitation of mineral deposits is practically impossible without a negative impact on the environment, first of all, for the reason of extraction of natural resources out of biosphere. In varying degrees, changes occur in all environmental components: atmospheric air, geological and aquatic environments, flora and fauna. The impact of mining on underground water is accompanied by a man-made metamorphization of aquatic environment, which is most clearly manifested in hydro geodynamics aquifers and qualitative composition of underground waters.

Over the years, groundwater has undergone changes due to human activity. Fifty years ago, the sustainability of groundwater systems became one of the main problems of groundwater engineering. As the population continues to grow, regions which used groundwater at a constant pace now face sustainability problems. A large population begins to stress groundwater reserves, which are a livelihood source that provides water to billions of people, plays a central role in irrigated agriculture, industrial activity of the regions and affects the health of many ecosystems.

Studies are being carried out on the relationship between the rate of depletion of groundwater and the rate of natural regeneration and the assessment of the resources necessary for the maintenance of ecosystems. Yet depletion of reserves is widespread in various groundwater systems in both semi-arid and humid regions of the world. People around the world are over-exploiting groundwater in many large aquifers, which are crucial for agriculture, drinking and industrial water supply. Excessive mining for irrigation and active mining, when groundwater is slowly renewing, are the main causes of depletion, and climate change may exacerbate the problem in some regions. New ideas and research are advancing groundwater engineering into nowadays to monitor and reduce the anthropogenic impact on groundwater. As technology continues to progress, the simulations will increase in accuracy and allow for more complex studies and projects in groundwater engineering. The modern technical approaches to water diversion, artificial groundwater recharge etc. should be complemented with the comprehensive strategies adapted to the specific social, economic, political and environmental conditions of each region in order to balance regional groundwater reserves.

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### **The problem of defining the category of land for some land plots**

Land plots may be owned by legal entities and individuals in Ukraine. When land plots are registered in the land cadaster, there is a problem of determining effective purposeful designation and category of land. These characteristics affect the rational use of land, paying taxes or rent for them.

Legislation establishes that lands in Ukraine are divided into the following nine categories by their purposeful designation, they are: lands of agricultural purpose; lands of housing and civil building use; lands of nature reserve and other environmental protection purpose; lands of health purpose; lands of recreational purpose; lands of historic and cultural purpose; woodland; water fund lands; lands of industrial, transportation, communications, energy, defense and other purposes. The type of land plot usage is established within the boundaries of each category. Each type of land plot usage is characterized by its own legal regime, ecosystem functions, types of development, and types of especially valuable objects. The acquirer of the right to a land plot can determine the type of land plot usage, but only within the boundaries of the category. Land plots belong to the category of land for the intended purpose on the basis of state bodies or local government decisions. One land plot may be related only to one category of land by purposeful designation. But there are situations when a land plot can be related to several categories by purposeful designation. Examples for such situations may be land plots under the recreation centers on the bank of the Samara River in Dnipropetrovsk region. These land plots can be applied to land of recreation (according to the use of land) and to land of water fund and forest fund lands. For the lands of the water fund, the type of land use for recreational purposes may also be established. Of course, the legislation defines the priority of land, and then the land plot should be assigned to the category of land that is more significant. But the type of the land plot usage will be established only within the boundaries of a certain category with a list of allowed activities on it. If the acquirer of land rights is not satisfied with this option, then it is necessary to divide the land plot. This procedure requires additional resources and time. Otherwise, the problem of irrational use and inefficient taxation will remain unsolved. The same problem arises if you need to combine two land plots. The merger procedure requires land plots to be of the same purposeful designation and adjoining border. The desire of the acquirers of the rights on land plots is not taken into account, despite the fact that they may be satisfied with the legal status of both land plots. If the land plots do not have the same telic purpose, the unification of such land plots is impossible.

Legislation needs to be improved to provide the possible decision, when one land plot has several types of use. It will provide rational use of land and effective payment of taxes or rent for them.

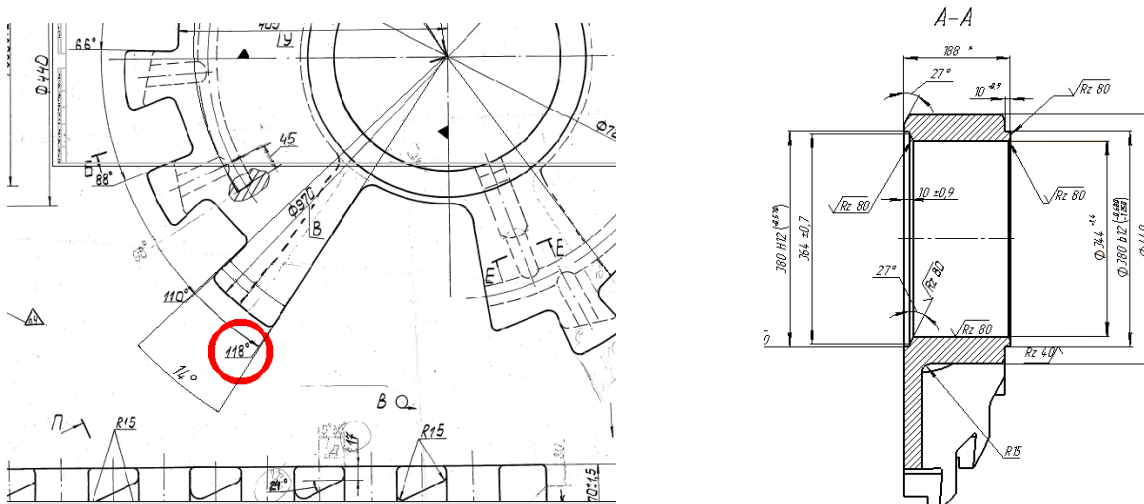
## Reverse engineering of the narrow-web cutter-loader executive body

Reverse engineering of the narrow-web cutter-loader is the task to be solved by the Department of Mining Machines and Engineering.

The aim of the work is to reengineer the executive body of the narrow-web cutter loader.

To achieve the goal, the following sub-tasks are set:

1. Initial drawings are to be analyzed, 3-D models are to be constructed and corrections done.
2. The operating conditions under which the machine can be used are to be determined.
3. The loads acting on the machine during operation are to be calculated.



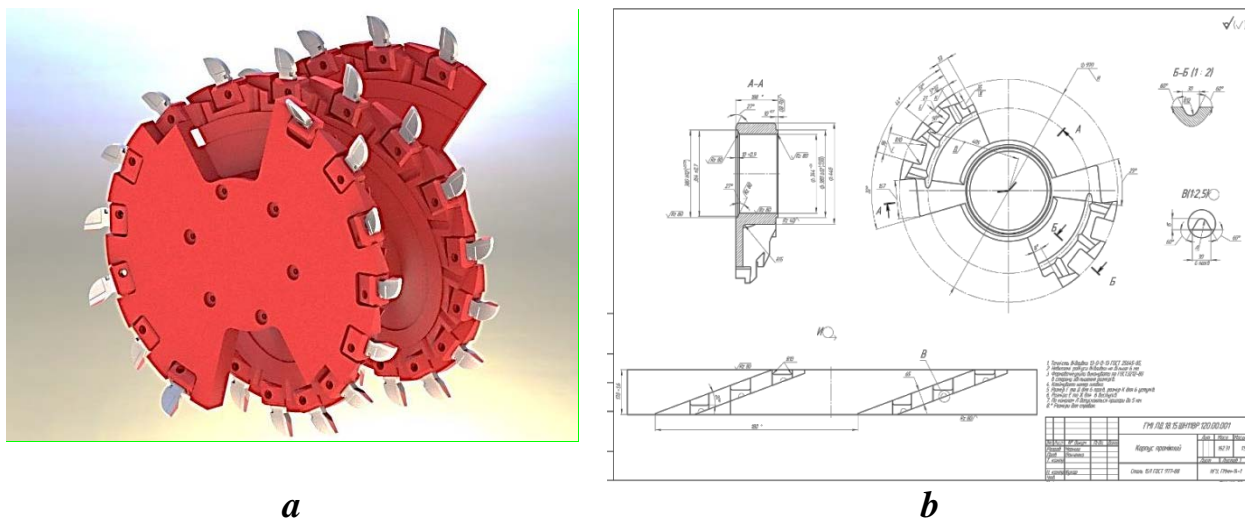
**Fig. 1 - Design errors**

As a result of the design and documentation analysis, the following has been determined.

1. Part of the design documentation is lost.
2. There are errors in the in the dimensions, cuts and sections (Fig. 1).
3. The shape of some parts is shown incorrectly.

Such errors in the drawings lead to difficulties in the assembly process, financial losses and an increase in time to manufacture the structure.

The 3D model has been designed to correct these errors (Fig.2a). The technical documentation for the narrow-web cutter-loader executive body has been developed (Fig.2b).



**a** **b**  
**Fig. 2 - Design documentation of the narrow-web cutter-loader executive body: a – the 3D model; b – the drawings**

The data taken from the technical documentation are used to calculate the technical requirements for the environment in which the combine operates. For example, narrow-web cutter-loader can be used when the maximum coal thickness is 2 meters and the maximum coal seam inclination is 20 degrees. Also, the loads acting on the machine during operation are to be calculated and these loads do not exceed the maximum loads that the structure can withstand.

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### **Relation between toxic and minor elements with ash content of coals of South-West Donbas**

One of the main factors controlling distribution and determining the relations of the studied elements with the coal matter is ash content.

Straight positive dependences between the content of rubidium, cesium, chromium, gallium, molybdenum, vanadium, titanium, copper, ytterbium, lead, yttrium, barium, zinc, lanthanum, zirconium, scandium and nickel, on the one hand and ash content of coal on the other hand has been established in black coals of South-West Donbas.

Similar dependences have been established between the content of elements and ash content in anthracites of south-west Donbas.

Germanium content shows no immediate dependence on ash content. There is a weak link of more complex form, described with sufficient accuracy by parabolic equation.

Three main groups can be singled out depending in a degree of dependence of elements upon ash content:

- rubidium, cesium, chromium, gallium, molybdenum (correlation coefficient is from 0.6 to 0.8);

- vanadium, titanium, copper (correlation coefficient is from 0.5 to 0.6);

- ytterbium, lead, manganese, yttrium, zinc, lanthanum, zirconium, scandium, barium, nickel (from the largest random value  $r$  at  $\alpha = 0.05$  to 0.5).

According to the increasing strength of relation elements shown positive dependences with ash content in coals of South-West Donbas can be represented with the following range: Ni – Sc – Zr – La – Zn – Y – Ba – Pb – Yb – Cu – Ti – V – Mo – Ga – Cr – Cs – Rb.

According to mineralogical analysis most elements having shown positive association with ash content (rubidium, cesium, nickel, vanadium, chromium, barium, lead, ytterbium, zirconium, niobium, and cobalt) are contained in clay coal matter.

The possibility to predict the content of a number of elements (rubidium, cesium, gallium, chromium, molybdenum) with reasonable certainty based on mass determinations of ash content has been established for the first time.

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### **International experience in using soil assessment methods**

The main purpose of the study is to analyse the foreign techniques of soil assessment and identify their features for making suggestions to improve the methodology in Ukraine. The analysis of literary sources [1, 2] reveals the methods of soil assessment and evaluation techniques used in 8 countries of the world, namely: Kazakhstan, Germany, Poland, England, Canada, USA, Bulgaria and Ukraine.

Analysis of the methods of soil assessment showed features that are taken into account in the assessment of land. Main properties evaluated in most of the techniques are: mechanical composition, relief, climate parameters and land productivity. Such parameters as soil rockiness and salinity play a significant role. The end result has its own peculiarities in each country. Analysis of the countries showed various assessment systems, which are very different from the regular assessment in Ukraine. For example, there are seven degrees of natural state of soils in Germany. Such degrees are established on the basis of the manifestation of certain morphological and genetic features. Each degree of soil condition is expressed in terms of each type: soil quality, comparative natural legal capacity, soil quality factor from the best to the worst. In Poland land is subdivided into six main classes, depending on the natural properties of the soil and the crop yields. In England land evaluation is performed on the basis of considering the objective groundwater indices and land conditions. Ten categories of evaluation are determined. The classification of soils is carried out and eight classes of suitability (capability) of land for agricultural production are distinguished in the United States. Soil quality is expressed through five classes of land in Canada. In Bulgaria the evaluation is based on the natural properties of the soil and the long-term indicator of grain yield. The final result is expressed by land scores from ten to one hundred.

The current method of soil assessment in Ukraine has many similar features with the methods used in foreign countries. The only thing that would be appropriate to take into account is the soil erosion as a corrective coefficient. High level of this indicator characterises the soils in all territories of the country except for the northern part of Ukraine. It is estimated that more than 500 million tons of arable land erode annually in Ukraine, which has already resulted in the decline in soil fertility on an area of over 32 million hectares. Soil erosion is a property that strongly affects soil quality and therefore must be taken into account when conducting soil assessment.

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### **The system of automation of ventilation of mines**

The development of the mining industry takes place in conditions of solving problems with increasing demand for energy and mineral raw materials. This industry is traditionally labor-intensive, where development trends are aimed at a significant increase in the level of automation of all technological processes.

Today, the industry intersects with such a feature that production capacity can be located in remote areas and in severe climatic conditions. Accordingly, the provision of staffing is difficult enough to keep highly skilled professionals working in mines. Another problem is the reduction of useful components with the exhaustion of balance reserves of minerals. Accordingly, extraction is carried out at greater depths or in more complex mining-geological conditions. All this leads to an increase in the costs associated with ensuring the efficient operation of mining enterprises and the need to increase the profitability of all production to maintain the profitability of the final product. However, the main priority is to ensure the safety of workers in limited geometric sizes of underground workings. Despite all the technological improvements made, mining remains one of the most dangerous and with the maximum number of accidents [1].

The increase in production capacity, the depth of mines and deposits, the concentration and intensification of mining operations is accompanied by a significant increase in the number of harmful components of the miner atmosphere, dust and heat. Therefore, comfortable and safe working conditions, with specific features of underground technology, should be provided by a normally functioning system of ventilation of underground environments [2,3].

In some fields, the share of ventilation accounts for almost 50% of the total electricity consumption. The automation system continuously regulates the degree of supply of fresh air for actual needs in a certain area of the deposit. Minimizing energy consumption, while preserving air quality, leads to greater savings.

The air-conditioning complex of a modern underground mining enterprise includes a ventilation network of mining operations, fans of main and local ventilation, underground air distribution devices, ventilation doors, devices for controlling parameters (air velocity, temperature, humidity) and components (useful and harmful impurities) of the mine atmosphere, caloriferous installation. The mine



ventilation complex may include degassing plants that are used to extract methane from a number of rocks.

The process of effective ventilation involves the supply of all existing underground workings (blowing, preparatory and cleaning) of fresh air; provision of permissible concentration and removal of harmful impurities of methane, carbon dioxide, poisonous gases after blasting operations; maintenance of a normal thermal regime and the deal with dust and moisture formation in man-made underground caverns; provision of conditions for the rapid elimination of accidents and their consequences.

Automation systems should function clearly both in normal operation of the mine and in emergency situations.[4]

The solution of the problem of integrated ventilation automation is possible on the basis of the development of a centralized system.

The ventilation automation system receives all the necessary parameters with the help of sensors, the primary information about the parameters of the ventilation system is transmitted to the central dispatching station. The received information is processed by a certain program with the help of information and computing complex (IEC). In the event of a difference in the current value of the parameter with the given, the IOC forms a controlling influence on the regulatory bodies automatically or by the operator. With the help of regulatory bodies, the performance and depression of fans, the supports of the branches of ventilation networks change as a result of changing the passage sections of underground air distribution devices. [3]

The implementation of the ventilation automation system allows for the qualitative management of the climatic conditions of mines and deposits without the direct participation of a person, or the abandonment of the right of the person to make the most responsible decisions. Also, it reduces the cost of electricity, which leads to increased profitability of the production itself. [6]

For the simplest exhaust systems, the main automation system is the transmission of a control signal from the operator to the drive of the fan located at a distance. This may be from a local control panel or from the dispatch panel. [5] If there is a control swing partition in the exhaust ventilation system, it is necessary to ensure that the fan starts to shut the closed ventilation network.

In cold atmosphere, heating systems are installed in the ventilation duct or in the mine shaft for heating the air. The incoming air is heated by a heat sink and mixed with cold. The temperature of the air mixture must not be lower than + 2 ° C.

Caloriferous installations can be fanless or work in complete with a fan.

The fanless unit assumes air movement through the system of a heater due to the depression of the head fan.

The sequence of the inclusion of the exhaust system may be different. The exhaust system can be started earlier, either at the same time or after the start of the equipment with a certain amount of time, for example, on the previous, or after-operation ventilation.

In order to maintain air balance, in some cases, it is necessary to ensure synchronous operation of exhaust and tidal systems. In the ventilation scheme, under the conditions of the technology, the backup fan should be installed.

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## Features of tectonic structure of Novomoskovsk coal area

In the context of its geostructure, Novomoskovsk coal area is located within a zone of the two tectonic structures joint: Ukrainian crystalline rock mass and the Dnieper-Donets depression. The considered area is in the Western slope of Ukrainian crystalline rock mass within so called Prydniprovya block mass.

Sedimentation mass is of the total monoclinial occurrence complicated by multilength faults; moreover, vertical displacement amplitudes vary. Their main part has been determined on the mismatch of stratigraphic levels and on unconformity angles in transverse sections.

Association of sedimentary Mesopalaeozoic formations occur transgressively on the Precambrian folded basement having gradual northeast mersion. According to age, the identified faults are divided into Lower Carboniferous and Mid-Carboniferous.

The majority of such faults as Klymovsky and Kulebivski are of inherent nature which can be supported by the fact that their amplitude is larger in Lower Carboniferous period than in Mid-Carboniferous one.

Below you can find the detailed description of all the faults identified within the area under study.

Spassky fault is in the eastern part of the area being described. It has northern-east geologic strike at an angle of  $70^{\circ}$ ; displacement amplitude for Lower Carboniferous and Mid-Carboniferous is 15 to 25 m.

Klymovsky fault is in the central part. Its central strike is sublatitudinal; its strike varies sharply to western in the western part. Vertical displacement amplitude is unfixed varying from 6 to 32 m.

Strike of Kulebivski fault is of north-west direction with north-east fault dip at an angle of  $70^{\circ}$ .

Area 1 of a diagonal fault with its north-east strike is visible within south-eastern section. The tectonic area is several parallel low-amplitude faults with 7-10 m vertical rock displacement. In section, width of the area varies from 400 to 1800 m.

The area 1 of a diagonal fault is a graben formed by a series of parallel low-amplitude faults with different fault dips at an angle of  $70^{\circ}$ . Total amplitude of the area displacement is 42 m.

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### **Features of geology of Kodatski rapids location**

Coordinates of center of Kodatski (Kadatski, Kaydatski, Kodatski) is  $48^{\circ}23'12''N$   $35^{\circ}8'51''E$ . On the right bank of the Dnieper near the rapids borders Starokodaski granite quarry is located, and Lyubimovski granite quarry is located on the left bank. Downstream from submerged rapids a rock is seen on the right bank, and a system of partially submerged gorges is located on the left bank. The system is situated perpendicularly to the Dnieper.

The rapids area corresponds to selvedges of local abnormalities of gravity of linear form of high and medium intensity (up to 2 – 3 mgl) following by magnetic response of honeycombed structure which intensity is up to 1,0 – 2,0 thousand nTl. The rapids area is limited to zones of faults documented on linear structures of

gravity field (with 1,0mg/l intensity) and magnetic one (with up to 500 nTl intensity), and with course of lineations within 0° and 347° azimuths.

Granitoids of Dnepropetrovsk complex (Ar1dn) of Palaeoarchean period formed 3,2 to 3,4bln years ago are seen in erosions at the rapids. The three rock types are shown megascopically on composition, and structural and textural features among them.

Biotitic granites mainly with massive and equigranular texture belong to the first type.

Biotite-corniferous granitoids with gneissoid, laminated structure and unequigranular structure belong to the second type. Among them xenoliths of amphibolites in which biotite practically replace amphibole are sometimes found. Except that crystals of biotite are oriented subparallelly along the rapids direction.

Both in the first and the second rock types microclinization zones are developed. They are formed subparallelly oriented along the rapids direction veins of microcline composition mainly.

Deeply modified and mouldy granitoids with numerous dispersive runs forming orthographic superimposed zones of microclinization, silicification and epidotization belong to the third group. When areas of epidotization coalesce and occupy considerable volume the rock may be classified as epidosite.

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### **Features of endogenous fissility within chalkstones of Donbass carbonous deposits**

Basic system and frontal system of endogenous fissility are well-marked within chalkstones, and are traced at considerable distances. They are located perpendicularly to formation or close to it, and deviations are no more than 5-10 degrees.

Azimuth of heading extension of the basic system of endogenous fissility of chalkstones of Donbass coal-bearing strata modifies from 335 to 25 degrees.

Surfaces of fissures are undulating. As a rule, surface endogenous fissures are open with one to several centimeters heave. Sometimes fracture cavities consist of calci-spar, clay matter and dripstones of hydrous ferric oxides.

Beds of chalkstones are often nonuniform. As a rule, they consist of interstratified beds of robust carbonaceous rocks, and thin interbeds of clay rocks (sometimes sandy and clay rocks). Thickness of some layers as well as total thickness of chalkstone beds varies greatly within carbonous deposits.

The studies help to determine statistic relation between consistency of primary fissility within chalkstone beds and their structure, and physiographic and textural and structural features. The relation is that seam structure complication, sharp modification of its morphology (its thickness increase or decrease), prevailing finer particle-size fractions, detrital particles as well as total fine-grained structure is followed by increase in consistency of basic fissility.

Maximum distance between endogenous fractures is within medium-grained and coarse chalkstones located in roof of coal beds of OC grade (average distance between fractures is 180cm), and minimum is in algal fine-grained chalkstones lying close to coal seams of D grade (average distance between fractures is 24cm).

Availability of organic deposits as well as coarse chalkstones under all other equal conditions favours reduction of endogenous fissility.

When level of epigenetic changes increases, fissility of chalkstones decreases.

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### **On problem of coal recovery**

Coal recovery is the differences in chemical, physical, and caking properties of coals of similar degree of carbonization and petrographic composition stipulated by the character of the initial vegetation and conditions of its transformation on initial stages of carbonization.

Recovered coals are characterized by increased content of carbon and decreased content of oxygen, much higher emission of volatile substances and better caking properties, higher combustion heat, and high emission of coking and semi-coking resins, much higher content of sulfur and basic oxides (mainly ferrous oxides), mineral impurities, decreased mechanical durability. According to the degree of coal recovery there are three (highly recovered, medium recovered, weakly recovered) or four (quite recovered, recovered, intermediate, slightly recovered) types.

Donetsk coalfield consisting of 1009 mining seams 734 of them (about 73%) are made up of coals of recovered type with sulfur content of >1,5%. Coals of low degrees of metamorphism including long-flame ones with the increase sulfur content make up significant part of coal reserves of Ukraine.

Donetsk coals of recovered type ("B") differ with much higher content of general or pyrite sulfur comparing to weakly recovered coals ("a") irrespective of metamorphism degree. Peculiarities of sulfur distribution depending on the degree of recovery are found out in case of high-sulfur coals. At transferring from slightly

recovered coals to the recovered one share of aliphatic structures increases and aromaticity level decreases.

More recovered coal always generate great amount of free-running products than the less recovered one. Content of carbides decreases in liquid nonvolatile constituents of less recovered coal but content of polycarbons at practically unchanged amounts of petrolenes and asphaltenes comparing to vitrinite of more recovered coal increases.

Here emission of volatile substances from liquid nonvolatile constituent is higher but their carbon content is lower than in slightly recovered coal that indicates its less thermal resistance and less molecular mass of liquid nonvolatile constituents being emitted from plastic mass of this coal.

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### **Basic results of pilot geology studies of the Dnieper rapids areas**

Despite numerous historical and ethnographical data on the Dnieper rapids reliable information concerning geology of rapids areas is not still available. Therefore, the National Mining University on request of Dnepropetrovsk Community Foundation made geologic-geophysical complex of pilot studies. Analysis of the results obtained helps to conclude:

1. In spite of the fact that in the Dnieper valley, between cities of Dnepropetrovsk and Zaporozhye, basal complex of Ukrainian fundamental crystalline formation consists of five units. All rapids of the Dnieper consist of similar rocks - granitoids of Dnepropetrovsk complex (Ar1dn) formed 3, 2 – 3, 4bln years ago. The rocks directly exposing earth surface are primordial both for Ukraine and for out planet. Their formation originated history of the Earth protocontinents.

2. Zones of tectonical faults determined on both geomorphological and geophysical features are contact lines of rapids (data of gravimetric prospecting and magnetic prospecting M 1:200 000 and M 1:50 000). Identified fault systems are grain boundaries, and form local block and mosaic crustal structure within the Dnieper rapids.

3. Analyses of material composition as well as textural and structural features of rocks confirm repeated processes of energizing crustal blocks movement along faults within rapids location. That very time analysis of indicators of tectonic movements in prominence within territory adjoining rapids shows that vertical and ascendant movement of local blocks of crust which upper part is rapids in the Dnieper valley still lasts.

4. Tectonic faults of crust located within the Dnieper rapids area are the most permeable zones, and hence mass-transfer and power-transfer “arteries” from bowels of the Earth up to its surface.

5. Repeated stages of energizing crustal blocks movement proved during the studies and followed by different types of deformations which vary stress pattern of rock mass are unusual “generators” of electromagnetic field modifications.

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### **Research of forecasting geomechanical processes around mining activity**

Scientific novelty of the research is the spatial computerized geomechanical model of the excavation site with step-by-step movement of the mining activity along the length of the extraction column justified taking into account the influence of the entire thickness of the stratified isotropic rock massif, power characteristics of the lining of the cleaning and development workings.

The practical significance of the results obtained is to determine the safe place for stopping along the extraction column, which will allow avoiding emergency situations in the longwall associated with the landing of the mechanized support sections on a rigid base.

The tasks related to the simulation of geomechanical processes around mining activity are based on the methods of solving differential equations. The development of computer technology and software currently allow solving quite complex tasks, including volumetric ones, over a relatively short period of time [1].

The purpose of the ієГВН is to construct a geomechanical computer model for forecasting the distribution of the stress-strain state (S-SS) of the rock massif around the mining activity.

To build the model, SolidWorks software version 2017 was used. To construct the model, its geometric parameters were determined [3]. According to the stratigraphic column for the conditions of the mine "West-Donbasskaya", a geomechanical model was constructed on separate lithological differences which were given the corresponding physical and mechanical properties.

After this, an external load was given - earth gravity, as well as the load on the top model, equivalent to the weight of the Quaternary deposits. Further, the model was split into a network of finite elements, in the form of tetrahedron with dimensions of  $10 \times 0.5$  meters.

After performing the above-mentioned algorithm of action, the calculation of the distribution of VAT was carried out directly in the conditions of the assembly chamber, with the removal of longwall 5 meters from the assembly chamber, and

every 10 meters of the passage to the mark of 285 meters, when a general pattern of the periodic repetition of the destruction of the roof was already determined [2].

The spatial (volumetric) graph of the regularities of the change of the VAT of rocks on the line of planting a landing number of hydraulic supports of mechanized fastening along the length of the pivot pillar is presented in Fig. 1

From the mounting chamber to the mark of 45 m, an increase in the convergence of rocks in the rocks is up to 0.22 m (Fig. 1). At the mark of 55 m there was a primary landing of the roof, which led to a decrease in convergence to 0.15 m in the longwall (Fig. 1). Then there is an increase of convergence up to 0.4 m at a mark of 75 m (Fig. 1). At this moment, the transition of the upper rocks into an extraterrestrial state with loss of continuity occurs, which leads to their collapse and a decrease in convergence to 0.22 m at a mark of 85 m (Fig. 1) [2].

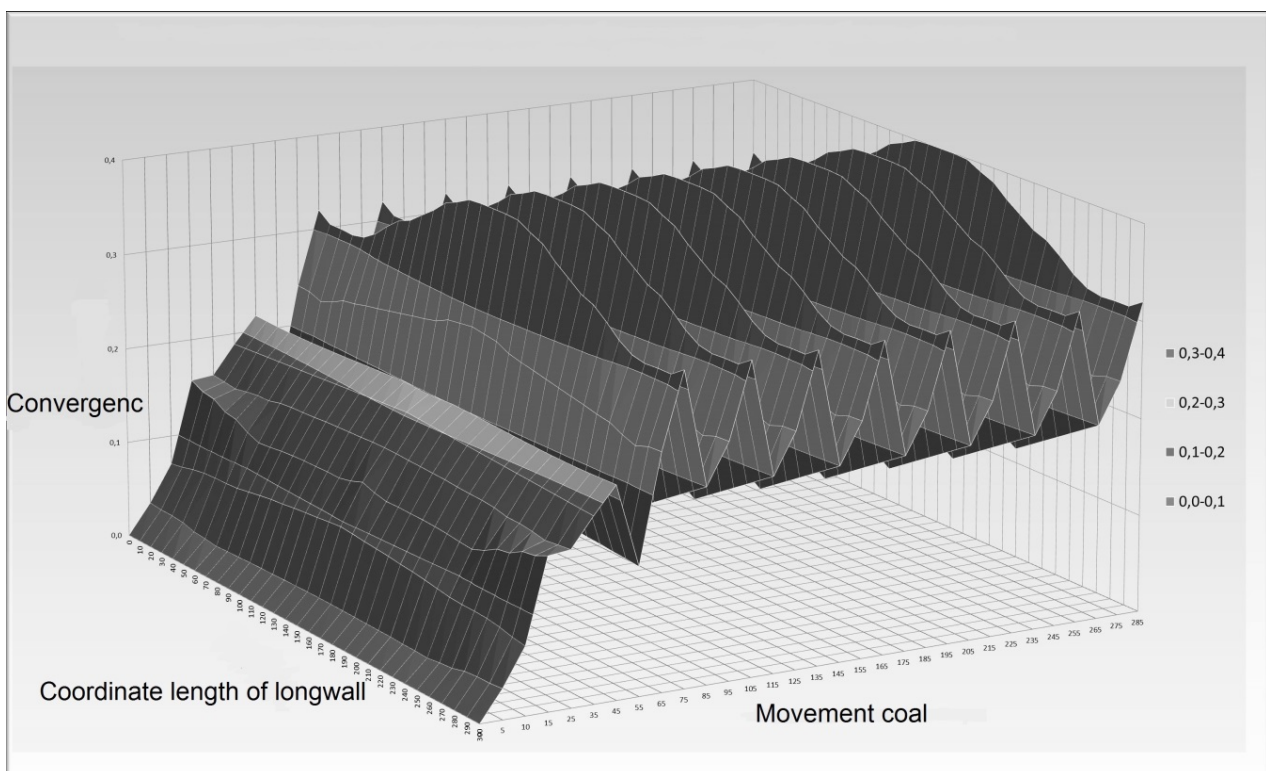


Figure 1 - The regularity of the change of the stress-strain state of the rock mass along the line of setting the landing gear number of the mechanized fasteners along the pivot pillar

Starting from the mark of 85 m from the setup room, there is a clear periodicity of the collapse of the roof with a step of 30 m. Given that the simulation should reflect the complete picture of the redistribution of the stress-strain state of the massive motion of the stope along the pivot pillar and cover several cycles of collapse of the main roof, calculation of the simulated value of the longwall movement from the setup room was carried out to a mark of 285 m (Fig. 1) [2].

Dimensions and the time, when zones in which the rock is in an out-of-state condition appear, are given in Fig. 1.



The analysis of the results of modeling allows us to establish the regularity and frequency of the collapse of the upper rocks - the main roof in any coordinate area of the recess pillar [2].

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### Magnetic effect in gemstones

The degree of gemstone magnetic attraction is effected by the factors connected with its chemical composition, such as the variety of metal and concentration of that metal in a gemstone.

Some metals have much stronger magnetic susceptibility than other ones. Iron and manganese oxides in gemstones are very magnetic; thus, they are easy to be detected. The example is a very magnetic orange spessartine garnet coloured with manganese as well as demantoid garnet coloured with iron. Tourmaline, natural spinel, beryl, corundum etc. are also paramagnetic.

Since each stone type demonstrates its characteristic range of responses to a neodymium magnet, such magnetic reactions may be used to distinguish gemstones. Some gemstones such as opal and topaz are not coloured with paramagnetic ions of metals. Their colour is connected with the processes of light diffraction from tiny silicon oxide globules (e.g. opal) or stipulated by the defects in atomic structure of a crystal that generates colour centers (e.g. topaz). That is also true about the gemstones which colour centers are formed because of radiation.

Magnetic attractiveness that can be often observed in colourless and coloured artificial brilliants made under high pressure and high temperature is stipulated by ferromagnetic impurities of iron melt and nickel melt being the remains of a production process.

The available diagnostic methods make it possible to distinguish the gemstones in terms of their attraction to a dry magnet (so-called direct method to study magnetic reaction) or by means of friction force decreasing – a floatation method making it

possible to demonstrate both attraction and repulsion, when a stone is placed on an inert object (foam plastic or cork) floating on the water surface.

Thus, magnetic bar is quite a sensitive instrument which can detect very weak magnetism. The bar is a mean for rapid recognizing of the majority of garnet varieties.

Differences in magnetic reaction may also be used to distinguish some natural gemstones from their artificial analogues. The magnet may be small, portable, and easy to use. Contrary to many other gemological instruments, neodymium magnets are affordable for everyone.

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### **Oryhodrygraphic and climatic characteristic of Novomoskovsk coal area**

Novomoskovsk coal area is limited to the southern side of the Dnieper-Donets depression; it occupies central share of Western Donbas between Petrykivka coal area in the west, and Pavlohrad coal area in the east.

On the one hand, the territory is lowered contour areas belonging to valleys of the Samara River and the Kilchen River; and watershed areas between the rivers dissected by deep ravines on the other hand.

The Kilchen River, being a feeder of the Samara River, flows in the west of the area. It flows south-eastwardly. Its right bank is abrupt; it is dissected by frequent ravines which absolute marks are 100-115 meters. It consists of deposits of 3<sup>rd</sup> and 4<sup>th</sup> terraces above flood-plain. Left bank is flat with 60-60 m absolute marks.

It consists of deposits of 1<sup>st</sup> and 2<sup>nd</sup> terraces above flood-plain. The lowest contour forms are confined to the Kilchen River bottom; their absolute marks are 55-60 m.

In the north of the area, in its central share, reliefs is plain and rise in the marks up to 88 m above sea level is observed.

1<sup>st</sup> and 2<sup>nd</sup> terraces above flood-plain of the Samara River are developed in the east; marks vary from 56 to 65 meters rising up to 80-117 meters north-easterly.

Lowered topographic forms with marks dropping to 50 m prevail southeasterly.

Climatic conditions of the area are continental with warm dry summer and moderately cold winter. Average annual air temperature is + 8.6<sup>0</sup>.

According to long-term observations, average annual total precipitation is 479 mm. Winter is extremely poor in precipitations. Predominantly, winds are of north-easterly direction. Average annual wind velocity is 3.3 m/sec.

Freezing weather starts from the end of September finishing at the mid-March. Average depth of soil freezing is 107 cm depending upon snow cover thickness.

### **Peculiarities of geological structure of Bodakva peat deposit**

Peat has been popular mineral resource since the ancient time. In the 12<sup>th</sup>-18<sup>th</sup> centuries, peat was widely extracted in the Western European countries. In the 17<sup>th</sup> century, Peter I ordered to recover peat in Voronezh and near the Azov. Turn of the 19<sup>th</sup>-20<sup>th</sup> centuries demonstrated beginning of the production of peat semi-coke and resin.

This mineral is characterized by several important properties stipulating its value. Being added to the soil, peat improves such properties as porosity, density, air capacity, humid capacity, microbiological composition. Moreover, peat contains humic acids improving growth and development of plants and aminoacids required for transformation of certain

Peat is characterized by antibacterial and gas-absorbing properties being useful for all the soil types. It helps reduce nitrite content in the product by 1.5-2 times, prevents the plants from accumulating heavy metals and other harmful substance. Black mould humus, formed in the soil in terms of long-term peat adding, helps avoid washing-out of highly soluble fertilizers.

Nowadays, peat is used in agriculture and livestock farming, biochemistry and energy production. Besides, peat is the basis to produce fertilizers, insulating and packing materials, carbon metal reclaimer, activated coal, graphite etc.

Bodakva peat deposit is located in Lokhvitsa district of Poltava region, 7 km eastward from the town of Lokhvitsa and 6.5 km to the north-west from Sencha railway station, near settlements of Sencha, Khrystynivka, Bodakva, and Khruli.

The deposit is located in the flood plain of the Sula River.

The deposit area in null contour is 1337.0 ha; it terms of production depth, it is 713.0 ha. Average peat thickness is 0.94 m; peat reserves are 820.0 thous. t according to C<sub>2</sub> category.

The deposit is covered with miscellaneous herbs along with the prevailing cane as well as willow and alder. Peat of that deposit belongs to the lowland type, uliginose sub-type, and woo-cane kind. The peat is characterized by following qualitative parameters (%): decomposition level – 42.0; ash content – 44.2; potassium content – 11.9; and iron content – 1.41. Within the areas of Zaluchka being the part of the deposit, ash content of the peat is not more than 30%. Area of Zaluchka is 109 ha. During the research, it has been determined that within Zaluchka area, according to local administration, peat is extracted by Lokhvitsa peat enterprise

It can be concluded that peat of Bodakva deposit is expedient to be extracted and used for agricultural purposed as it has increased ash content.

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### **As for the content of geodetic works for the development of certain types of documentation for land management**

In accordance with Article 50 of the Law of Ukraine "On Land Management", a list of geodesic materials is to be provided, which should include a draft land management plan for the allocation of land plots. From this list, you can select the source documents, documents that are developed by the land surveyor engineer and the results of the geodetic installation of the boundaries of the land plot. The documents concerning the execution of geodetic works, referred to in Article 50, do not fully characterize the results of geodetic works. Therefore, the purpose of the study is to identify such geodetic works, which give a complete and qualitative characterization of their implementation. According to Article 50, these documents are almost final results of work, but before they are received, there are a number of documents that play an important role in the formation of the documents referred to in Article 50.

Article 55 mentions such documents practically duplicating the information that should be in the cadastral plan in accordance with Article 34 of the Law of Ukraine "On State Land Cadastre".

Article 56 does not have a complete list of documents, which is the basis for the development of documentation on land management.

Summarizing the above, it should be noted that Article 50 and Article 55, in contrast to Article 56, do not specify a technical task for geodetic works, which is being prepared by a land surveyor engineer. Also in Articles 50, 55, 56 there is no scheme of anchoring to the points of the State Geodetic Network, in accordance with the Law of Ukraine "On State Land Cadastre"; the scheme of the film basis, if the situational conditions of the location of the vertices of the angles of the land turns do not allow the use of GNSS receivers, and then the scheme of coordinating the vertices of the angles of the land boundaries. At the same time, for each corner, you need extra measurements, since the results can be equalized and reliable information is obtained. If the situational conditions permit the removal of vertices of the angles of the turns of the land boundaries, then a scheme of removing these vertices of the angle of rotation is required.

And finally, according to the Instruction, the average square error of the position of the vertices of the angles of rotation in the regional centers should be up to 0.1 m. Consequently, the results of the calculation of the mean square error of coordinates must be given, and in calculation of the area the mean square error of calculation of this area should also be given.

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**Modelling ash content of mined rock of coal mines**

To reduce general mine ash content modeling of winning quality within a mine according to the following methods is offered:

1. Production units with ash overcontent are determined.
2. Model of ash content averaging includes the function of limitation as for mining coal with high ash content:

$$P = \frac{\sum_{i=1}^n Q_{iAd} + \sum_{j=1}^m Q_{jAd}}{\sum_{i+j=2}^{n+m} Q_{i+j}}, \tag{1}$$

$Q_{iAd}$  is a planned winning from the units within which ash overcontent is recorded;  $Q_{jAd}$  is a planned winning within the units which do not exceed ash content norm;  $Q_{i+jAd} - Q_{jAd}$  are planned winning within the mine.

Limitation on the planned winning output within the areas with the recorded ash content overcontent sometimes can be represented as follows:

$$0 \leq Q_i < Q_{i0}, \tag{2}$$

$Q_{i0}$  is actual winning within the units with the recorded ash content overcontent.

The limits of possible plan for the units not exceeding ash content norms:

$$Q_{j0} < Q_j < Q_j^{\max}, \quad (3)$$

$Q_{j0}$  is actual winning within the units not exceeding ash content norm.

Using the model of ash content averaging it is possible to determine the points of cargo traffic mixing, optimal planned loads on stoping faces allowing limiting the extraction within the units with the exceeded ash content norm.

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### **Expected volume of disconfirmation and write-off of reserves inexpedient to be developed**

Estimation of expected volume of disconfirmation and derecognition of reserves inexpedient to be developed due to technical-and-economic reasons is performed by means of their total relative fraction ( $D_{CH}$ ) forecasting within confirmed in-place reserves

The fraction is determined from the formulae:

For fully-mechanized mines:

$$D_{CH} = 3 + 2.8 \cdot \lambda_{yD}^c + 0.10 \cdot \delta^c, \%$$

For nonmechanized mines:

$$D_{CH} = 2.1 + 2.0 \cdot \lambda_{yD}^c + 0.07 \cdot \delta^c, \%$$

For coal strip mines:

$$D_{CH} = 1,5 + 1,0 \cdot \lambda_{yD}^c + 0,04 \cdot \delta^c, \%$$

Where  $\lambda_{yD}$  is mean specific value of lambda criterion of layer hypsometry exploration maturity; and  $\delta^c$  is mean value of relative delta criterion of depth exploration maturity.

Such mean values as  $\lambda_{yD}$  and  $\delta^c$  are identified by means of calculations of entering it tetragons of holes networks.

Mean specific value of lambda criterion is determined on mean specific  $\lambda^c$  value expressed in meters, and mean square of ratable blocks  $S^c$  representation in hundreds thousands  $m^2$  :

$$\lambda_{yD}^c = \frac{\lambda^c}{S^c}$$

Expected volume of disconfirmation and write-off of reserves is used in the process of preparation of optimistic and pessimistic estimations of cost-performance ratio operation of an enterprise.

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### **Development of Thin and Very Thin Coal Seams by the Unit of Front Auger Extraction**

Periods of qualitative changes in mining machinery and technology are considered to be basic stages of the development of mining industry. Coal mining has passed several stages beginning from the use of simplest tools and devices up to the coal shearers and ploughs. Due to the transition of mining operations to the depth down to 1000 m and more, modern mining industry needs continuous unmanned technologies with automated control systems.

Practically all Western Donbas coal reserves occur in thin and very thin (less than 0.8 m) extremely has-bearing formations with various mining and geological conditions. In terms of basic properties of coals and enclosing rock, Western Donbas area is rather complicated for the development. The available coal-mining machinery and technology are no more efficient in terms of thin seams being absolutely inappropriate to develop very thin seams.

From the viewpoint of operating conditions (dust, temperature, humidity, noise, vibration, air rate etc.), people must not be in the stoping face; in this context, gas-bearing capacity of coal seams is of special concern.

Solution of the mentioned problems of underground coal mining may be represented in the form of the development of extraction unit for thin coal seams which objectives are as follows: to simplify coal mining, to provide continuous high-productive longwall operation, to make presence of workers in the longwall to be unnecessary (as well as longwall ventilation), thus, to reduce coal mining costs and miners' safety.

Unmanned coal recovery from thin and very thin seams is possible to perform by the unit of front auger extraction UFAE demonstrated on Fig.1. It has an operating member and transportation device made of sequentially located (along longwall 1) auger sections 2 with shaft 3 on which blades 4 roller cutters 5 are mounted. Shield barrier 7, ending with guiding ploughshares (upper 8 and lower 9), is located on external side of each section; shield barrier 7 is fixed with the help of rods 6.

The unit contains a device to develop pressure efforts on the face and unit motion in the form of driving shaft 10 with forcing rolls 11 supporting on seam foot 12 and connected with shaft 3 of auger section 2 by means of expansion rods 6. Roller cutters 5 on blades 4 of sections 2 performs effective front coal breaking within the seam with the depth of 20-40 mm providing simultaneously minor rotation resistance at the expense of rolling within the face and ground; that reduces considerably drive power to extract coal.

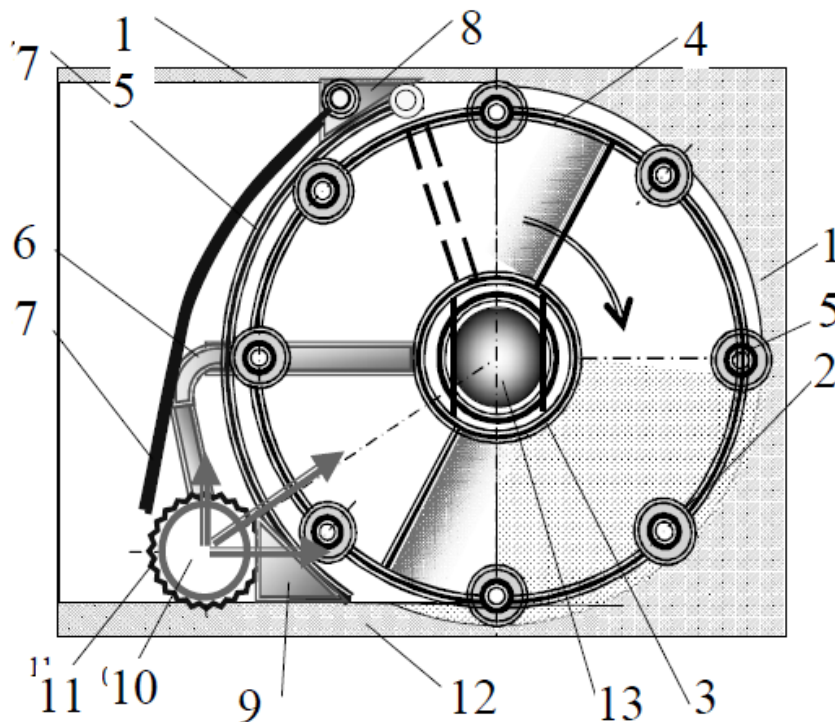


Fig. 1. Unit for front auger extraction

Velocity of front displacement of the unit is within the range of 0.05 – 2 m/s. Since the unit runs completely into the coal seam and operating area is minimal (about the half of the seam thickness), there is no need in powerful mechanized support – light-weight roof shielding in the form of guard plate will be enough. Moreover, people are not present in the longwall at all; thus, there is no necessity in ventilation.

UFAE advantages include: universal and wide range of its application, simplicity and low cost of the unit structure, unmanned coal mining from thin and very thin coal seams (from – 0.4 m) with dipping angles being from 0 up to 40-50 degrees, continuous technology of the operations and their complete automation, high productivity (4-6 thous t/day), no final and auxiliary operations in the longwall.

In addition, costs of the longwall equipment decreases by 3-5 times, and payback period of the unit is less than 1 month.

Thus, it is possible to state that use of UFAE unit will make it possible to refuse from manufacturing multi-type traditional extraction equipment and begin using unified scheme of longwall equipment. Transition of coal mines to the machines of such level will help reduce fatal casualties practically to zero along with the considerable increase in the overall productivity and annual output of an enterprise.



### **Geochemical characteristics of Snezhnianskaia zone coal-bearing rocks**

Lithochemical analysis of coal-bearing rocks of early Carbon ( $C_1^4$ ) and middle Carbon ( $C_2^0$ ,  $C_2^1$ ,  $C_2^2$ ,  $C_2^3$ ) gives ability to recognize such regularities:

Comparison of mean compositions of elements with abundance ratios by means of concentration factors estimating shows that each type of coal-bearing rocks of early Carbon and middle Carbon are significantly enriched in nickel (28.5), cobalt (130), niobium (190), copper (32), and amalgam (89). Plumbum (5.14), vanadium (5.8), wolframium (3.3), chrome (6.45), germanium (5.5), lithium (8.4), manganese (5.1), zinc (8), and scandium (8.8) show lower concentration factor. There are no significant differences in chemical elements distribution on early Carbon and middle Carbon.

Within lower part of Snezhnianskaia zone there are recognized epigenetic mercury scattering halos with  $2 \times 10^{-6}$  –  $1 \times 10^{-5}$ % content. They are located between Olkhovski and Saur-Mogylski oversteps, and westward of them. Within this very zone part, there are explored numerous low-intensive and medium-intensive plumbum, vanadium, gallium, nickel, cobalt, molybdenum, lithium, copper, arsenic, zinc, and argentum scattering halos.

Linear efficiency on samples in which important ( $3 \times 10^{-6}$ % and more) mercury content was estimated to analyze the law of mercuric abnormalities distribution. As for the age, maximum mercury efficiency is associated with  $C_2^0$  series – 73% of specified total zonal efficiency. Sandy shales in  $C_2^0$  series are of maximum efficiency to be 53% of specified total zonal efficiency.

The greatest efficiency values are in the south end of area under study – within a segment with intensive development of disjunctive structure.

Considerations of mercury content estimations help to conclude that sandstones and sandy shales have the highest figures (11.2% and 11.3% accordingly). As for the age, sandstones and sandy shales of  $C_2^3$  series, and sandstones of  $C_2^3$  series have the highest values (12.5%, 17.7%, and 11.3% accordingly).

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### **On endogenous fissility of argillites within carbonous deposits of Donbass**

Argillites are the most abundant rocks within carbonous deposits of Donbass. Overwhelmingly, coal seats and roofs of coal layers consist of the rocks. Within carbonous deposits they form lenses, dividual seams, and layers of varying thickness.

Within natural exposures and open pits fissures in argillites are mainly open with size of heave up to 3-4cm. Argillite is intensively wind-worn along fissures.

In mines, endogenous fissility emerges well both in development workings and in stopes. Often stone separation from solid mass with its following falling into stripped area takes place under opening just Dyas of fissures.

Dependence of fissility consistency on physiographic features and structural features of argillites is that structural complication and jump in seam height, changing textural type as well as content noddle follows by fissility increase.

Statistically significantly, fissility level of carbon-bearing argillites, sideritized argillites and argillites as such differ from each other.

Maximum distance between endogenous fissures is in sideritized argillites being at the stage of katagenesis associated with T coal ranks (average distance between fissures is 94cm), and minimum one is in argillites which country Д coal ranks (average distance between fissures is 9cm).

Fissility of argillites and carbon-bearing argillites under the effect of katagenesis varies under some conditions, and fissility of line argillites and sideritized argillites – under other ones. Distance between fissures within rocks being at the same stage of katagenesis, and under all other equal conditions regularly increases in carbon-bearing argillites, argillites, lime argillites, sideritized argillites line.

Distances between fissures within carbon-bearing argillites and argillites increase depending upon growth of katagenesis degree being in accordance with modification of grade constitution of coal from Д to Ж with following decrease. Endogenous fissility of lime argillites and sideritized argillites monotonously decreases depending upon growth of katagenesis.

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### **The key features of composition of productive stratum of Proletarsky deposit**

Natural magnet is principal ore mineral of the deposit. Shining ore as a second-order mineral is available only in some boreholes in quantities being out of commercial interest. Nonmetallic minerals are silicates (rhombic pyroxenes and clinopyroxenes, amphiboles, biotite, garnet, and clinkstone), quartz, and carbonate rocks (siderite, sideroplesite). Iron sulphides and apatite are minerals-bearers of harmful impurities. Mainly, sulfides are available as iron pyrites and pyrrhotines.

Natural magnet is in the form of polyhedral congeries within ore beds as well as monometrical disseminations within nonmetalliferous quartz or silicate beds. As a rule, flakes of natural magnet monomineralic and plane. Borders of natural magnet and silicates interlocking are normal, plane, and less often they are slightly rolling. Subautomorphic interlocking character prevails, but sometimes mermekitlike interlocking are available. Poikilitic interlockings (so called sieve textures) are less common. When it occurs, flakes of nonmetallic minerals are disseminations in ore minerals. Size of natural magnet is within 0,015 – 1,0mm, and 0, 1-0,6mm flakes prevail. Shining ore is available in the form of the two morphogenetical phases – primary shining ore and martite.

Primary shining ore prevails in slides. Most of all, it is available in pay leads forming close interlockings with natural magnet. Automorphic flakes of 0,04-0,08 x 0,08-0,17mm tabular shape are manifestation of shining ore. Martitization is not important; it concerns some flakes of natural magnet from surface. Most of all, quartz has monometrical shape with even outlines; less often the shape is ungeometrical – long. It forms mosaic structure.

Silicates are mainly available as pyroxenes (diopside, hypersthene), and as amphiboles (hornblende and actinolite). Less often peridot, biotite, garnet, stilpnomelane and clinkstone are available. In the majority of cases sizes of flakes of silicates are 0, 1-0,8mm. Carbonate rocks are rare.

Mainly, sulfides are iron pyrites and pyrrhotines half-and-half approximately. Most of all sulfides are limited to flakes of natural magnet forming either disseminations or interlockings in them. Sizes of particles are within 0, 04-0,15mm. Concentration of sulfides is also available within areas of silicates stretch.

Close interlockings sulfides and natural magnet may result in increase of sulphur content in concentrate.

**Section 06 Smart Engineering**

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**Petrological features in rocks of the Varvarivskyi ultrabasic massif of the Serednoprivodnirovskyi megablock as a potential object of magnesian raw materials**

The relevance of the research topic is justified by the need to ensure the development of the mineral resource base of Ukraine in relation to extremely deficient raw materials for producing refractories of the basic composition - forsterite, talc-magnesite, periclase-chromite, and others.

The trends of world production of magnesian refractories are developing towards introducing a converter method of steel smelting instead of open-hearth process, for which magnesian refractories of high quality are needed. One of the directions in developing the mineral-raw material base of Ukraine in relation to high quality magnesian raw materials and providing the domestic enterprises by magnesite powders may be producing active magnesium oxide from serpentinites. The prospect of such a direction lies in the fact that, unlike talc-magnesite and other ultrabasic rocks, serpentinites in the crushed form are readily soluble in acids.

Within the Serednoprivodnirovskyi megablock of the Ukrainian shield promising objects on magnesian raw materials are associated with massifs of ultrabasic rocks that form productive bodies in sections of green stone structures, and are characterized by high magnesian content. Typical Greenstone structures in Serednoprivodnirovskyi megablock comprise the rocks referred to Konkska and Bilozerska series. The largest of them are Verkhivtsivska, Chortomlytska, Surska, Konkska, and Bilozerska.

The Varvarivskyi ultrabasic massif is located in the central part of the Verkhivtsivska greenstone structure. In the central part of the massif, primary rocks and serpentinites are preserved in their unchanged holistic state, which are considered as promising for magnesian as well as asbestos raw materials.

To determine the material composition of rocks of ultrabasic massifs and substantiate the expediency of their use, petrographic and laboratory-technological researches have been carried out and the results of chemical analysis of the laboratory of the Communal Enterprise " Pivdenukrheolohiia " were used. According to the petrographic and petrochemical composition, the Varvarivskyi massif is markedly differentiated. It is characterized by a zonal structure, which varies from the center to the periphery.

Thus, the central part of the massif (the core of the penetration rock) is composed with serpentinitized dunites (Fig. 1), chrysotile-antigorite serpentinites (Fig. 2) changing to the periphery to talc and carbonate serpentinites (Fig. 3). Also on the periphery talc-carbonate, chlorite-carbonate-talc rocks, tremolite-actinolites,

chlorite-actinolites, chlorite schists and metasomatic formations are widespread (Fig. 4).

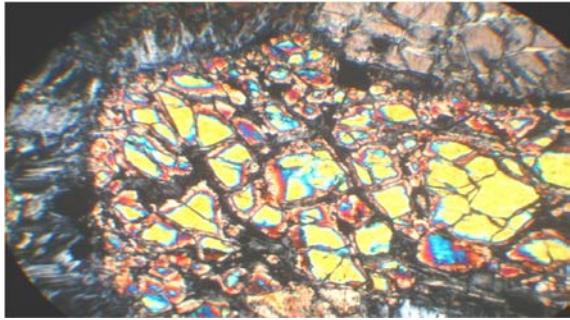


Fig. 1. Serpentinized dunites

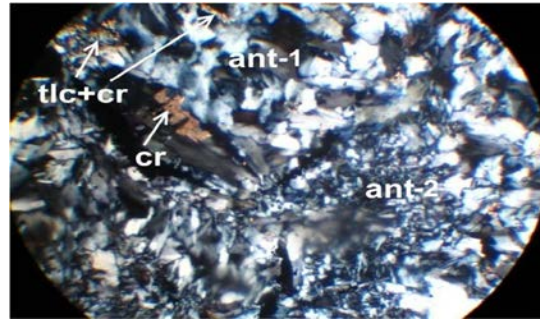


Fig. 2. Chrysotile-antigorite serpentinites

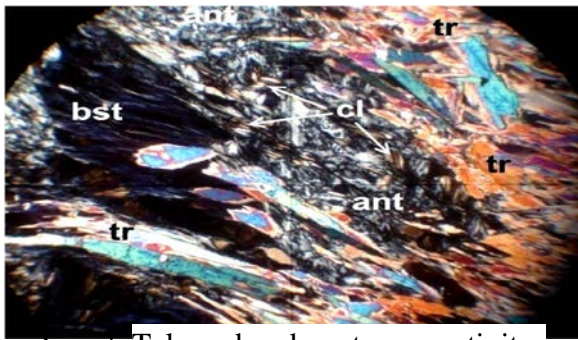


Fig. 3. Talc and carbonate serpentinites

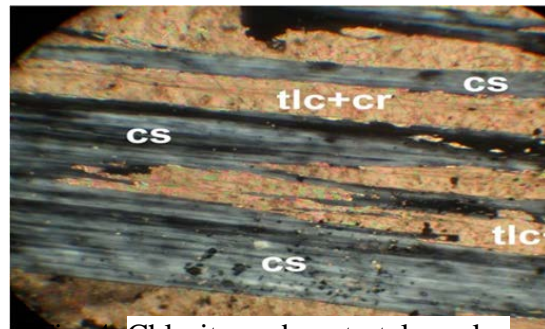


Fig. 4. Chlorite-carbonate-talc rocks, tremolite-actinolites, chlorite-actinolites

Serpentinites of the Varvarivskiy massif, in comparison with all known massifs of ultrabasic rocks in the Serednopydniprovskiy region, are marked by the highest content of magnesium oxide in geological sections, the indicators of which reach 37.5-43.5%. This is due to the process of brucification and carbonatization of rocks, which in turn has a positive effect on the quality indicators of magnesian raw materials. It is well known that gangue of brucite and carbonate of magnesia increase the refractoriness of magnesian-silicate rocks.

Serpentinites of the Varvarivskiy massif studied and characterized in detail are marked by the highest content of magnesium oxide in comparison with the ultrabasic rocks of other massifs of the Prydniprovya. Therefore, the Varvarivskiy massif is the primary object for exploration for magnesian raw materials.

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## **Energy saving**

Coal industry involved in the extraction and processing of coal has a big technical and national economic importance . Modern coal mines are equipped with high-performance machines and mechanisms for mine workings and coal product , powerful vehicles , and the perfect stationary installations for lifting the rock mass to the surface . Currently, in the mines of Western Donbass, the main type of energy is electricity necessary to power the drive this machines . In recent years, the energy load of mining machines has increased significantly respectively, and the use of electricity too . To reduce power consumption without loss of performance, energy-saving technologies are used.

Production efficiency is one of the main problems in all enterprises, including mining enterprises.

This is a constant search for ways to reduce production costs and the possibility of rationalizing them. In my opinion , energy saving is the best solution to this problem. Energy optimization will give good potential to reduce the cost of energy costs. Managing the energy of an enterprise is a time-consuming and complex process that requires the ability to carefully analyze the overall situation in an enterprise and make timely decisions and actions to ensure energy saving at its enterprise.

Timely inspections, proper operation according to the standards and high-quality maintenance of all systems, make it possible to monitor the electricity consumed.

Proper organization of control of the process of electricity consumption can solve the following tasks:

- compliance of electricity consumption with the technology complex according to the established daily limit;
- the right composition of equipment ;
- installation of special sensors on the equipment, for indications of power consumption;
- installation of control points that have modern computing systems;
- optimization of dispatching points.

Energy indicators and data on the process of energy costs will be essential for the formation of the energy balance of the enterprise, which consists of an external energy balance.

The need to maintain such a balance is that only in this way energy administration will be able to determine the exact indicators of the ratio of the volume of consumed and used energy resources.

While observing actions on energy consumption optimization and timely performance of evaluations of measures taken for energy conservation, this will forecast the necessary future volumes of energy purchases, resulting in tight control over the terms of electricity costs.

Energy saving at an enterprise can be implemented through the implementation of special programs that will include measures that will be implemented, with mandatory monitoring of compliance with certain rules, requirements and conditions.

The target of such energy saving measures is not only to prevent losses at the enterprise, but also to take care of the state of the environment and preserve natural resources.

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**No blades - no problems**

Cheap and environmentally friendly electricity is in great demand nowadays due to the fact that hydrocarbons are not renewable and, moreover, they cause damage to the environment. From this point of view, a wind power looks much more perspective alternative, as it is inexhaustible and environmentally friendly. But, unfortunately, wind power stations of traditional design cannot satisfy the needs in electric energy, so searching solutions for more efficient use of wind energy is required. One of the perspective solutions is a bladeless wind generator from the Spanish company Vortex Bladeless.

This vertical bladeless wind turbine looks like a huge baseball bat standing on a handle swaying in the wind. The main principle of its work is an oscillating flow taking place when such fluids as air or water flow through a cylindrical body. In this flow, vortices are created at the back of the body and detach periodically from either side of the body. This effect is called *Von Kármán Vortex Street*. It is destructive for building structures, and construction engineers prevent the possibility of entering the structure into resonance. Vortex Bladeless engineers specifically carried out research



in the wind tunnel to find the shape of a generator that would be more responsive to resonance. Vortex innovation consists in its unusual shape, where fiberglass and carbon fiber mast oscillate in the wind taking advantage of the *vortex shedding effect*. At the bottom of the mast a carbon fiber rod moves inside a *linear alternator* that generates the electricity, with no moving parts in contact. Vortex has a small carbon footprint that is noiseless, has low center of gravity and allows for small foundation dimensions. Owing to this more generators can be placed in the area with the density as much as twice compared to traditional turbines [1].

According to Vortex Bladeless statements, their bladeless generator performance overtakes the performance of a traditional wind power turbine of the same power and it can be proved by the following results:

- 53% off in manufacturing costs – less materials are required;
- 51% off in operating costs – no moving parts in contact;
- 80% off in maintenance costs – simpler construction;
- 40% global power generation costs reduction;
- 40% carbon foot print reduction – such processes as manufacturing, transportation and maintenance are simplified.

Some other advantages should be mentioned as well. Lower speed of the wind results in oscillating process. Power stations are possible to be located much more compactly. Wind turbines of the classical design with a dense arrangement do not receive enough wind flow, while this bladeless generator benefits from dense displacement and its oscillatory effect is amplified by the vortices from the generator ahead. Little noise harmful for wildlife is produced, and this type of generator is safe for birds and does not clutter the horizon [2].

Vortex Bladeless is developing three different products. The main characteristics of these three products are:

- Vortex Atlantis: 3 meters height and 100W generation capacity, working along with solar panels, mainly to bring energy to off grid locations.
- Vortex Mini: 13 meters height and 4 kW generation capacities, mainly for small-scale/residential wind.
- Vortex Grand: 150 meters height and 1MW generation capacity, capable of generating electricity for 400 houses.

Atlantis and Mini models are planned to be introduced for private homes in developing countries, or small constructions like radio antennas with their first field tests in Avila, Spain. And by 2019, the deployment of the Vortex Grand will have been planned.

It is hard to forecast which problems can occur as there is still no final product, but possible problems can be predicted: vulnerability to such natural disasters as storm winds, and low temperatures resulting in disrupting generator aerodynamic properties.

It should be concluded that as the era of hydrocarbon use is going to end sooner or later and nuclear power is potentially very dangerous, we strongly need a reliable source of clean energy. That is why there is a great necessity for searching



and financing non-standard and forward-looking solutions in clean energy despite some failure can occur.

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**Sensorless control**

Nowadays, there are two main types of motor vector control systems. These are the systems with speed feedback and sensorless systems. The latter have no speed sensors on a motor shaft.

Field oriented control of SMPM received its wide spreading as it provides quick, smooth and precise control of a shaft position, speed and torque of an electric drive. But to realize this method it is necessary to know the position of a rotor.

There are two ways of FOC depending on the method of determining the rotor position:

- with sensors (feedback by a proximity sensor and/or a speed sensor);
- sensorless (the information regarding the rotor position is calculated automatically in real time and based on the information that has already been in the control system).

The appliance of both methods of FOC is determined by the area of motor appliance. The sensorless FOC of a motor is applied in cases of small ranges of speed change (not more than from 1 to 100) and the requirements of its precise maintaining at no more than  $\pm 0.5\%$ .

The methods of FOC are applied with a speed feedback stipulated by such conditions as:

- speed of shaft rotation changing in a wide range (from 1 to 10000 and more);
- requirements of high precision maintaining of the rotation speed (up to  $\pm 0.02\%$  with a frequency not more than 1 Hz);
- shaft positioning requirement;

- necessity to regulate the torque of a motor shaft at a very low speed of rotation.

The object of sensorless control can be divided into the following 3 stages:

- determining an initial rotor position for the motor launch;
- controlling a motor at a low speed, i.e. motor acceleration to the speed, where the generated EMF is enough to determine the rotor position;
- accelerating the motor to the rated rotation speed, regulating rotation speed during the operation and maintaining the maximum torque.

There methods of sensorless to determine the initial rotor position without applying any sensors can be listed as follows:

- carrier signal injection
- PWM method
- current impulse method

Since only the third method allows making distinguish between north and south pole, it can be taken as the best solution for the problem of the sensorless start.

Now let's consider a sensorless control of the motor.

### **1. Sensorless control at a low speed**

At a low speed of rotation (0-10% from rated one) the value of the back-EMF, generated by motor, is not enough to determine the position of rotating rotor. Therefore, the information about the rotor position is obtained as a difference between the inductances in d-q axes that SMPM with explicit poles has.

### **2. Sensorless control in a baseband**

The speed baseband (10%-100% from rated speed of rotation) is considered as such a mode of operation where the motor speed is enough to calculate the rotor position with acceptable accuracy. The observer is used to calculate an angle. It implements the calculation of all variables and parameters of the motor with permanent magnets required to realize an algorithm of adaptive vector control using the information about two phase currents of the stator and two set values of phase voltages.

### **Solutions for motors working at high speeds**

In such appliances as radial compressors and turbomolecular pumps the use of high-rpm electric motors with a speed of rotation more than 60000 rpm is required. Electric motors with permanent magnets are used for such purpose and their rotor has one pole pair. As the proximity sensor is in a big error at high rpm and not always able to be constructed in terms of design, the appliances described above require using sensorless control systems.

To solve the problem of an electric motor control the following stages should be taken into consideration:

- sensorless determination of initial position
- scalar acceleration method
- vector control at high rpm (in case of a variable load).

It should be concluded that sensorless systems have such advantages as reliability, cheapness and compactness. At the same time FOC requires precise determination of angular rotor position and has a big sensitivity to changes of motor

parameters. However, in steady-state modes it provides fewer losses of calculated resources and lower level of torque pulsations comparing to direct method of torque control.

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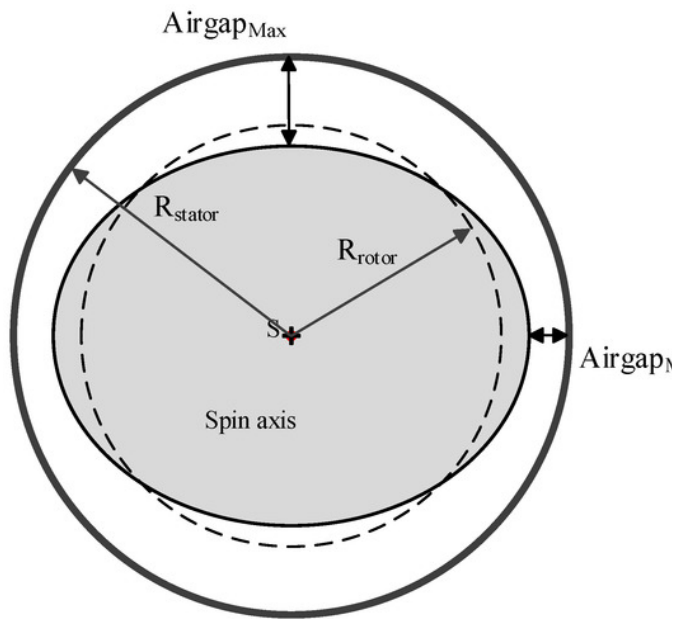
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**The advantages of continuous monitoring**

Nowadays such issue as decreasing energy losses in any industry is of great concern. The most common problem can be considered as low voltage or power outages. This pushes modern firms to research the causes and their possible solutions.

For example, in places where energy is generated with the help of a hydrogenerator, power slumps are possible due to the fact that vibrations in the engine can lead to asymmetrical rotation that it locks. The **Figure 1** illustrates that type of engine rotor deformation. Also, because of long-term vibrations, there is a very high probability of generator break, thus resulting in energy generation reduction and replacement of an expensive generator.

Nevertheless, the wind generator is connected to the mains to compensate for the drop in AC power during generator repair and peak hours. However, wind turbines are very expensive and bulky due to transformer substations. Wind turbines that are directly connected to the network are currently being developed. They themselves can equalize the voltage at the terminals and control the frequency, which is good for the network and consumers.



Moreover, the electromagnetic coupler decouples the synchronous generator from the gearbox and wind turbine rotor side of the drive train. The synchronous generator oscillation torque does not pass through the gearbox and to the rest of the drive train and wind turbine structure during grid faults. This is a benefit for the drive train components, especially for the gearbox.

Figure 1. Model of the rotor ellipse deformation

Low Voltage (LV) electricity distribution grid operations can be improved

through a combination of new smart metering system capabilities based on a real time Power Line Communications (PLC) and LV grid topology mapping. Developed methodology of a smart metering PLC network may be used to monitor and get information about a grid in a real time with the information obtained from the existing smart metering operational activities. Moreover, it can be used to obtain fault identification through grid conditioning. Availability of grid information in a real time can lead to faster detection of fault location and higher quality of electricity level. **Figure 2** shows a structure of PLC communication.

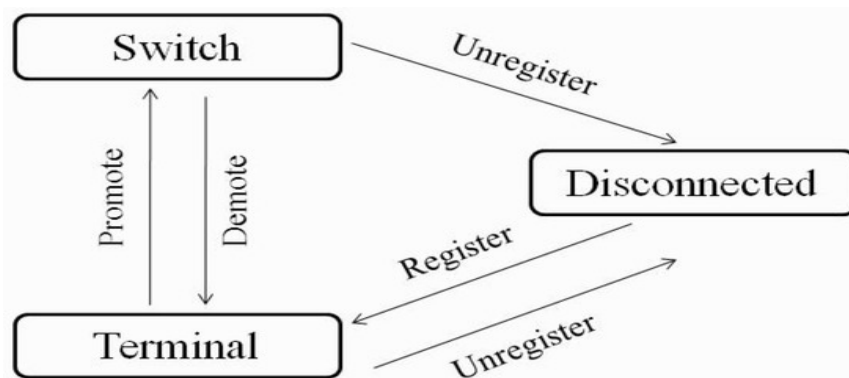


Figure 2. PRIME Service Node (SN) state machine.

It should be concluded that all network problems can be monitored and prevented using PLC networks. They can monitor networks for subsidence or failures, facilitate operation and accounting, as well as process data received from meters, companies and utilities with the laying of new networks and faster troubleshooting.

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### **Why is it important to assign a cadastral number correctly?**

The cadastral number of the land plot is a unique code which does not repeat throughout the territory of Ukraine and is stored on the land plot throughout its lifetime. The cadastral number confirms the fact of registration of the land plot in the State Land Cadastre with information about its owner, the assignment of land, borders. That is, the cadastral number guarantees the owner of the land plot the fact of its existence and makes it impossible to encroach upon it by other persons.

In order to carry out any transaction with property, it is necessary to have a cadastral number for the land on which it is located. The purpose of the cadastral number is very important, as it will protect the owner from the land of illegality. To obtain a cadastral number, contact the Land Management Organization, which has a relevant license and certified personnel.

The assignment of a land cadastral number is necessary in the following cases: registration of the inheritance, the conclusion of a donation agreement, mines and other transactions, sale and purchase of land, sale of a residential building or a building located on a plot of land.

There are, of course, a lot of problems faced by citizens. A huge number of sites are registered in the state land cadastre with various mistakes - from incorrectly defined codes of the intended destination and ending with incorrect fixing of borders, when the registered land may "appear" in kilometers from its actual location.

For example, there was a situation where my parents wanted to get a cadastral number for a house and a plot next to him that was inherited. But it turned out that the borders of neighboring territories crossed the borders of my parents' home. It turned out that several neighbors turned to the organization of land management. Employees

of the company entered the wrong coordinates in the cadastral map. Because of the bad work of such a firm, my parents need to go to another organization and pay a lot more money, because it is necessary to re-engage in surveying the area of several buildings.

There are many benefits to the cadastral number system, but the main disadvantage is unscrupulous workers who are doing their job incorrectly. In modern terms, correcting mistakes in a cadastre from a technical point of view is not a problem, but the main question is who will finance the relevant land management work and reimburse damages caused by mistakes. Land owners and land users. The only way out is the introduction of a professional liability insurance for land tenure executors. It is necessary to fundamentally revise the land management system by abandoning the outdated system and switching, like most developed countries, to liability insurance for developers - this will create a financial resource for correcting mistakes, and any possible damage to land owners and land users will be reimbursed by insurance companies.

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### **Modern graphic design**

Graphic design is an activity, synthesis of project thinking and creativity, the purpose of which is to create visual elements with the help of graphic editors and computer programs. Over the past 20 years, the development of graphic design is linked with the development of information technology and computer programs and PC design. During this period of time it is possible to allocate 3 main stages of advancing graphic design at new level(s).

The first stage is the transition to computers with much more computing power and capabilities to use more modern computer programs of graphic design. The first computers designed to work with graphics objects were rather expensive, large and had low performance that limited capabilities for designers. During the development of computer production, it was possible to significantly reduce the physical size and to increase the computing power of components for computer. This gave designers the opportunity to work using more complex and multifunctional computer programs which made possible to create 2D drawings and 3D models.

The second step is replacement of computers with graphics tablets. The transition from the use of computers to the use of graphics tablets has become possible thanks to graphics tablets possessing all the qualities of a good computer. Tablets have become used by designers around the world because a tablet unlike a computer is portable that provides its mobility. Mobility and compactness give graphics tablets an undeniable advantage over computers. With the help of some programs it is possible to show the screen to other users, demonstrating them clearly a drawing made on a tablet. This allows the designers to do their work remotely. Graphics tablets are equipped with a stylus that in comparison with a computer gives higher accuracy when working on an object design.

The third stage is the ability to work on details in virtual reality. Virtual reality is a new step in IT where designers can immerse themselves in the creative process by wearing virtual reality glasses. Wearing glasses, the user turns the room around him/her into a working program interface that allows to create and import three-dimensional models and work with them using gesture control technologies. Work in such glasses is radically different from the monitor or graphics tablet. The other benefit is that you can work with the object, giving more details close to real world.

Thus, we see that over the past 20 years, the development of technologies for graphic design has made a significant technological breakthrough. Without any doubt, the future of designing will be greatly influenced by use of virtual reality.

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## The main reasons for implementing sustainability in mining

There is a lot of views on what sustainability is and how we can achieve it. The original definition is considered to be: "Development that meets the needs of the present without compromising the ability of future generations to meet their own needs." Fast increase of the world population and worldwide industrialization of the 20 and 21 centuries have led to the giant effects and ecological footprint on the Earth. However, sustainability is not only about preservation of the basis for all generations (for instance air, water, forests, raw materials). Basically, there are 5 main principles of the sustainability: life quality, equity, participation and partnership, attention to the environment and respect for geological constraints. So, as a matter of fact, sustainability involves not only ecological but also economic and social sides.

In 2015 United Nations elaborated 17 Sustainable Development Goals to end poverty, protect our planet and provide welfare for all people as a part of a new sustainable development agenda. For mining companies, sustainable practices are fundamentals for their license to operate. Recent times mining industry is affected such problems as resource scarcity, climate change and energy efficiency. Due to this a huge amount of enterprises recognize that the best way to be economically profitable is working with environmental and social responsibility.



Nowadays mining industry has the unique opportunity and potential to make a positive contribution to all 17 goals of the Sustainable Development. For example, the 1st goal is to end poverty: mining promotes significant part of revenues through taxes and dividends that can be invested by government in economic and social



development of the country. Besides, mining is responsible for the environmental damage and there are some goals concerning it, namely the 6<sup>th</sup> goal (Clean Water and Sanitation) and the 15<sup>th</sup> goal (Life on Land) as mine development requires access to land and water representing extensive and considerable landscape impacts that must be responsibly guided.

There is a lot of advantages to have sustainable business management in mining companies. Among them are not only moral liability and representation of the company, but also trust of the consumers that are ready to spend more money on sustainable products. A lot of companies discover new technologies and more efficient methods of the development because of their participation in social and environmental activities of their regions. In addition to this, sustainability helps to use minerals and energy more efficient taking into account the fossil fuels exhaustion (especially oil and gas).

In conclusion, the questions of how to combine the maximization of ore development and support environmental and social sustainability are quite critical. The non-renewable nature, environmental damage as well as air and water pollution and CO<sub>2</sub> emissions still conflict with sustainability thus underlining the importance of the efficient resource use as well as implementing sustainability management in the mining industry as soon as possible.

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## **A model driven approach for engineering requirements of industrial automation systems**

Model driven requirements engineering (MDRE) is proposed to deal with the ever-increasing complexity of technical systems in the sense of providing requirement specifications as formal models that are correct, complete, consistent, unambiguous and easy to read and maintain. A critical issue in this area is the lack of a universal and standardized modeling language to cover the whole requirements engineering process from requirement specification, allocation to verification. SysML is being proposed to meet these requirements.

A model driven requirements engineering process for industrial applications in the field of automation systems is described in order to reveal shortcomings in recent modeling tools and modeling languages. Special focus is focused on the requirements definition and the automated verification of the design against the requirements using executable models. Based on the analysis, a new profile of the Unified Modeling Language (UML) called Model Driven Requirements Engineering for Bosch Rexroth (MDRE4BR) is presented to contribute to latest investigations in this field correctness with respect to the customer requirements.

Studies at the Bosch Group have shown that over 50% of field problems were due to insufficient requirements engineering (RE). The RE accompanies the whole product development process, in which various engineering disciplines are involved. Therefore, a universal and standardized modeling language is required to share the understanding among engineers from different disciplines. This common language shall enable the building of requirements models, system design models, traceability models as well as verification models containing domain-specific details.

The Systems Modeling Language (SysML) is being proposed by the Object Management Group (OMG) to meet these requirements and has already been evaluated by several researchers. The main drawbacks coincide with the results of the analysis of the engineering process of automation systems and it can be concluded that requirements constructs in SysML are not sufficient for real industrial applications, and the SysML is not capable to describe continuous-time dynamic models.

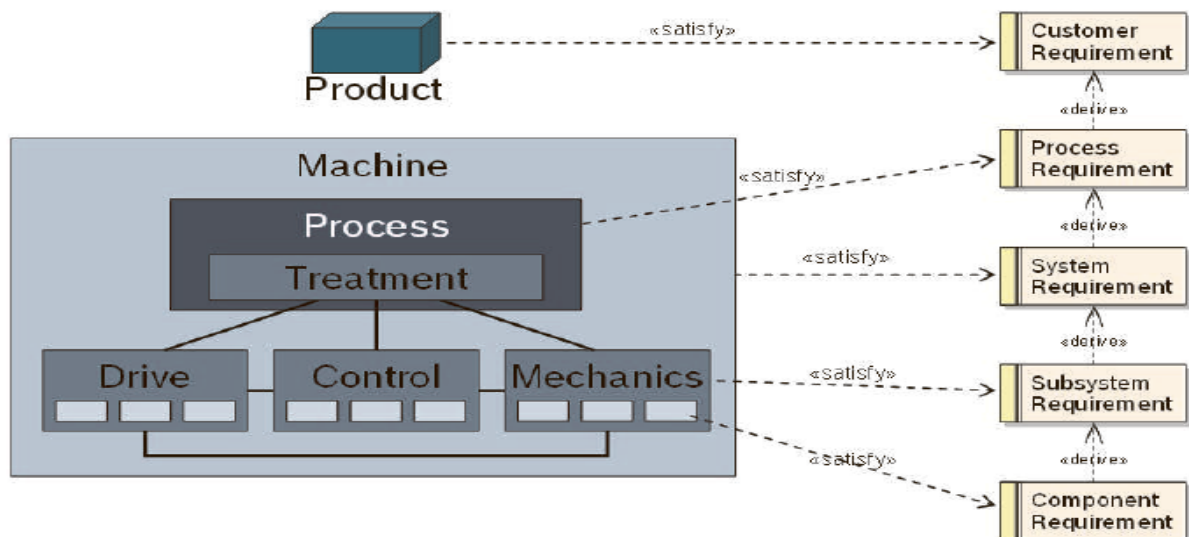


Figure 1. Levels of Abstraction in Requirements and System Design

In order to contribute to the solution of these shortcomings, a UML profile MDRE4BR reuses and extends the current requirements constructs in SysML targeting the first issue. Recent works on the integration of SysML and Modelica like ModelicaML have been carried out. Reusing these improvements the proposed extensions of the MDRE4BR gives the possibility to provide links with the ModelicaML and transform the later introduced analytical models into executable Modelica models.

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## Synchronous motor as an ideal drive for transport vehicles

Permanent magnet synchronous machine (IPMSM) is by far the best drive for electric vehicles, machine tools, etc. Synchronous motor has the following advantages:

- high torque
- flexibility of characteristics
- possibility of precise control
- small size and environmental friendliness compared to the internal combustion engine

There are a number of disadvantages, among which are:

- unnecessary distortion of current and torque in partial load mode
- significant electrical losses in the core of the machine

These shortcomings are undesirable, and therefore, it is necessary to get rid of them. To begin with, it is necessary to analyze the source of undesirable processes in order to further optimize the system in accordance with the given criteria, taking into account the obtained data [1].

The diagram for determining the loss of the stator core is shown in Figure 1.

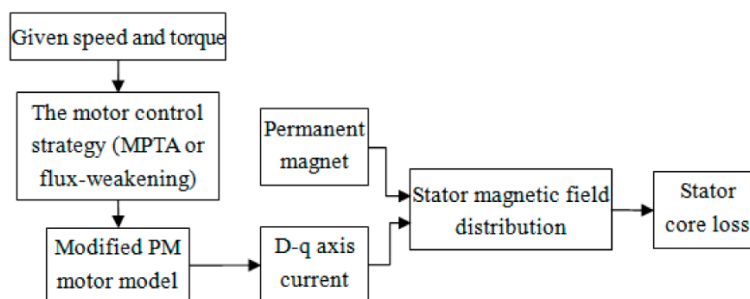


Figure 1. Chart of determining the stator core loss, MPTA: maximum torque per ampere, PM: permanent magnet.

Below are graphs of engine losses with a nominal speed of 1000 rpm.

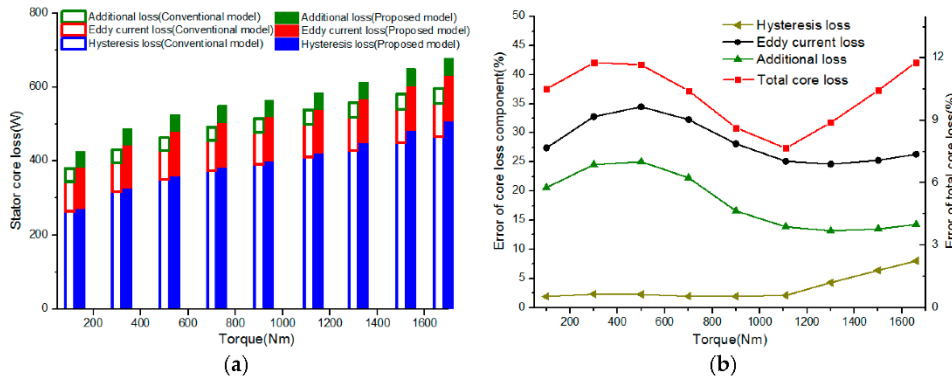


Figure 2. The stator core loss comparison at the speed of 1000 rpm. (a) The stator core loss; (b) Errors from the core loss component comparison and total core loss comparison.

Taking into account the research, it should be noted that when designing an engine for a particular installation, it is necessary to take into account its speed and load, based on this count the number of poles. Pole combinations directly affect magnetic field and loss.

As for the first drawback, to control the current vector of the magnetic flux, circuit use is shown in Fig.3.

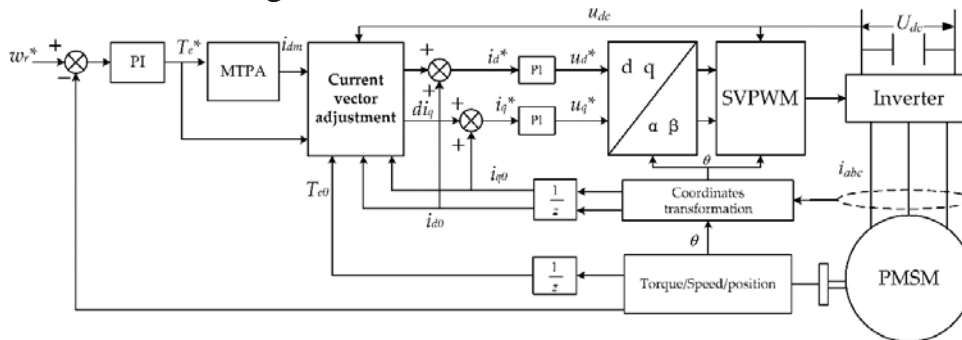


Figure 3. Overview of the current torque control strategy.

The maximum torque per amp (MTPA) becomes the primary choice for operating at a constant torque when the command torque signal is converted to a specific reference current. The proposed strategy for managing the current path takes into account the changes in the input and output parameter at each step and demonstrates worthy agreement with the actual operational situation of the motor.

The induced loss graphs and current magnetic flux control circuit allow you to unlock the full potential of a permanent magnet synchronous motor (PMSM). When using innovative technologies to control a synchronous motor, its correct selection or design, it becomes the ideal drive for a transport vehicle. The possibility of flexible control of torque and speed makes it the undoubted leader for this task among electric motors [2].

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### **The main concept of applying underground coal gasification**

It is commonly known that the underground coal gasification (UCG) process represents industrial underground burning, which aim is converting coal strata into gas. This technology is carried out by means of drilling a specific amount of boreholes where each of them has its own purpose. Such gases as carbon dioxide, hydrogen, carbon monoxide and methane are resulted due to the combustion. The ratio of those may vary depending on several factors such as the values of oxidant balance, the depth of the coal bed and the amount of embedded pressure. In most cases, outputted gas can be utilized at power plants as a source of fuel. However, firstly it is required to be processed and separated from undesirable impurities and then transported through the gas pipeline.

Besides, a great chemical feedstock in the form of a synthetic natural gas (syngas) is possible to obtain. To form this type of gas and accelerate the chemical reaction supplying steam and oxygen into underground is required. This synthetic gas is worth providing additional operations, as it is highly valuable resource for such fuel production as diesel, fertilizer, explosives and other products.

In terms of safety, this method wins greatly in comparison with general coal extraction due to several reasons. One of the main benefits of this technology is eliminating mining and enhancing mine safety issues. UCG does not involve human factor to ensure protection beneath the ground. Since there is no such thing as working, rock mass is no longer required to be extracted from the workings.

Now let's consider the issue of economy. UCG is claimed to be significantly cheaper due to eliminating the process of building all those underground facilities. Besides, implementing this technology results in sufficient increase of reserves to be economically recoverable by several times, which presents great importance for economy of the country in general. To prove this idea, Lawrence Livermore National Laboratory calculated that underground coal gasification could enlarge recoverable coal reserves in the USA by 300%, which is apparently a successful step in technological improvement.



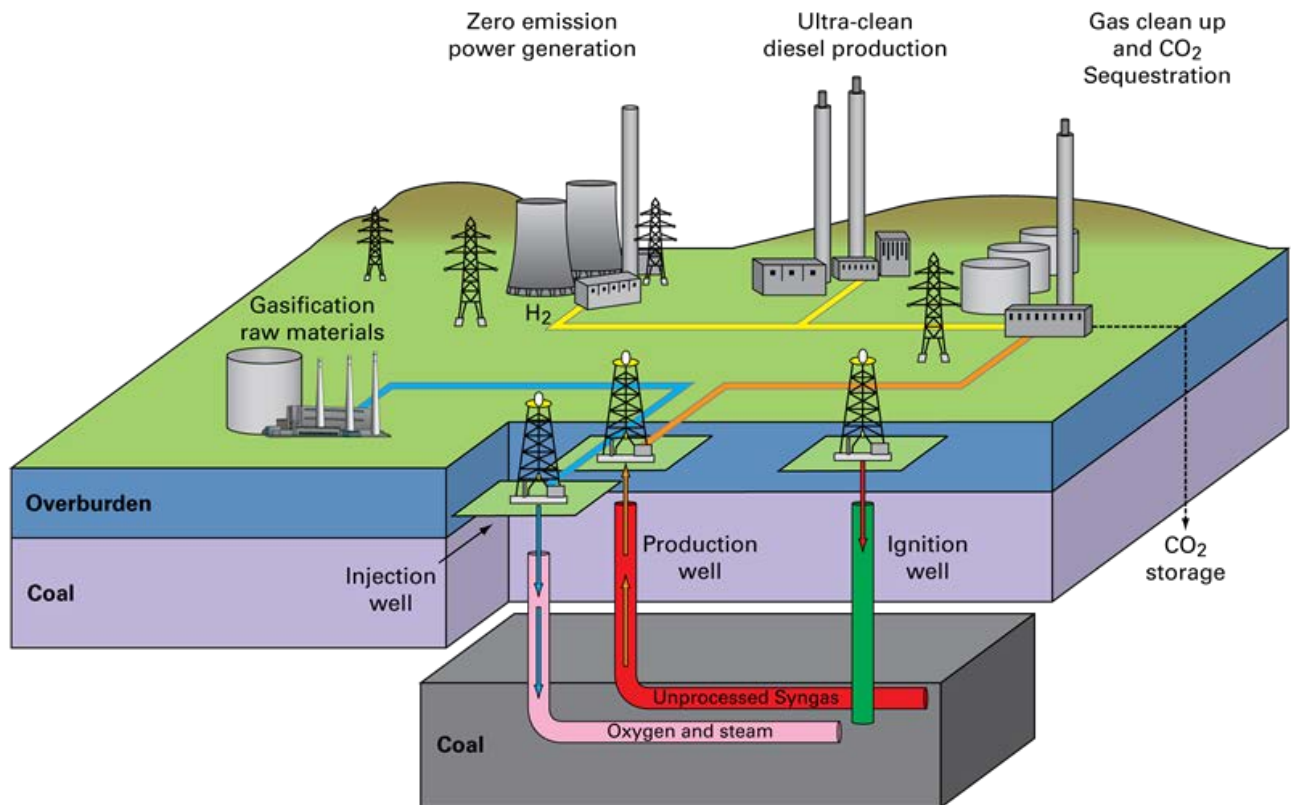


Fig.1. Basic layout of UCG

Ecology is also of great deal when it comes to mining. Comparing to the traditional mining of coal, the underground coal gasification excludes damage to the soils, reduces most of such emissions as sulfur dioxide ( $\text{SO}_2$ ) and nitrogen oxide ( $\text{NO}_x$ ) contaminants that are followed by mining. Taking those data into consideration, the ash content of syngas is estimated to be at the point of  $10 \text{ mg/m}^3$  comparing to the smoke produced from normal coal combustion (up to  $70 \text{ mg/m}^3$ ).

Summarizing all those facts, we can assume that this technology may be reasonably applied on the coal seams having the thickness less than it is required to provide feasible extraction by means of the underground method. Moreover, it is sure to be less polluting, more efficient and far safe than the traditional techniques.

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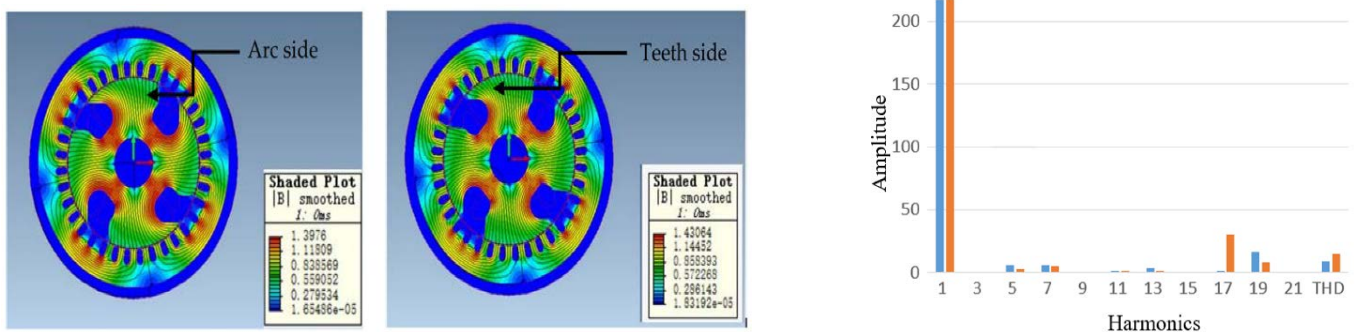
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### Small and powerful electric motor — now it is possible!

There is a tendency of reducing energy losses and creating new economic standards in the world today. All energy companies are keen on making the product with minimal costs. These modern companies produce electric drives using modern research and the latest technologies.

The development of electric motors continues to improve every year. The amount of such improvements depends on the shape, design, size, use of the material and even the efficiency of the generator output power. However, the role of software used in the process of development of such motors is very important and should not be ignored.

There is a relatively new kind of electric motors, which allows you to achieve the desired power and accuracy of adjustment at small dimensions. Due to the rotor shape of synchronous motor improvement it became possible to reduce its dimensions by several times (Fig. 1).



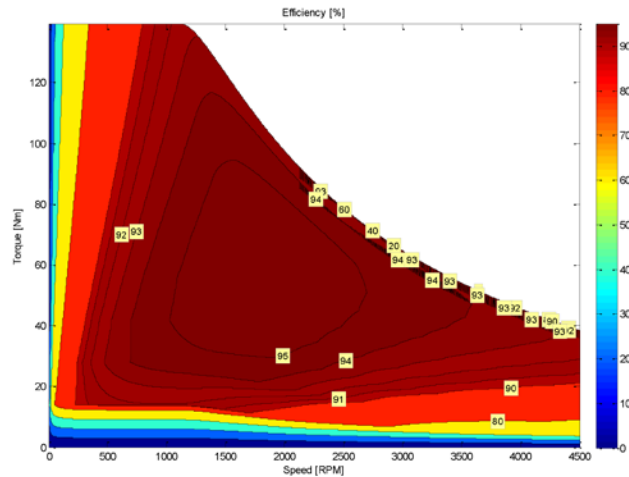
**Figure 1.** Changes in rotor geometry and their corresponding performance.

(a) Enlarging the arc side;

The rotor with an optimized slot shape has great potential for lower maintenance and adjustment costs. Two representative approaches have been used to overcome the inaccurate torque estimation issues arising from inherent physical limitations: a lookup table method and a direct-torque control (DTC) scheme. The proposed algorithm estimates the equivalent d- and q-axis back EMFs in a recursive and stability-guaranteed way, in order to compute the equivalent mutual inductances between the d- and q-axes.

The torque components formed from binding and inductance effect are shown on Figure 2. The EPR model developed by such companies as Derakhshan and Nurbachham to achieve bigger efficiency in a wide range of speed can be applied to meet these requirements.





**Figure 2.** Efficiency map of an Interior Type Permanent Magnet Synchronous Motor (IPMSM) at various operating points.

With the development of the pace of modernization of electric machines and technologies of control AC machines are and will be the dominating product in the market of traction machines. Not only can modern synchronous motors completely replace asynchronous ones, but they can also make the driving force cheaper. Therefore, further research of such electric motors will be useful for electric cars and mechanisms with limited dimensions.

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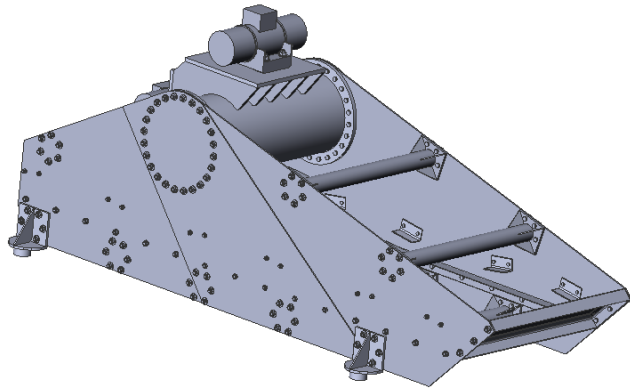
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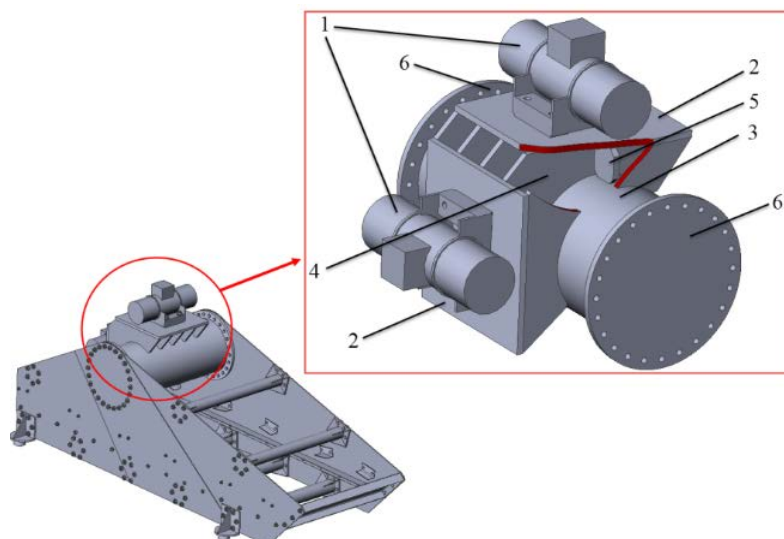
### Calculation of modernized screen design

The structure of the vibrating screen needed improvement to increase its efficiency. Two vibration exciters that consist of two parallel shafts with eccentric mass are usually used in the well-known design screen. Shafts are driven by two electric motors. Vibration exciters are fixed on the screen with a flange connection. The solid-state model of the upgraded design has been created using SolidWorks programme (Fig.1).



**Fig. 1 – Solid-state model of the improved design of the vibrating screen**

Two vibration exciters are used instead of two unbalance vibration motors (Fig. 2). Installation of vibrators is carried out on a specially designed construction. Vibrator mount consists of horizontal and vertical plates (the vibrators are bolted to the plates), metal tube with longitudinal, and transverse stiffening ribs. Flanges are used to mount the unit to the screen.



1 – vibration motors; 2 – horizontal and vertical plates; 3 – metal tube;  
4 – longitudinal stiffening ribs; 5 – transverse stiffening ribs; 6 – flanges.

**Fig. 2 – Main parts of the vibrator mount**

There is a need to determine the durability of the modernized design of the screen for rationale of efficiency. The screen is a complex welded construction. It is not calculated using standard algorithms and requires additional research.

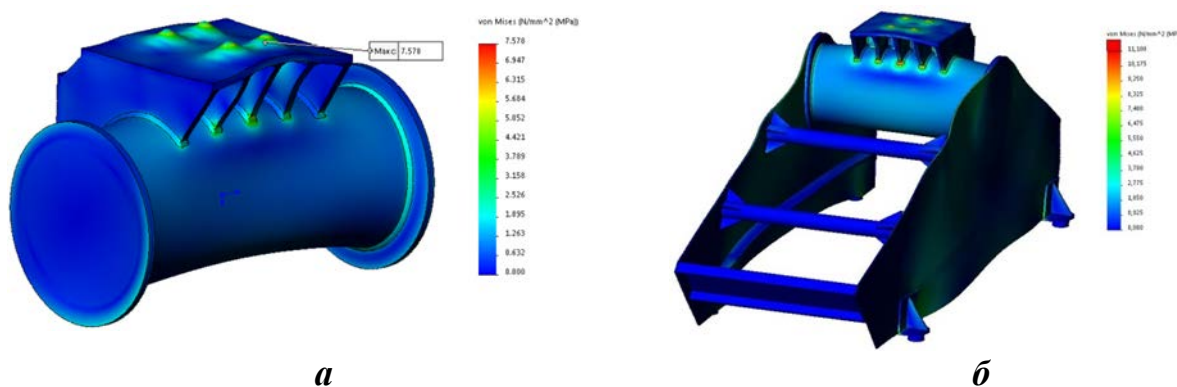
The purpose of the study is to determine the durability of the modernized design of the screen.

The following assumptions are made during the validation of the computational scheme: dynamics task is transformed into static task; crash box is fixed on the base; the interaction of vibrators with the mount is modeled by a force equal to 12.3 kN, which is determined from the technical characteristics of the vibrator.

The solid model screen is simplified for research to determine its durability. Bolted connections and openings for them are excluded. Computer models of vibrators, sieve and metal angles for its support and mounting are not used. An important step in creating a computational model is modeling the welds of the vibrator mount. Welded seams are created as a solid part, taking into account the geometry of the parts being welded.

Angle-free weld seams are used in the manufacture of the screen. This is the reason for the formation of a low penetration zone, which leads to a decrease in the durability of the welded joint. Requirements for modeling welded structures with lack of penetration are: the lack of penetration is modeled as a rectangular slot 1 mm thick between the parts to be welded; the optimal size of the element of the finite element mesh is equal to the width of the gap; reducing the size of the grid element from 10 to 1 leads to an increase in stresses, which indicates the singularity of the problem and the need to apply special calculation methods such as the Hot Spot Stress [1].

The method of calculating welded structures with incomplete welding is applied to the calculation of the vibrator mount to the screen. The result is shown in Figure 3a. The maximum stresses in the welds occur at the junctions of the middle longitudinal rib with the platform and the pipe. The HSS method should be used to assess the durability of these joints. As a result of using the HSS method, the stresses arising in the welds are 2.5 MPa. The design of the screen is calculated in the same way (Fig. 3b). From the analysis of the results, it follows that the maximum stresses arise in the welds in the node of the vibrator's attachment to the rumble.



**Fig. 3 - Equivalent stresses: a - in the vibrator mount; б - in the screen**

The allowable stresses are determined:

$$[\sigma] = \frac{\sigma_{-1P}}{k \times K_{ef}} = \frac{220}{1,5 \times 3,5} = 41,9 \text{ MPa},$$

where  $K_{ef} = 3,5$  – effective stress concentration ratio [2];

$k$  – safety factor [3];

$\sigma_{-1P} = 220 \text{ MPa}$  – tensile strength limit for steel 45 [3].

If the stresses arising in the construction are lower than  $[\sigma]$ , the durability of the welded joints exceeds the cycles, and since the maximum stresses in the welds found by the HSS method are 2.5 MPa, the durability of the welded screen structure is not lower than cycles.

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## Synchronous reluctance motor

Nowadays tendency of reducing losses in devices due to increase of equipment efficiency is observed. Companies are striving to produce new equipment and improve control systems. Different types of motors are used in the electric drive designed for different technological processes and their efficiency has already reached 93% and continues to grow by small steps. Synchronous Reluctance Motor (SynRM) is not so common in the world. However, it spreads very quickly and is considered to be a good substitute for PMSM.

SynRM has a usual stator design, and rotor is constructed from ferromagnetic steel and nonmagnetic lamination. That is why there is no winding or magnets in it to increase price. Simplicity, adaptability in production and operation, higher efficiency and torque density, higher overload capacity and lower rotor temperature can be listed as some advantages SynRM in comparison to IM.

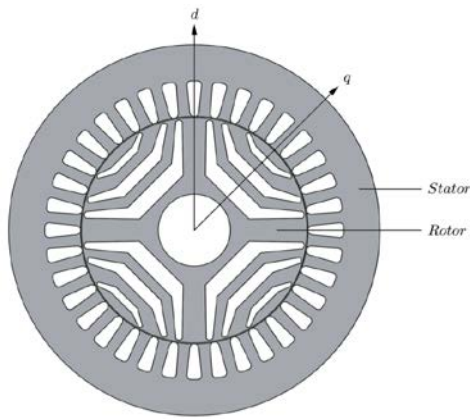


Fig 1. Design of SynRM

A detailed view of SynRM is shown in Fig 1. A rotor has a different value of inductances on  $d$  and  $q$  axis due to flux barriers. The principle of the motor operation consists in the difference of inductances.

Equations of SynRM in rotating  $d - q$  system are as follows:

$$u_d = R_s i_{ds} + L_d \frac{di_{ds}}{dt} - \omega_r L_q i_{qs} ,$$

$$u_q = R_s i_{qs} + L_q \frac{di_{qs}}{dt} - \omega_r L_d i_{ds} ,$$

$$T_e = \frac{3P}{2} (L_d - L_q) i_{ds} i_{qs} ,$$

The main problem of SynRM comprises cross saturation, which makes the control system much harder.

As the inductances  $L_d$  and  $L_q$  have a nonlinear dependence on the currents from themselves (Fig 2.), that is why it is necessary to take into account a cross saturation curves which have a big influence on the motor flux linkage at high currents.

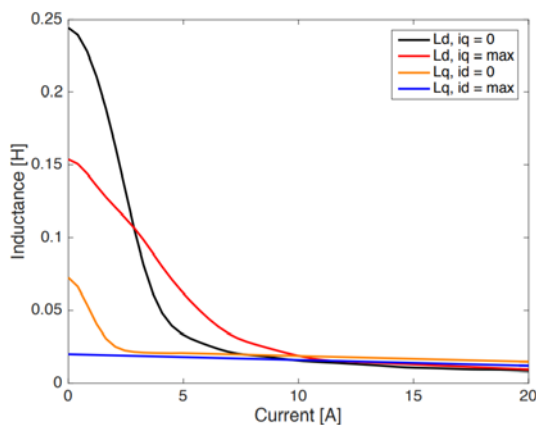


Fig 2. Cross-saturation curves.

We can conclude that there are some suitable ways to control SynRM. Direct Torque Control (DTC) system is the easiest way to control SynRM. It is realized by finding the currents  $i_d$  and  $i_q$  due to calculating the magnetic flux of the stator. Currents control provides preset torque of the motor. However, DTC needs powerful and expensive hardware because of requiring complex calculations in real time.

Some systems allow to get rid of complex calculations. These systems are aimed at increasing system efficiency and serve as pre-prepared values of currents. The principal disadvantage of this is requiring motor presence for experimental calculation. Some systems are already in use and MTPA is the most commonly applied.

The main idea of maximum torque-per ampere (MTPA) control system is maintaining minimum possible stator current at any required torque. This control law allows minimizing copper losses, which is the main loss of the motor.

Nowadays, such successful companies as Siemens and ABB promote Synchronous Reluctance Motor in Europe and demonstrate great interest in its extending. Proved quality and undeniable advantages of SynRM in comparison with other types of electric motors attract much interest to its implementation.

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### **Design improvements – for better efficiency**

Nowadays the world faces such tendency as decreasing energy losses in any industries. Companies strive to produce a product with minimum cost. This pushes a present-day companies to produce electric drives with using modern research and recent technologies. The Fig. 1 shows the detailed 3D design of model generator.



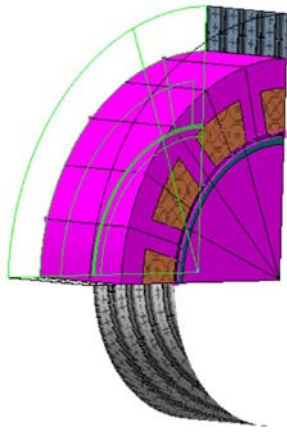


Figure 1.  
Design 3D  $\frac{1}{4}$   
model  
generator

The development of generator technology continues to improve from year to year. The scope of such improvement varies from the shape, design, size, the usage of material, and even regarding to the efficiency of the generator output power. However, the role of the software to design such electric machinery in the improvement of generator technology development should not be ignored.

There is a relatively new magnetic material, which allow producing soft magnetic composite cores of electric drives. Soft magnetic composite (SMC) is a kind of iron powder made of fine particles with thin electrical insulation. Due to the powder nature, motor cores made of SMC have some advantages. These advantages benefit the design of high-performance permanent magnet (PM) motors with 3D flux path, such as trans-verse flux machine, axial flux motor, linear brushless motor and claw pole motor. Also it is their low cost, including the manufacturing cost.

The manufacturing of the SMC cores taking advantage of both the powder metallurgy technology and the molding technology. This kind of technology can be used to produce SMC cores with complex structures that may be hard or even impossible to manufacture by the traditional lamination method. The Fig. 2 demonstrates the structure of that machine. With advances in electrical machines and recent control technologies, AC machines have become dominated the traction machine market. Both synchronous and asynchronous AC machines are used in commercially available electric-powered vehicles. The advantages of an interior permanent magnet (IPM) motor include its wide velocity and torque variation, high power, lightweight, and energy efficiency. The most influential factor affecting the performance of IPM motors is the rotor shape. That claim is illustrated with the data provided on Fig. 3.

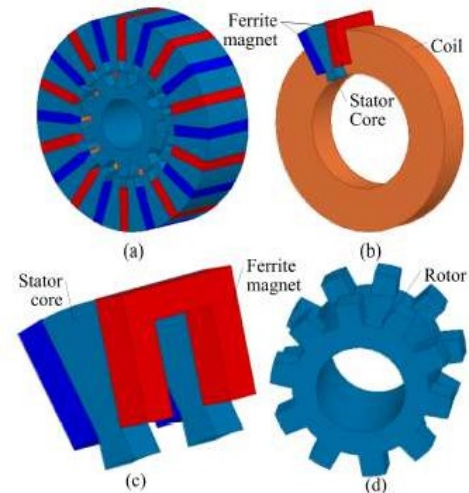


Figure 2. Structure of an FSPMM with SMC cores, (a) one-phase structure, (b) winding and magnets

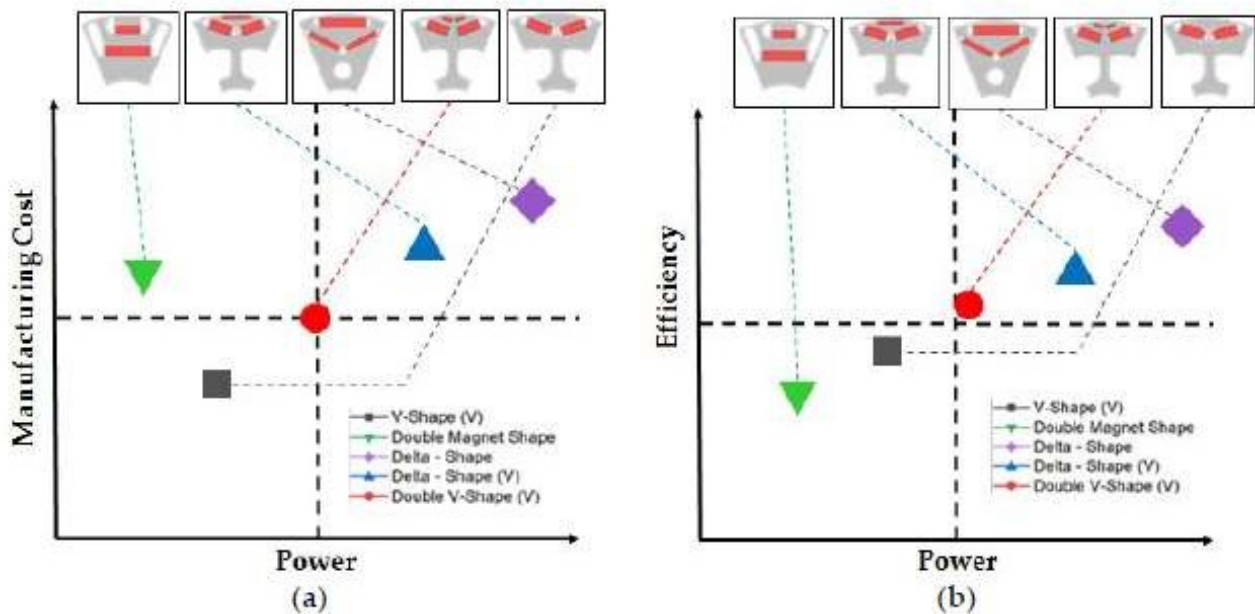


Figure 3. Comparison of power and other factors: (a) comparison of manufacturing cost and power; (b) comparison of efficiency and power.

It should be concluded that using modern material with design improvement allows taking in result energy efficient engine with characteristics superior to those of the classic design the most commonly used on the market.

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### **Acidity of soil and ways to neutralise it**

Ukrainian economics depends on agriculture therefore the soil is one of the main assets of the country. Nowadays the degradation of soil can be observed all over the world. Soil degradation occurs due to technological influence. Very often you can hear such terms as acidic soils pH of the soil. An acid is a substance that tends to give up protons (hydrogen ions) to some other substance. Conversely, a base in any substance that tends to accept protons (hydrogen ions). Soil acidity may be defined as the soil system's proton ( $H^+$  ions) donating capacity during its transition from a given state to a reference state. A

Soil acidity involves intensity and quantity aspects. The intensity aspect is universally characterised by the measurements of  $H^+$  ion activity, expressed as pH. The quantity aspect is characterised, directly or indirectly, by the quantity of alkali required to titrate soil to some arbitrarily established endpoint. Soil acidity is a major problem in relation to plant growth and therefore, acid soils are called a problem soil.

Acidity is very important because the fertility of soil and plants as well as their immunity depends on it to a great extent. Soil acidity affects plants in various ways: nutrient availability, toxicity of some metals and activity of beneficial microorganisms. Plants absorb nutrients from the soil solution and in the right ionic form in which the plant can absorb them. Nutrients adsorbed on exchangeable sites on soil particles are in equilibrium with the soil solution and can also become available to plants.

The research on determining the soil acidity was held in Zaporizhzhya region in spring 2018 on the territory of the village Kuchugum. Several samples were taken near the lime factory and the gymnasium. The measurements were carried out with the use of high quality digital laboratory Einstein ENPS sensor A0 16

The research shows average acidity 4.1 to 4.4 pH, this means that the local soil is very sore and it requires human intervention. The research group developed a number of recommendations and selected the most appropriate method to solve the problem.

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## Supercapacitors as the energy-storage system of the future

Recently, such ordinary things as batteries have attracted a lot of attention, because of our great dependence on it. Widely used such electrical gadgets as smartphones, tablets, laptops etc. are powered by using the batteries. But a low battery capacity is turned to be a really big problem.

Li-ion batteries are used in modern devices, where capacity is slightly reduced during the charging process and cannot withstand high power. Fortunately, there are many technologies to accelerate charging and creating supercapacitors is another big step in the science.

Supercapacitors are getting popular as alternatives for the conventional and traditional battery sources because they offer some advantages as:

- a capacitor stores energy by means of a static charge as opposed to an electrochemical reaction;
- rated in farads, which is again thousands of times higher than the electrolytic capacitor; the charge time is about 10 seconds;
- stored energy of a supercapacitor decreases to 50% in 30-40 days.

The supercapacitors have the same efficiency as Li-ion batteries, near 95-98%, which can be seen on the diagram (Fig 1). However, its life cycle is much higher. And the main problem of Li-ion battery, namely lifetime, can be decided.

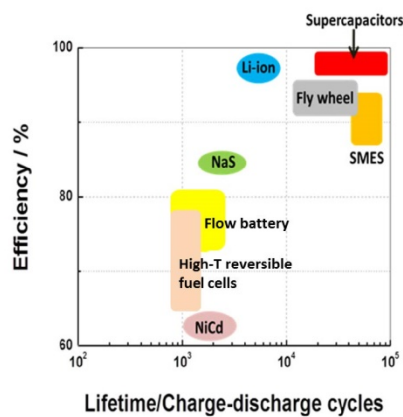


Fig 1. Efficiency and lifetime of batteries

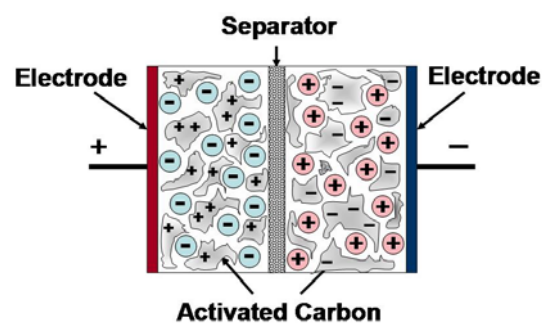


Fig 2. Supercapacitor

A supercapacitor can be described as negative and positive electrodes with activated carbon and a separator between them (Fig 2). The two key storage principles behind the supercapacitor theory can be listed as follows:

- double-layer capacitance is an electrostatic storage achieved by charge separation in a Helmholtz double layer at the interface between the surface of a conductive electrode and an electrolyte;

- pseudo capacitance is Faradic electrochemical storage with electron charge-transfer, achieved by redox reactions, intercalation or electrosorption.

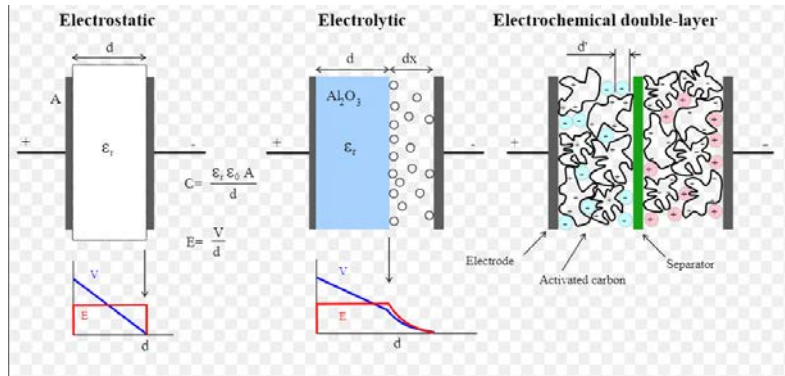


Fig 3. Supercapacitor diagram

The supercapacitors are divided into the following big groups:

- double-layer capacitors – these ones with activated carbon electrodes or derivate with much higher electrostatic double-layer capacitance than electrochemical pseudocapacitance,
  - pseudo capacitors – capacitors with transition metal oxide or conducting polymer electrodes with a high amount of electrochemical pseudocapacitance;
  - hybrid capacitors – these are capacitors with asymmetric electrodes one of which exhibits electrostatic and the other mostly electrochemical capacitance, such as lithium-ion capacitors. They are environmentally friendly.

Since anything has its own advantages and disadvantages, the supercapacitors are also limited by such factors as a low specific energy, a fraction of a regular battery, full energy spectrum is impossible because of linear discharge voltage, higher self-discharge in comparison to most batteries, low cell voltage, necessity of serial connections with voltage balance, and high cost per watt.

Still, despite all these obstacles, applying supercapacitors is the best decision for humanity nowadays. It is a promising alternative approach to meet increased demands of energy storage systems. With high power density, ability to perform in extreme temperatures, and millions of charge-recharge cycle capabilities, supercapacitors can be promising replacement for traditional batteries.

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**Section 07 Humanitarian Sciences (Philosophy, Political Science, Education etc.): Experiences and Challenges**

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**Peculiarities of English Children's Literature**

The acquaintance of readers with O. Wilde, D. Defoe, T. Melori, R. Stevenson and C. Dickens has its own history. Their works, like the legacy of many other English writers, have long enjoyed recognition throughout the world. The children's tales of Chris Ould are played by the greatest actors of the European theaters, "Adventures of Robinson Crusoe" attracted T. Shevchenko; Dicken's novels inspired L. Tolstoy, "Valiant knights" of Thomas Malory was D. Steinbeck's favorite literature and subsequently inspired him to write his interpretation of history.

"Children's literature" – is a kind of fiction created as a dialogue with an imaginary (or sometimes quite real) child, it is "tuned" to the child's world perception. Thus, the writer builds a dialogue with an imaginary reader, taking into account the difference in levels of ethical and aesthetic values of a child and an adult.

In critical research it is assumed that there is a broad range of British children's literature about animals:

- "social novels" with animal characters, where the community of animals appears epic in scope - with its history, geography, religion, mythology, and social structure;
- stories in which animals live and behave like people. For example, literary critics claim that in the book of K. Graham's "The Wind in The Willows," the main characters living on the banks of a river (all of them animals), represent different varieties of the national English character;
- books in which animals are toys. For example, the immortal inhabitants of the Wonderful Forest of A. Miln;
- stories about fantastic animals. The bright representatives of this type are the March Hare and Cheshire Cat of L. Carroll, all dragons of E. Nesbit, mythical D. Darrell's animals ("The Talking Parcel") or H. Elbow's flying white bears;
- the works whose heroes are real animals with their lifestyles, habits, typical behavior, in the description of which even professional zoologists can find virtually no mistakes - from R. Kipling's wolf (Jungle Book) to the young Peaver's wolf (Chronicles of Ancient Darkness).

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## **Human Trafficking**

Human trafficking is a form of the twenty-first century's slavery and human rights violations in any country, including ours. Exploiters profit through control and exploitation of others. This problem can pose a threat to anyone. It does not depend on age, gender, education or social status. According to the US government, every year about 600 – 800 thousand people in the world are sold abroad for exploitation [1].

Guided by the data of the International Organization for Migration (IOM) in Ukraine, started from 1991 more than 160, 000 Ukrainians became victims of human trafficking. Most of the victims, who in recent years have received assistance from IOM, are young people under 35 years. [2]

Trafficking human is a crime against the will, honor and dignity of a person, in contrast to illegal migration and the smuggling of migrants, which are crimes against the inviolability of state borders, the provision of recruitment and mobilization.

You should be careful, because offenders usually use special ties for spreading fake advertisement in the local press, illegal recruitment agencies and job placement websites. The terms they offer are usually very appealing and may seem plausible, such as financial assistance and support in organizing the trip, the registration of all the necessary documents, etc.

Article 149 of the Criminal Code provides that trafficking in persons, as well as the recruitment, transfer, harboring, transfer or receipt of a person committed for the purpose of exploitation, using coercion, abduction, deceit, blackmail, material or other dependence of the victim, his vulnerable state or the bribery of the third the person who controls the victim, for obtaining an agreement on its exploitation, is punishable by imprisonment for a term of 3 to 8 years. [3]

Since 1951 IOM provides services, policy advice and recommendations to governments and migrants for promoting humane and orderly migration.

Human trafficking beings can only be caused by non-compliance with the rules of employment abroad - the most common cause of migration. That is the reason, why at every step of finding a job abroad, you must check information about legislation, visa regulations, your own rights abroad and safety rules.

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### **History of fantasy and its genre peculiarities**

The formative features of the modern genre of fantasy are conditioned by the historical milestones of its development. The genre of "fantasy" originates from Greek mythology, ancient fairy tales, medieval legends, epics and the aesthetics of romanticism. In the ancient Greek epic, the unreal beings, events and feats stored in human consciousness began to embody their incarnation. From the fairy tale genre, fantasy has absorbed the aspect of morality - victory of the forces of good over evil. Medieval legends have provided fantasy works with the spirit of chivalry. The ancient epic of the Germanic and Icelandic nations preceded, forming the basis for the appearance of a new genre of fantasy in the future, that was the source where the genre borrowed its characters, motives and themes.

Thus, while preserving the powerful force of fairy tales, the young fantasy in the form of a knight ballad, drew attention of people to the omniscient, immense forces - good and evil, which are part of another, weird world. The later stage of literary development, which preceded the emergence of the genre of fantasy, is associated with the era of romanticism in Western Europe at the end of the XVIII-XIX centuries. The traits which romanticism contributed to fantasy were fantastic, blurry images, neglect of plausibility, idealization of heroes, passion for the secret, magic.

Among representatives and founders of the modern fantasy genre are Robert Howard, John Tolkien and Clive Lewis, the author of worldwide famous «Chronicles of Narnia». They can be called "creators" of the early fantasy plots and conflicts - the eternal struggle of two forces, good and evil.

Fantasy works have motives of magic, chivalrous epic, combined with a realistic narrative. They depict virtual worlds with medieval realities, non-technical psychology. Such works are not subject to logical interpretation contrary to science fiction. Therefore, in their analysis, no motivation is used. Instead, the fate is the decisive factor based on the binary ethical opposition of "good - evil". In fantasy works, writers usually describe characters that have special powers, animals usually act like people. As for settings, places can be imaginary or belonging to another world or universe, time is any time or no time, time travel is possible. Fantasy plot comprises surprising twists or developments involving situations that are not possible in the realistic world. The plot starts right out with fast moving action that grabs the

reader's interest and keeps it. Conflicts are usually resolved with great deeds or acts of human kindness related to good and evil.

In recent times, the term 'fantasy', when regarded as part of an individual genre, generally brings to mind tales of dragons and castles and knights in shining armor - but in truth, the genre as a whole encompasses so much more.

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### **Staff responsibility for law violation in the Sphere of Labour Protection**

Nowadays, a system to control observation of safety rules at enterprises does not meet standards developed in the European countries; however, meeting basic legislation standards in the sphere of labour protection is the guarantee of safe production processes.

Observation of basic standards of the labour protection law guarantees safe production and improved economic activity of an enterprise. Current Ukrainian system to control observation of the labor protection laws is not efficient enough. It means that the system acts according to old standards; thus, bringing of those being guilty to the responsibility demonstrates its low efficiency.

The problem of responsibility is a key one in the system of labour protection. Controlling authorities act on the basis of Soviet standards which is a problem for today. To analyze responsibility for the law violation in the sphere of labour protection of Ukraine, we should study systems of other countries with further implementing of the required changes into Ukrainian legislation.

Article 44 of the Law of Ukraine "On labour protection" stipulates following types of responsibility: disciplinary, material, administrative, and criminal.

Disciplinary responsibility is regulated by the Code of laws on labour; it stipulates such punishment types as admonition and separation from employment.

Administrative responsibility is regulated by the Code on administrative violations of law; it stipulates imposition of fine on the officials in the amount fixed by the Code.

Material responsibility means compensation for losses or damage by enterprises for workers (or members of their families) being wronged by an accident or occupational disease.

Enterprise officials or citizens – profit-making entities, being guilty in violation of labour protection law which has been hurtful for the health of the injured person, are brought to criminal responsibility: fine from 20 to 50 of non-taxable income minimums or correctional labour for the period up to three years. If the violation has



resulted in the death of people, then the officials may be imprisoned for the period up to seven years.

Current system to control observation of safety rule at enterprises does not meet the standards of the European countries since it does not cover all the fields of Ukrainian enterprises. It is required to organize special commission to monitor and control the labour protection system, which will have certain rights and responsibilities being regulated by new legislation in the sphere of labour protection.

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### **Adaptation of the Ukrainian environmental legislation to the European Union standards**

The Association Agreement between Ukraine, on the one part, and European Union, European Atomic Energy Community and their member states, on the other part, dated to 27 June 2014, ratified by the Verkhovna Rada of Ukraine on 16 September 2014, became crucial for the state environmental safety. Issues of cooperation in the field of natural environment protection are formalized in Chapter 6 entitled “Natural Environment”, Section V “Economic and Branch Cooperation” (2014).

As Ukraine undertakes steps to bring its legislation close to the EU legislation within the time frames established in Annex XXX of the signed Association Agreement. It is considered necessary to study the evidences of adaptation of the Ukrainian environmental legislation to the EU standards after almost 5 years of its ratification.

In accordance with the Annex, it is mentioned that Ukraine undertakes to implement provisions of 26 Directives and 3 EU regulations into its legislation. Adaptation of the EU legislation to the Ukrainian legislation have been taking place in such sectors as: environmental management and integration of environmental policy into other branch policies, air quality, waste and resources management, water quality and water resources management, including marine environment, environment conservancy, industrial pollution and technogenic threats, climate change and ozone layer protection, genetically modified organisms.

In 2017, the Law of Ukraine “On Environmental Impact Assessment” was adopted, that makes possible to implement a progressive updated and pro-European model of Environmental Impact Assessment (EIA) in accordance with the requirements of Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment (codification).

Verkhovna Rada of Ukraine adopted the Law of Ukraine “On standardization” (2014), “On natural gas market” (2015), “On introduction of amendments to some



legislative instruments of Ukraine as to implementation of integrated approaches to water resources management according to the basin principle” (2016).

The Order of the Cabinet of Ministers of Ukraine dated to 8 November 2017 No. 820–p approved National strategy of waste management in Ukraine till 2030. The provisions of this strategy have defined the goals and principles of the policy in this area in accordance with the obligations of Ukraine under the Association Agreement.

The amendment to the Law of Ukraine “On Waste” entered into force on 1 January 2018. This innovation in national legislation prohibits landfilling of unprocessed waste.

On 8 November 2017 the Order of the Cabinet of Ministers of Ukraine No. 796–p “National Emissions Reduction Plan for Large Combustion Installations” was adopted. The Order is aimed at gradual and steady reduction of emissions of sulphurous anhydrides (SO<sub>2</sub>), nitrogen oxides (NO<sub>x</sub>) and substances in the form of suspended particles from large combustion installations.

Agreement on the Legal Status of the Regional Environmental Center for Central and Eastern Europe (the Law of Ukraine dated to 15 July 2015), Agreement between the Cabinet of Ministers of Ukraine and Government of Montenegro on cooperation in the field of protection against natural and other disasters (the Law of Ukraine dated to 16 November 2016), Paris agreement (the Law of Ukraine dated to 14 July 2016), Protocol on Pollutant Release and Transfer Registers (the Law of Ukraine dated to 3 February 2016), Protocol on Sustainable Transport to the Framework Convention on the Protection and Sustainable Development of the Carpathians (the Law of Ukraine dated to 16 March 2016), within that period of time were ratified.

The Ukrainian environmental legislation has got a unique opportunity to achieve compliance of its legislative instruments and acts with the EU legal system considering criteria for the states that intend to join the community, formation of relevant institutions and other additional measures necessary for effective lawmaking and law enforcement in the environmental field.

The implementation of EU directives and regulations will become a prerequisite for creating a clear and transparent mechanism for the realization of environmental management, conservation and restoration of natural resources, environmental protection and compliance with the conditions of environmental safety, protection of environmental rights and legitimate interests of individuals and legal entities and other subjects of environmental law.

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### **The system of checks and balances in the current model of Ukrainian parliamentary-presidential republic and the necessity of its reformation**

The analysis of current Ukrainian legislation makes it possible to acknowledge that Ukraine is a semi-presidential republic where the essential role of the government function is performed by Verkhovna Rada which constitutes the unicameral Parliament of Ukraine.

The Parliament of Ukraine is the only legislative authority that defines the pillars of Ukrainian foreign and internal policy. It also appoints and dismisses the Prime Minister of Ukraine, the Minister of Defence of Ukraine, the Minister of Foreign Affairs and consents for appointments of the Prosecutor General of Ukraine and other officials under article 85 of the Constitution of Ukraine.

Despite that, we can see that a number of important parliamentary decisions are based on President's recommendations. The above mentioned top state officials are appointed by the Parliament based on the President's recommendation. The President has also a veto power for Verkhovna Rada's bills according to article 106 of the Constitution of Ukraine.

Compared to other semi-presidential republics the Ukrainian functional system can be characterized by the excessive presidential authority. In majority of other republics a president has no authority over the foreign affairs, or they share it with the parliament (e.g. Latvia, the Republic of Poland). On the contrary, in Ukraine the President recommends candidates for the positions of the Minister of Defence and Foreign Affairs of Ukraine. The latter has a leading position in defining the foreign policy of the state, and represents Ukraine in international stage.

The President of Ukraine also has a unique power, which is to appoint the heads of local state administrations, which provides the President with almost unlimited repercussion power in the executive branch. By doing so, the President indirectly influences the budget process in the regions, thus influencing economic development. According to articles 18-26 of the Law of Ukraine “On Local Self-Government in Ukraine” the heads of the local state administrations have a range of authority in the budgetary and financial sphere, property management, privatization, entrepreneurship promotion, regulatory framework implementations and others. Therefore, the President has indirect influence on business, governmental enterprises heads, some supervisory and law-enforcement agencies. Such broad authority might create the danger of political operationalization of the local self-government and lead to electoral manipulations.

The President has a key role in the Prosecutor General of Ukraine appointment, which might also endanger the rule of law. Unlike Ukraine, in other semi-presidential European republics, it is elected only by the Parliament (the Republic of Croatia) or other authorities (Romania).

The system of checks and balances is designed to prevent a president from manipulating the power, for example, through controlling the budget process, appointments of the key members of the government, legislative authority and others.

It can be concluded that one of the biggest problems in Ukraine today is a lack of clear division of constitutional powers of the head of the government and the President, who represents the majority party in the Parliament. It gives the President authority to control the legislative branch.

From the conducted analysis the only way to solve this problem might be to change the essence of parliamentary elections and limit presidential powers. The party that wins elections will have one national President and the parliament majority. Such electoral system will allow the avoidance of the necessity of searching for the corruption compromise with the parliament fractions.

In addition, it is necessary to create the legislative platform for strong opposition in the Verkhovna Rada and empower it by control functions and possibility to affect the parliament processes. It will serve as a mechanism for combating the corruption.

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### **Marijuana Decriminalization in Ukraine: for or against**

Illegal drug business poses a threat to a society. Firstly, drugs physically put customers at risk. Secondly, drug market makes gangs richer, promoting corruption all over the world. There is a belief in the society that decriminalization of some kinds of drugs could be a solving of these problem. [1]

Decriminalization of soft drugs doesn't mean that people can do that with impunity. It means that keeping drugs in small portions doesn't attract conviction or imprisonment. [2]

Legalization is some changes in code according to which prohibited earlier acts become legal.

In some European countries (the Netherlands, Portugal) marijuana is decriminalized. Thus, criminal liability for keeping, using and carrying of marijuana is absent there.

As for the current situation in our country, everything that is connected with cannabis is prohibited in Ukraine, except for its growing for industrial purposes, but it requires a license. Nowadays, the punishment for keeping even 5 g of cannabis is punishable by imprisonment for 3 years. [3]

Considering the issue of marijuana decriminalization in Ukraine, one should take into account the researches yielding medical benefits of cannabis which is thought to be effective at relieving chronic pain, depression, post-traumatic stress disorder symptoms, specific types of epilepsy, etc [4]. Among other advantages of soft drugs decriminalization are also named reduction of the crime level, soft drugs demand fall at a black market, more conscious attitude to doing cannabis, state treasury forfeiting.

On the other hand, it may lead to a possible growth of abused people. Next, it could result in new corruption schemes while drugs trafficking, and, finally, incomplete new law could be easily broken.

To sum up, the problem of cannabis decriminalization in Ukraine concerns scientific, ethical, medical implications, needs its further investigation as it can make our standards closer to European, but the process can face hurdles.

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### **Occupational Diseases of the IT-workers**

According to the statistic, most people working on a computer have chronic fatigue syndrome. The matter is that when you use PC, time goes very fast long with the organism overloading with different information – as a result the brain just get tired. However, chronic fatigue syndrome is not the only one occupational disease of program-developers and PC operators.

Arthritides, radiocarpal articulation neuritis, repetitive stress injury – those are pathologies caused by constant hand loading while mouse using. That begins with certain wrist pain with gradual development of articulation disease.

Eyesight problem is one of the most important ones in terms of the mentioned professions. In particular, shortsightedness is the most often diagnosed problem.

It should be mentioned that about 20% of health problems due to computer use is caused by not harmful factors but by the fact that workers do not pay attention to basic rules of safe working on computer.

According to the data by the Ministry of Labour of the USA, it costs annually about USD 100 bln to compensate software engineers' occupational diseases.

Totally, there may be not only eyesight and wrist problems but also diseases of central nervous system, cardiovascular system, respiratory organs, and allergic illnesses. Intense computer use may also result in musculoskeletal system and conjunctive tissue. Besides, there may be psychical disorders being the result of stresses. PC operators may be even have insomnia, face and hand skin diseases, and lose their appetite.

Due to those facts, organizations should have 10-15 min breaks for their workers to have rest (apart from the lunch break) depending upon the operation mode. Anyway, continuous PC operation should be no longer than 4 hours. Moreover, it is recommended to have special sports facilities or some other places for workers to have rest and relax.

Ergonomic characteristics of the working place are also of considerable importance. Inconvenient body position may result in areas of muscle tension and spasms resulting in backaches, neck pains, tensions, and migraine. It means that the chair and table dimensions are rather important for the worker's convenience. For instance, there are not only chairs but also even desks where it is possible to adjust the required height. While changing the height during a working day, it is possible to reduce spine loads.

Thus, IT-sphere is characterized by numerous occupational diseases with serious consequences; that is why all the possible measures should be taken to prevent them both in terms of employers and employees.

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### Basic Ergonomic Requirements for the Working Place of a PC Operator

Nowadays, computer is the integral part of our everyday life both at home and at work. Consequently, we should remember that while using a computer (like any other device) we should observed certain rules. Those rules are rather simple including following points: body position, eyesight and lighting, operating time, and others.

As for the position, experts- orthopaedists emphasized that the body of PC user should be in the position of two successive angle of 90 degrees, i.e. the back and a thigh should be at 90 degrees to each other as well as a shin should be at 90 degree to a thigh (Fig.1).

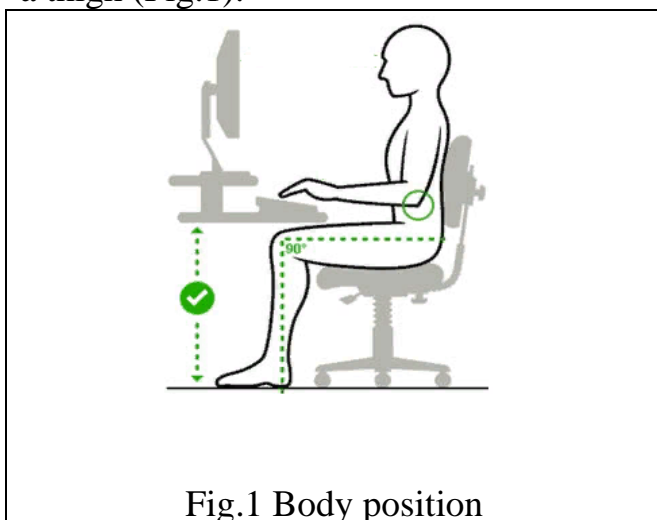


Fig.1 Body position

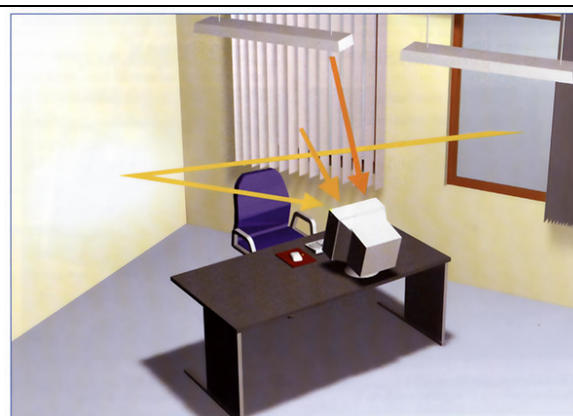


Fig.2 Example of the lighting scheme

In addition, attention should be paid to the back which should be straight without any bends; thus, one should select the proper chair to support transverse lordosis.

There are two main requirements for PC operation in terms of eyesight protection: distance between the eyes and PC monitor should be not less than 45 cm (45-70 cm is the best one); working room should have additional source of lightings (Fig.2).

As for the best duration of the operating time, adults should operate PC no longer than 1 hour with 20-minute break between the hours.



There are also certain restrictions. In particular, it is prohibited to eat and drink near computer due to the risk of short circuit or even electric shock.

Those are rather simple rules but their observation may prevent the development of occupational diseases in many cases since the effect of computer upon the human organism may be rather negative.

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### **Ukraine`s police reform: experience, challenges and failures**

Any country is in need of highly effective police who provide order in a country. Police is known as a system of public services and public order agencies. Up to 3 July 2015, there was no police in Ukraine, but was militia and militiamen as a relic of the Soviet past. Moreover, militia has compromised itself by the bribe, militiamen`s, corruption, low effectiveness etc. That is why Ukrainian government has made a decision to introduce crucial changes in the ways of providing public order in the country and replace militia by police within its post-Euromaidan reforms. Intended by the government as a visible sign of its commitment to shake off a deep-rooted culture of corruption in this public institution, the National Police of Ukraine today counts approximately 140,000 employees. Experience, failures and problems of police reform in Ukraine are in the focus of this paper. The statistical data of the research published by Zakharov are applied to compare whether anything has changed since 2017.

If to compare Soviet militia and new Ukrainian police, the overall aim of them is the same: to provide public order. However, there are some differences in their functions and organization. If the militia consisted of many functional departments: a traffic police, crime detectives and organized crime detectives, the modern Ukrainian police includes only policemen and detectives. There are no traffic police now in Ukraine, though a modern policeman should have a driving license and can drive a special police car provided for a crew of 2 – 3 policemen that was prohibited for militiamen. In the former militia there was special drivers. Moreover, soldiers from the internal troops of the Soviet army were involved in the work of urban militia.

It is quite natural that the reform of Ukrainian police has met some challenges. When initiating police activities, it was difficult to avoid challenges, mistakes and blunders. Therefore, it is admitted by Zakharov that the re-certification of all personnel of the National Police of Ukraine carried out in the period November 2015 September 2016 was not consistence with goals. Some of the militiamen involved in corrupt actions or other offenses were not fired. This can be resulted from the unfortunate assessment regulations which failed to define grounds for dismiss clearly



that allowed all the dismissed by the decision of assessment commissions to return to their jobs after recourse to a court [1]. However, assessment produced positive results too. To prove their qualification and availability to work in the police everyone had to pass two tests-the ability to think logically (General Skills Test) and knowledge of applicable laws. Unfortunately, the results show that nobody attained the pass rate of 30 points which is one half of the maximum [1]. According to Zakharov, the tests being relatively simple, the majority of examinees got the average of 25 to 30 points.

As Zakharov has revealed, due to the lack of funds, the police officers who had passed the assessment did not get pay rise as promised. It was a bit paradoxical when a former militiamen with more than 20-year record of service received 2-3 times lower salary than the new patrolmen who had served a year or less after only 3 months of training. Even the heads of district departments and chiefs of staff of oblast departments had lower wages. This led to mass layoffs of personnel, and in the early October, after equalization of salaries, the shortage of personnel reached 30-40%. The withdrawal of specialists was especially sharply felt in rural areas. The reforms seemed to fail under such circumstances. It should be recognized that the 2016 reform of the police failed due to the lack of funding. This leads us to the conclusion that under the conditions of the lack of funding it would be advisable to create a new patrol police only in 7 major cities (Kyiv, Kharkiv, Lviv, Odesa, Dnipro, Zaporizhia, and Kryvyi Rih) and introduce the Sambir model in all other cities [1].

Evaluating and assessing reform nowadays is a difficult task, though it is possible rather, to talk about individual examples and analyse directions of change. For the entire time of the reform, various strategic documents were adopted, though, a common vision and direction were not formed, that would allow us to sum up today, using information on the implementation of the tasks set for the police. However, it is necessary to dwell on those things that are not often discussed in the media. They can be called invisible aspects of reform.

Trust in the police is linked to trust to the government. Unfortunately, the influence of politicians on the work of the authorities has always been high, which, among other things, calls into question the work of the police either in peaceful assemblies or in the investigation of crimes. This means that the less the policy intervenes in the work of the police, the greater is confidence in the police and trust to policemen. No matter how strange it may seem, few still know that the Minister of the Interior has no formal authority to manage the police today. Often, the demands of journalists or public organizations to investigate specific criminal proceedings are addressed specifically to the minister. In fact, they have no legal basis, because the work of the minister is the formation of state policy in law enforcement, and not the investigation of crimes. However, in practice, the current minister leaves his influence and tries to intervene in the work of the police. There are some legal grounds for this: the Law contains a provision stating that the appointments of all heads of local police stations and deputy chairmen of the National Police must be agreed with it.

Disclosure indicators and police performance evaluation system in the face of constant demands from the public about the investigation of high-profile crimes, the

quality of the report have a great influence on the success of the reform and the credibility of law enforcement agencies and prosecutors. Evaluating criminal statistics as a tool, it should be said that no one offers to abandon it. It is proposed only to refuse to use it as a cross-cutting source for assessing the effectiveness of the work of law enforcement agencies, which affects the careers and wages of real people — either police officers or prosecutors. The positive fact is that today criminal statistics in Ukraine contains not only information on the number of crimes committed and the results of their investigation, but also certain criminological information about criminals.

Crime data today cannot be the basis for evaluating the work of law enforcement agencies. They can be criminological surveys within which with the help of sociological tools one can get: crime data alternative to official statistics; assessment of the level of public confidence in the police based on specific criteria by independent sociological organizations; use of standards (protocols) of work of each professional participant in criminal proceedings, first of all, the investigator and prosecutor. Such standards should contain a minimum list of procedural actions that must be taken when investigating a typical crime, and the manager will be able to evaluate his subordinate based on their results. The level of trust of citizens is the main criteria for evaluating the effectiveness of the work of the police. Though this is enshrined in Part 3 of Article 11 of the Law «About National Police», it still remains declarative as no studies have been conducted yet.

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### Designing innovative filtering respirator

Modern requirements for safe operation at industrial enterprises have resulted in the development of innovative filtering respirator which main peculiarity is in the decreased initial breathing resistance and increased period of protective action. That has become possible owing to the fact that the back wall is made in the form of confusor, which helps increase airflow rate on its way to the outlet of a filtering box along with the uniform flowing around the whole area of corrugated filter.

The respirator (Fig.1) contains elastomeric half-mask with obturator 1 and exhale valve 2, which is connected stiffly with filtering box 3. There is distributing plate 4 with four points to fix headpiece 5 with fixing set 6; the plate is mounted between a filtering box and half-mask.

Table 1 shows the results of comparative tests performed in the context of innovative filtering respirator and the known protective device PIIA used in terms of most coal mines in Ukraine as standard respiratory protective devices

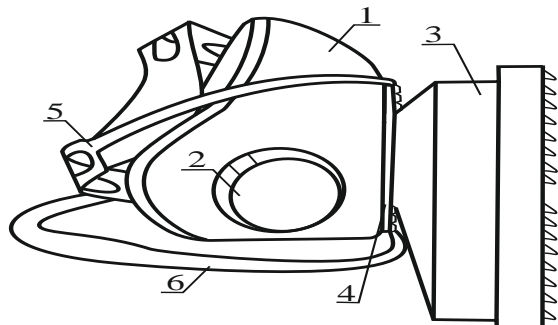


Fig.1 – General view of a filtering respirator:

- 1 – rubber half-mask; 2 – exhale valve assembly; 3 – filtering box;
- 4 – distributing plate to fix headset;
- 5, 6 – upper and lower headset straps

Table 1. Results of the laboratory tests for filtering respirators

Parameters	The respirators value	
	PIIA	Developed one
Penetration coefficient in terms of sodium chloride test-aerosol, tested on volunteers K, %	4	1.5
Initial breathing resistance of a filtering box in terms of air loss, 30 l/min, Pa	25	9
Dust content in terms of dustiness with 500 mg/m <sup>3</sup> dust concentration, in terms of 30 dm <sup>3</sup> /min air loss up to the boundary breathing resistance 100 Pa, g	1.1	4.8
Time of filter dustiness up to the boundary breathing resistance 100 Pa, g	75	320

Thus, dust content and protection period of the developed respirator have increased by more than 4 times in terms of dust concentration in the air being 500 mg/m<sup>3</sup>.

## **Will Trump's wall solve the problem of Hispanic immigration to the USA?**

There are many methods of solving problems. Sometimes humanity finds appropriate solutions, sometimes we avoid them and sometimes we build walls. Walls to protect ourselves, to stop the problems from happening.

Usually, reading this, people would think of mental walls, but there are also material walls built for the same purposes!

An excellent example of a real wall in our world would be Trump's Wall. Does it exist at the moment? No, it does not. However, there are plans of making this wall in the near future. The main objective of the Wall is to secure the USA from the constant flow of immigrants. Donald Trump believes that this Wall will save his nation from the instability in the economy caused by the immigrants. Of course, not everyone supports the idea. Not everyone believes that a wall could stop people from crossing over, which is the main reason why it hasn't been built yet.

No one can say for sure if the Wall will work or not, but we can look into history to find out. Let's remember the Great Wall of China. It was built about 500 years ago to protect the citizens from their enemies. Was it effective? I believe not. While it was being built many invaded by making loops around the built part, after it was built it still didn't hold its stand because the enemies would go right through it. It wasn't strong to keep the tribes away.

Then we also have the Berlin Wall. It was effective to some point, however 2.6 million out of 17 millions of people escaped. In the end, it was taken apart by the people themselves.

Another example would be Hadrian's Wall in England. This wall still exists, even though it was built 122 AD. The funny thing is, it still stays because no one needed to attack it. Thus, it is questionable if the wall was effective.

The examples of history show that no wall was ever good enough.

As we can see, the estimated costs of building Trump's Wall are growing by the day and the number of immigrants, even while the Wall is built haven't gone down, on the opposite, they are growing. In fact, during the time the president was Barack Obama the number of migrants was less (he didn't build walls).

After completing this research, I came to the conclusion that Trump's Wall won't be as effective. I believe that the number of migrants will temporarily decrease, but Mexicans will find a new way to flee to the USA, including the tunnels under the border.

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### **The concept of development of the centers for providing administrative serviced in Dnipro**

In conditions of the state course realization for the formation of a legal social state, issues of higher relevance of public authorities and local self-government bodies for the provision of public services are becoming acute and of social significance. At the current stage of development of the Ukrainian state, the main task of the authorities is to serve the citizens - consumers of administrative services, the quality of which must meet European standards. Under these circumstances, it is particularly relevant to formulate approaches that allow us to obtain the maximum socially useful result at the minimum cost of resources (material, human, etc.).

The purpose of the study is to substantiate the model concept of the functioning and development of the centers for providing administrative services and the formation of approaches to the integrated organization of a unified system of centers for providing administrative services (CPAS) activity in cities that have a territorial division.

In the course of the research, information was obtained about the CPAS from 13 city councils websites of Dnipropetrovsk region, the website "Regional Virtual Office of Electronic Administrative Services of the Dnipropetrovsk Region"; analytical data on CPAS, which are placed on the official website of the Ministry of Economic Development and Trade of Ukraine; the website of the "Unified State Administration of Administrative Services Portal", personal observations of project experts gathered during visits to the CPAS and during communication with the management of the CPAS, as well as the documents provided. [1]

The assessment of the quality of service was carried out according to the following criteria: CPAS work organization; CPAS location, requirements for the premises and its arrangement and other amenities; CPAS staff; work of the back office; internal analysis of CPAS activity.

According to the criterion of completeness (sufficiency) of the administrative services list, the center for the provision for administrative services "Visa" in Kryvyi Rih has a primacy, since it can provide such services as: permissions / declarations in the field of construction; registration of legal entities management, private entrepreneur; registration of real estate rights; services with "internal" passports (paper); services in the field of land (issuance of information from the SLC and registration of land plots); social services (including assistance and so-called "package" services in life situations) with the exception of subsidies. [2]

The analysis of information given in the CPAS administrative service card found that some cards contained outdated or incomplete information about the CPAS (location, mode of operation, telephone, email address, and website). It is necessary

to update the information in the information cards for the administrative services provided at the Dnipro, Dnipropetrovsk oblast.

The monitoring of open sources of information showed that only two of the 13 surveyed CPAS have their own web-sites on “Regional Virtual Office of Electronic Administrative Services of Dnipropetrovsk Region” (CPAS, Dnipro and CPAS, Novomoskovsk). The information provided on “Regional Virtual Office of Electronic Administrative Services of the Dnipropetrovsk Region” regarding the CPAS operation, their location, telephone numbers, e-mail addresses, web resources, lists of administrative services provided by the CPAS and information cards is mostly irrelevant and needs updating. There is no complete list of services and information cards on any of the CPAS website resources (sites or pages). [3]

According to the results of the study, the related services are provided only in the central CPAS of Kryvyi Rih, in the CPAS in the city of Kamensk, in the CPAS of the city of Volnogorsk (terminal for payment of services).

In the premises of the central CPAS of Kamyanets'k there is a separate place for the provision of related services (document copying services, free Wi-Fi, photo on documents, a free computer with Internet access), as well as Internet banking. After the payment is made, the administrator prints the receipt.

The premises of the central CPAS of Kryvy Rih are equipped with free Wi-Fi. Visitors to the CPAS have the opportunity to use banking services through a full-fledged bank branch of Privatbank. CPAS has services for copying documents in the waiting sector. A free computer with Internet access is installed. Photographs for documents are made by the administrators of the Passport service of the CPAS.

As for the CPAS staff, the Livoberezhnyi CPAS has an advantage, but this figure is not perfect. With a maximum score of 120 points, the Livoberezhnyi CPAS has only 80. Therefore, the main areas of the concept of the development of CPAS are the improvement of electronic document management and staff training for professional and psychological training

As a result of the research, the model conception of the functioning and development of the centers for the provision of administrative services was substantiated, the approaches to the integrated organization of the activity of a unified system of centers for providing administrative services in cities that have a territorial division and identified promising directions for the development of the CPAS are formulated.

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### **On the Problem of Cargo Transportation**

Transportation of hazardous cargo is accompanied by additional risks in terms of the facts that those cargos may be the cause of explosion, fire, injury or death of people; they may be also harmful for the environment. The most important thing to consider during transportation of dangerous cargos is to provide its maximum safety. To prevent accidents while transporting those types of cargo using different transport, national authorities on different countries have been regulating such activities with the help of different standards and laws. The difficulty is in the fact those laws and standards may differ along the whole transportation route complicating the transportation relations for all the participants. That has resulted in the necessity of international regulation of dangerous cargo transportation and development of the series of agreements and other international documents aimed at providing safe dangerous cargo transportation. Statements of those documents are based on the papers issued by the UNO concerning dangerous cargo transportation: standard rules, guidance on testing and criteria, rules to transport radioactive materials.

International transportation of dangerous cargos in terms of national and international routes of motor transport is regulated by the European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR), technical appendices to the agreement A and B.

Law of Ukraine "On joining of Ukraine to the European Agreement concerning the International Carriage of Dangerous Goods" has ratified that agreement.

According to the ADR statement, dangerous cargos are divided into nine classes: class 1 – explosives and products (e.g. black powder); class 2 – gases (e.g. aerosols); class 3 – fire accelerants (e.g. petrol); class 4.1 – solid fire accelerants (e.g. sulphur); class 4.2 – substances prone to spontaneous combustion (e.g. activated coal); class 4.3 – substances emitting fire accelerant gases while contacting with water (e.g. zinc powder); class 5.1 – oxidizing substances (e.g. potassium permanganat); class 5.2 – organic peroxides (e.g. acetylacetone peroxide); class 6.1 – toxic substances (e.g. pesticides); class 6.2 – infectious substances (e.g. vaccines); class 7 – radioactive materials (e.g. uranium); class 8 – corrosive materials (e.g. sulfuric acid); class 9 – other dangerous substances and products (e.g. dry ice).

In case of accident or leakage, most chemical substances may propagate in the air in the form of dust, fog, vapour, and gases. Thus, recently, special attention is paid to the problem to minimize risks which sources are represented by stable, biologically accumulated and toxic substances since their considerable negative effect may be observed for a long time.

## **Relevance of the study on the problems of release from punishment due to illness**

The Constitution of Ukraine, as the main law of the state, establishes that no one shall be subjected to torture, cruel, inhuman or degrading treatment or punishment. This norm reproduces the provisions of Article 7 of the International Covenant on Civil and Political Rights and deals with torture and other cruel forms of detention and punishment, which degrade the person as a gross violation of human rights. However, as the practice of the ECtHR shows, the Ukrainian system of criminal justice [1] does not always meet such requirements. This concerns the penitentiary system of Ukraine, in particular, the release from punishment due to illness. The ECtHR taking into account the general state of health of patients and in the case of incompatibility with serving a sentence, notes the inadmissibility of their continued detention and equates the violation of the rights of the latter to torture, inhuman and degrading treatment.

The Institution of release from punishment due to illness as part of the Law of Ukraine on Criminal Liability embodies the principle of humanism and ensures the economy of criminal repression if the nature and degree of public danger of persons who committed a criminal offense is partially or completely eliminated. However, the practice of law enforcement of the release from punishment due to illness proves that there is a significant contradiction, in particular, the unequal interpretation of the norms of the Criminal Code of Ukraine (Article 84). This is due to the low level of doctrinal study of this issue. In the criminal law of Ukraine, as a science, the issue of exemption from punishment due to illness is not explored in any dissertation research or monographs, which generates a certain doctrinal vacuum and the complexity of the process of rulemaking on this issue.

The relevance and timeliness of the study of the problems related to the release from the punishment on the basis provided in the Article 84 of the Criminal Code of Ukraine is also grounded in the fact that in the penitentiary institutions in the form of imprisonment have a negative tendency towards the disease of tuberculosis. This disease often serves as the basis for the release from punishment due to illness, but the process of reforming the state penitentiary service of Ukraine impedes the dispatch of justice this category of cases.

The real state of affairs in Ukraine is such that a significant number of court decisions contain illegal, biased and unjustified refusals to release from punishment due to illness that impedes serving the sentence. In this way, the rights of the convicts are violated. The same applies to persons who have suffered mental illness while in prison, thus depriving them of the ability to realize or direct their actions. The use of coercive measures of a medical nature is not a punishment, and therefore the



illegality and groundlessness of the adopted court decisions may be considered as compulsory withholding without sufficient grounds, which is clearly recognized as a violation of the order of appealing to the ECtHR and from the advice of the Commissioner for Human Rights.

These circumstances indicate the need for a comprehensive theoretical and legal study of release from punishment due to illness in order to identify problematic aspects in this area and identify ways to address them. As Winston Churchill once said, «Show me your prisons and I shall say in which society you live».

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### **Peculiarities of terminology translation in the field of cybersecurity**

Relevance of the topic under study is determined by the need to incorporate the subject knowledge related to the translation of terminological vocabulary in the field of cybersecurity with the prospect of its further inclusion in the content of future translators' training.

Translation from one language to another is a complex process of human mental activity. To translate means to adequately reproduce the concept expressed by means of one language, using the means of another language, to reproduce the original considering the interaction of content and form. Rapid development of modern science and technology led to the increasing importance of scientific and technical translation.

In order to produce an adequate translation, the translator must have specific knowledge not only of terms in the field in which he translates but also general knowledge of the term, its functioning and variations. Such scholars as V. Vinogradov, V. Leichik, G. Vinokur and others have studied terminology, while V.I. Karaban, A.Ya. Kovalenko, V.N. Komisarov and others examined terminology translation.

According to Golovin and Kobrin, the term is a word or a subordinate phrase having a special meaning, expressing and forming a professional concept and used in the process of learning and mastering scientific and professional technical objects and the relations between them. J. Maruso gives the definition of terminology as a section of vocabulary that covers the terms of various fields: science, technology, art, and social life. According to Barkhudarov, translation transformation is an interlanguage transformation, sense re-expression or text paraphrasing aimed at achieving

translation equivalent. V.M. Leychik defines terminological system as a set of terms, formed on the basis of one theory or concept and reflecting the connections between all concepts in a certain field of knowledge.

The ways of term formation are the following: semantic (a mouse as an animal and a mouse as a computer device), terminological borrowings (a virus of flu and a computer virus), morphological (compound words or abbreviations, for example: spyware, PC - personal computer), syntactic (for example: cyber threat, cyber-attacks). morphological-syntactic (water, to water). According to the structure, terms are subdivided into: simple (access), compound (cybersecurity), term-combinations (mobile banking Trojans), or shortened terms (open Wi-fi, wireless fidelity). According to the sphere of their use, professional terms can be divided into: general professional terms (used in different fields of knowledge), special professional terms (used only in some fields), the narrow-specialized terms (used only in one area, such as some linguistic terms).

However, to adequately translate terms, the translator should use translation transformations, such as: loans, transliteration, transcription, descriptive translation, analogue translation etc. For example:

Term	Translation	Translation transformation
Spyware	Шпионская программа	Analogue translation
Mobile banking Trojans	Мобильные банковские трояны	Loan translation
DDos attack	DDoS-атака	Transliteration and transcription
Phishing	Фишинг	Transcription
Open Wi-fi	Бесплатный Wi-Fi	Analogue translation and transliteration
Data breach	Утечка информации	Analogue translation
Botnet	Ботнет	Transliteration and transcription
Ransomware	Программа-вымогатель	Analogue translation

To sum up, having studied literature on terminology the following conclusions can be made: terms and terminology are studied as multi-aspect phenomena; researchers provide different definitions of the term and terminological system using different criteria; the use of new technologies and the Internet makes it possible to develop terminology as a science.

**Section 08 Applied Linguistics, Translation Theory and Practice**

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**Media style of the English language**

The second half of the 20th - the beginning of the 21st century is characterized by a rapid growth of mass communication and new information technologies.

As a result of the active study of the linguistic features of the media language, a new discipline emerges, media linguistics, whose object of study is the language of media texts. The formation and development of media linguistics as a direction of modern linguistics is due to both linguistic factors and information, technological and socio-cultural spheres of social life. The rapid development of information and communication technologies, the formation of a single information space as a virtual text messaging environment have contributed to the formation and scientific comprehension of the language of the media, the study of its functional and stylistic features and internal structure.

The analysis of scientific literature makes it possible to say that the definition of the theoretical foundations of media linguistics, the study of mass-media text, its structure and typology, and the methods of its study have been considered in works by domestic and foreign linguists, psycholinguists, and mass-media theorists.

The dynamic development of traditional media, the press, radio, television, the emergence of new computer information technologies, the globalization of the world of information space have a huge impact on the process of production and dissemination of words. All these complex and multifaceted processes require not only scientific reflection, but also the development of new paradigms of practical study of the genre specificity of the media.

Media stylistics is a special area of stylistics, the subject of which is the mass-media language as a whole. The basis of stylistics is the integration style category. The media style integration category may also be the basis of media stylistics. Media style is understood wider than the journalistic style, developed within functional stylistics.

Media style is a multidimensional phenomenon, difficult organized. In addition to the intentional structure of media style, it is proposed to allocate its narrative structure. Most transparently, this structure appears in television materials of various genres (in news releases, in reports, in political talk shows, etc.). Narrative is a story, with a certain plot, with specific characters. Media style is a "fusion" of narratives, which are unfolding in the text space of the media discourse, and, equally important, each narrative has its chronological development. In the media, there is an author's narrative, in which there are narratives of witnesses of events, and a narrative of experts.

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### **The peculiarities of translation of terms denoting astronomical phenomena and processes into the Ukrainian language**

Along with the development of technologies and growing amount of prominent achievements in the field of astronomy, a sufficient theoretical basis has begun to increase and set there. Not only new concepts appear quickly, but they also need to be denoted and transferred into many languages around the world. That is why the issue of translation of professional astronomical terminology is currently in the focus of linguists' attention. In order to perform the adequate translation of terms, a translator should demonstrate comprehensive knowledge of the field to which a particular text belongs, as well as the high level of linguistic expertise. While translating, we should pay exceptional attention to the interaction of a term with a general context, because it is very important for finding out the true meaning of a word or word collocation.

The process of translation of a term into the Ukrainian language can be divided into two stages: 1) determining the meaning of a term in a particular context; 2) translating the meaning into Ukrainian. The main translation technique used for translating terms is a usage of a lexical equivalent. By a lexical equivalent we mean a constant lexical counterpart, the meaning of which corresponds accurately to the meaning of the original word or collocation.

While translating terms from English into Ukrainian, translators usually apply the following basic techniques:

1) descriptive translation – a communication of a terminological unit via expanded explanation of an English term that is used in case of absence of the unit's corresponding meaning in the Ukrainian language (e. g., *collapsed object* – «об'єкт, що колапсує», *ejected object* – «об'єкт, викинутий із (Сонячної) системи»);

2) translation by means of genitive case (e. g., *multi-messenger astronomy* – «астрономія багатьох джерел», *Pluto-Charon system* – «система Плутон-Харон»);

3) translation with the use of prepositions (e. g., *binary neutron star system* – «система з двох нейтронних зірок», *highly spun-up Kerr hole* – «чорна діра Керра з високою швидкістю обертання», *thick H-dominated atmosphere* – «щільна атмосфера з високим вмістом водню»);

4) loan translation, or word-for-word translation – a translation of an English term or terminological phrase via its accurate communication by means of the Ukrainian language (e. g., *brown dwarf* – «коричневий карлик», *binary supermassive black hole* – «подвійна надмасивна чорна діра»);

5) transcription – communication of the pronunciation of an English term by letters of the Ukrainian alphabet, i. e. communication of its phonetic pattern, often used while translating proper names (e. g., *Polaris* – «Полярис»);

б) transliteration – communication of a written pattern of an English term by letters of the Ukrainian alphabet, regardless of its pronunciation (e. g., *planetesimal* – «планетезималь»).

One-component terms which denote astronomical phenomena and processes are often translated into Ukrainian via the word-for-word method: *jet* – «джет», *counterjet* – «контрджет», *curves* – «завихрення». In some cases a translator should choose an equivalent terminological phrase with more components, if the term cannot be translated adequately using one word: *inspiraling* – «зближення по спіралі» (about stars).

Quite a large part of terms used for denoting astronomical phenomena and processes consists of two-component terminological units. Sometimes it is possible to translate them word-for-word (e. g., *ring rain* – «кільцевий дощ», *quantum transition* – «квантовий перехід», *multiwavelength view* – «багатохвильове зображення», *critical threshold* – «критична межа»). One of the components of such phrase may be translated differently, depending on the context, e. g.: *gravitational radiation* – «гравітаційне випромінювання», but *electromagnetic radiation* may be translated not only as «електромагнітне випромінювання», but as «електромагнітний діапазон» as well. While translating two-component terms, specialists typically use genitive case: *stellar collision* – «зіткнення зірок», *kilonova event* – «явище кілонової», *wave trains* – «ряди хвиль (в атмосфері)», *pulsar timing* – «хронометрування пульсарів». Translation with the use of prepositions is also used, but not as widely as the previous method: *deuterium fusion* – «синтез з дейтерію», *hydrogen fusion* – «синтез з водню».

Astronomical phenomena and processes are frequently denoted with three-component terms. They are translated mainly by means of genitive case: *brown dwarf collision* – «зіткнення коричневих карликів», *black hole collision* – «зіткнення чорних дір». Sometimes the use of genitive case is combined with the application of prepositional phrases: *planet-planet collision* – «зіткнення планети з планетою». Some terminological phrases containing adjectives undergo word-for-word translation: *proto-planetary collision* – «протопланетне зіткнення», *Loop Quantum Gravity* – «Петльова квантова гравітація», *fast radio bursts (FRB)* – «швидкі радіоспахи».

Terms consisting of four, five and more components are rather rare to come across. As a rule, they are translated via loan translation. However, some additional transformations, such as concretization or, on the contrary, generalization, can be applied in order to achieve more accurate and adequate translation, e. g.: *fountain of molecular gas pumped by a black hole* – «фонтан молекулярного газу, насичуваний енергією чорної діри».

To draw the conclusion, we would like to observe that two-component terminological phrases dominate among the terms denoting astronomical phenomena and processes, and word-for-word translation as well as translation by means of genitive case take leading positions among the techniques applied while translating units of this particular term system.

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### **An encrypted language code to save and optimize language effort in the field of ecology**

Nowadays, along with the rapid quantitative growth of modern English vocabulary, the rationalization of the language and a tendency to save nominative and word-making efforts take place. These processes cause the need for shorter forms of words and phrases, especially in the scientific and technical literature, which is a sphere of wide use of complex and multicomponent terms. These trends are also observed in the field of ecology and environmental protection, as it is becoming an increasingly important component of the life of the modern world community.

The problems of lexical items shortening as a specific language phenomenon and ways of their translation attracted attention of such researchers as V.N.Komissarov, N.N.Morozova, L.S.Barkhudarov, N.N.Alekseeva, S.M.Enikeeva etc. Abbreviation is a method of word formation, which is the cutting off of a part of the base, which either coincides with a word or is a phrase combined by a common meaning. The term “abbreviation” includes both the process and the result of the process of reduction, cutting off phonemes and / or morphemes of words and phrases without changing their lexical and grammatical meaning. The process of translating abbreviations which are absent in dictionaries and reference books is carried out in two stages: decoding abbreviations and transmitting the correlates by means of the Ukrainian language.

As far as abbreviations in the field of ecology are concerned, the following ways of translation are distinguished: 1) translation by the corresponding shortened form, e.g. WWC (World Water Council) – ВВП (Всесвітня водна рада); 2) translation by the corresponding full loan-form, e.g. GPGP (The Great Pacific Garbage Patch) - Велика тихоокеанська смітцева пляма; 3) descriptive translation (explication), e.g. 3R (Reduce, reuse, recycle) – мінімізація виникнення відходів, їх вторинне використання та повернення до процесу виробництва; 4) transcoding (transliteration and transcription), e.g. UNIDO (United Nations Industrial Development Organisation) – ЮНІДО (Програма ООН з промислового розвитку); 5) direct borrowing of the abbreviation, e.g. WWF (Worldwide Wildlife Foundation) – WWF (Всесвітній фонд дикої природи).

Practical study of a significant amount of illustrative materials revealed that abbreviated units in translation are considered to be an encrypted language code that saves and optimizes language effort. But an abbreviation should not be a riddle or rebus that distorts our perception of the text and creates an “information noise”. To achieve adequacy of translation, such factors as ease of pronunciation and spelling in Ukrainian, the tradition of translating this abbreviation into other languages should be taken into account.

### **Thematic classification of musical terms**

Music, as one of the types of art, is studied and theoretically substantiated by various disciplines. Due to increasing multicultural and multinational relationships in the sphere of music (theatrical performances, international music and song contests, festivals, exchange studies and others) contemporary musical discourse is of great interest for experts in different fields, including translators and interpreters due to the global status of the English language. Thus, the issue of studying musical terms, which as any other term system constantly develops and changes, is topical and requires thorough consideration by translators/ interpreters.

Musical discourse features great diversity and involves different aspects including social, linguistic, instrumental, technical, historical ones and many others. The purpose of the work is to highlight the key issues which refer to the term system of music art. By combining these terms into groups on a thematic basis, one can obtain the so-called thematic classification of musical terms:

1. Musical instruments and their parts: alto, harp, balalaika, horn, guitar, domra, piano, etc.
2. Singing voices and their registers: baritone, basso, soprano, mezzo-soprano, discant, tenor, falsetto, etc.
3. Musical groups and their subgroups: ensemble, band, quartet, second violins, duett, chapel, orchestra, etc.
4. Professions, specialties, roles: accompanist, accordionist, vocalist, cellist, capellmeister, violinist, trumpeter, drummer, etc.
5. Actions, processes of work: arrange, conduct, improvise, instrument, orchestrate, solfeggiare, etc.
6. Genres, types, branches of music: ballet, ballad, anthem, intermezzo, cantata, concert, nocturne, opera, oratorio, song, prelude, requiem, symphony, etc.
7. Separate musical compositions and their parts: aria, barcarole (gondola song), bourree, waltz, gavot, divertimento (variety show), entree, mazurka, menuet, tarantella, etc.
8. Musical forms and their elements: entrance, voice, double fugue, coda (outro), counterpoint, leitmotif (main theme), refrain (chorus), rondo, etc.

Many terms can be divided into generic and specific terms, depending on the scope of the concept enclosed in it. Terms that serve as generic names are present in all groups. They have a wider meaning in comparison to other terms: OPERA - comic opera, lyrical opera, opera ballet.

Specific terms are focused on the particular sides of a concept, which generic term would correspond to.

Thus, we can conclude that the musical terminology is quite wide-ranging and multifaceted. To master the musical term system, one should be aware of the fact that

the translation of musical texts is certainly not simple and it is not always easy to decide which particular sub-meaning is to be chosen. To render musical texts, a translator/interpreter requires the ability to understand ambiguous or archaic words or to translate one or more foreign languages into English.

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### **Anglo-American youth slang: peculiarities of translation into Ukrainian**

An integral attribute of the living functioning of any language is the existence of its original pillars, i.e. the so-called sociotypes. These are the languages spoken by individual social groups, representatives of certain occupations and age categories. Slang as a kind of linguistic substrate traditionally attracts the attention of domestic and foreign philologists (Yu. Vasilenko, I. Arnold, L. Burdin, R. Williams, E. Partridge, A. Smirnitsky, T. Solovyova, etc.) due to bright emotionally expressive color, laconicity and imagery, the ability to constantly change the boundaries separating it with the linguistic norm.

The notion of slang implies words or sayings used by people of some professions or class strata. Slang is traditionally opposed to the official, generally accepted language, and is fully understood only by representatives of a relatively narrow circle of persons belonging to a particular social or professional group that introduced the word or phrases into a language (Ya.Goldovansky). The slang reflects the way of life of the language team that originated it, often the speakers of a language with a sufficiently high level of education, who resort to its use in a particular communicative situation.

An active "supplier" of youth informal speech is the student's spoken vocabulary, which has a clear expressive emotional dynamic. The most developed spheres of communication, inherent in student slang, are educational, professional, social-household and spectacular mass.

Very often, translators render slang vocabulary by means of a number of transformations of different nature, in particular: 1) equivalent correspondences (if available in the language of translation), for example: *wild-assed* – відморожений; *top-notch* – суперовий; *dude* – чувак; 2) variant matches (when one lexeme in the source language corresponds to several translation options in the bilingual dictionary article and the translator chooses one of them, the most preferable), for example: *awesome* – потрясаючий, фантастичний, кльовий, прикольний, чудовий, цікавий, люксичний; *bubblehead* – дурак, довбань, дурбелік, придурок, пень, йолоп, бевзь, олух, одоробло, дулятор, аут, балда; *copper* – мусор, мент, лягавий, поліцай, коп, ментура; *nut* – голова, баняк, башка, довбешка, макітра; 3) contextual correspondences (suitable only in the context, arise as a result of an interpreter's creative search), for example the relation between words *honey* and



*перлина*: ...*he did not know this particular honey of English resorts*.- ... він не знав про саме цю *перлину* англійських курортів; 4) generalization, for example: *snow* – морфін, героїн, кокаїн – *наркотики*; *Caddy* – Кедді, кадилак – *машина*; 5) descriptive translation, for example : *ball-breaker* – жінка, яка демонструє свою владу, принижуючи гідність чоловіків; *goldbrick* – людина, та, що ухиляється від виконання своїх обов'язків; 6) transcription, for example: *surprise* – сюрпрайз; *deadline* – дедлайн; 7) transliteration, for example : *super* – супер; *label* – лабель; *message* - мессаж; 8) loan translation (verbal or literal translation), for example: *pass-fail* – залік-незалік; *bookworm* – книжний черв'як.

The youth slang is an interesting linguistic phenomenon whose existence is limited not only by certain age limits, which is obvious from its nomination, but also social, temporal and spatial boundaries. It exists in a student environment in some more or less closed referential groups. The slang of every historical epoch reflects the features of its time. In our time, it is controlled by a mass culture, i.e. different youth categories come under the influence of it.

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### **The phenomenon of polysemy in English technical terms**

The definition of "term"

"The term - a word or verbal complex is related to the notion of a organized field of knowledge (science, technology) that come into the system relationship with other words and verbal complexes and form with them in each case and for some time closed system, which is highly informative, unambiguous, accurate and expressive neutrality"

Classification of terms by degree of specialization:

- 1) general scientific terms (terms used in practically all industry terminology, for example: system, tendency, law, conception) and general technical terms (for example: device, equipment);
- 2) inter-sectoral terms (terms used in several related or remote industries, for example: amortization, environmental costs, private property);
- 3) narrow-line terms (terms that are specific to a particular industry, for example: leasing, drain canal, chip).

Classification of terms by structure:

- 1) simple, consisting of one word: circuit-chain.
- 2) complex, consisting of two words and written together or through a hyphen: flywheel - flywheel.
- 3) phrases, consisting of several components: circuit breaker - circuit breaker.

The main features of the term

- Stylistic neutrality, lack of emotionally expressive color.
- Accuracy and independence from the context. The technical term should clearly convey the essence of the concept in order to avoid misunderstandings and inaccuracies.
- Trend to uniqueness within a certain terminological system.
- Plasticity Ability to create derivative terms.
- Systemicity Each term has a terminology within the defined terminology system.
- Briefness in terms of expression.
- The presence of a definition that clearly delineates limits its meaning.
- International character. The presence of terms-internationalisms in some cases facilitates interethnic communication.

- Materiality.

Polysemy: the types and causes of its occurrence

Polysemy (from greek polysemos - "polysemy") - is the presence of different, but somehow interconnected values of the same word phrases, phrases.

Lexical polysemy is the ability of a single word to serve to denote various objects and phenomena of reality that are associative between themselves and which form a complex semantic unity.

Types of Polysemy:

1) internal (inside the terminus) and 2) external (on the verge of the termsphere).

Causes:

- 1) the ambiguity of the commonly used word, which includes the term;
- 2) the use of the word in a figurative sense.

Ways to translate multi-valued terms

1) Lexical and lexical-semantic transformations in the translation of multi-valued terms from English into Ukrainian:

- reception of specifics;
- reception of generalization;
- reception of semantic development of a significant term.

2) Translation of a multi-valued term according to the context.

3) Using the dictionary when translating multivalued terms.

When translating polysemic terms, lexical-semantic transformations are used, such as specification, generalization and reception of semantic development. Context plays an important role in choosing the right value. When translating polysemy terms, dictionaries are the necessary reference material. An integrated approach to changing the terms is to apply lexical-semantic transformations, to take into account the context and use of special dictionaries.

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## **Electronic news texts in English: Lexical features and specifics of translation into Ukrainian language**

The rapid development of technology has begun a period of "information explosion" in the world. A continuous stream of information contributes to the development of the media that are closely linked to the Internet technologies. The rapid pace of life and a large amount of information requires media to be more informative, operational and memorable. The development of Internet technologies facilitates the expansion of the role of text informative genres and separate news texts.

The news texts of the media serve as a basis for describing the present state of the language, since they reflect and establish numerous changes in linguistic reality, as well as all those processes that describe the use of modern language. The language of the media is used to create mass communication texts that are international in nature and should be accessible for understanding throughout the world. Thus, the translation of the texts of the media affects the linguistic, cultural-historical, and social consciousness.

Given the growing role of the media in society and the changes taking place in the modern information space, news texts are considered to be the core of a high-quality press. Therefore the lexical features and syntactic organization of news texts, for example, of electronic versions of American newspapers "USA Today" and "The New York Times" and the British electronic media, and the problem of their translation into Ukrainian is relevant and is an interesting subject for research.

The most used stylistic figures in the texts considered in the media are:

metaphors: broken English; as large as life;

euphemisms: adventurous, the word characterizing something dangerous or impossible is usually translated as a risky, less provocative and abrupt nature;

Epithets: Bleeding Kansas - Bloody Kansas, verbatim translation. However, usually this phrase implies a civil war in Kansas;

slengizms: bootlegging - to sell goods illegally, engage in smuggling;

hyperbole: have not seen for ages;

metonymy: Buckingham Palace is not supposed to make statements on this issue; it is believed that the Buckingham Palace will not make statements on this matter;

idioms: Bite off more than you can chew - take too many obligations on yourself;

antithesis: It's better to be beautiful than good, but it's better to be good than ugly.

Analysis of works by such scholars as S.I. Vinogradov, T.G. Dobrosklonsky, I.Д. Fomichova, G.P. Apalat, A.N. Vasiliev, M.N. Volodina and S.I. Potapenko allowed to conduct a stylistic analysis of texts of mass media, the classification of texts of English-language media, typological analysis of texts of English-language media, specification of methods for the translation of English-language media texts.

The translation of news texts facilitates convergence of languages and cultures of different societies. In turn, the process of translating information and news texts confronts not only with the system of equivalent links between the two languages, but also with the peculiarities of the functioning of this system in translation activities. Therefore, when translating information and news texts it is necessary to take into account the linguistic and cultural characteristics of the translated language as a part of the cultural picture of the world.

It should be noted that stylistic techniques of different languages have one basis, but their functioning in speech is different. The same methods have different degrees of use, perform different functions, and have a different weight in the stylistic system of each language which explains the need for translation transformations.

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### **Newspaper-publicistic style as a kind of functional styles of modern English language**

It is known that the system of functional styles is in a state of continuous development. Probably the most accurate definition of functional styles is the definition of V.G. Kuznetsova: "Functional styles are varieties of language that relate to certain areas of social consciousness and linguistic functions". Newspaper publicistic is called the chronicle of the present, as it fully reflects the current history, addresses the topical problems of society - political, social, domestic, philosophical, and so on. The main features of the language of the newspaper are:

- 1) saving of linguistic means, conciseness of presentation at informative saturation;
- 2) use of socio-political vocabulary and phraseology, rethinking the vocabulary of other styles (in particular, terminological vocabulary) for the purposes of journalism;
- 3) the use of language specific stereotypes for this style, cliché;
- 4) genre diversity and the related variety of stylistic use of language means: ambiguity of words, resources of word formation (author neologisms), emotional and expressive vocabulary;
- 5) a combination of features of publicistic style with the features of other styles (scientific, official-business, literary, artistic, and spoken), due to a variety of themes and genres;

6) use of figurative-expressive means of language, in particular means of stylistic syntax (rhetorical questions and exclamations, construction parallelism, repetitions, inversions, etc.). Not all of these features are equally common to all newspaper genres, and not all of them are typical only for a publicistic style. Some authors propose to allocate not newspaper, but informational style, which can be used in newspapers, on radio and television. It is also called the style of mass communication.

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### **Translation of English advertising slogans into Ukrainian**

Advertising is the attempt to influence the buying behavior of customers or clients with a persuasive selling message about products or services.

[Susan Ward]

**Types of advertisement.** Informative advertisement, Persuasive advertisement, Reminder advertisement.

Advertising slogans. Advertising slogans are short phrases used in advertising campaigns to generate publicity and unify a company's marketing strategy.

The phrases may be used to attract attention to a distinctive product feature or to reinforce the company's brand. [Dowling, Grahame R.; Kabanoff Boris]

**Slogans are divided into:** image and commodity. 1. Peculiarities of Advertising Slogans

According to general information, advertising is divided into three types:

Informative advertisement. Persuasive advertisement. Reminder advertisement.

If you look below, you can see examples of types. In the first picture shows an example of informative advertising. A lot of information about this service.

The next picture we can read example of persuasive advertisement: *Buy me....* These slogans encourage people to buy goods. And, on the last picture we can see the reminder advertisement.

#### **Advertising slogans**

Advertising slogans are short phrases used in advertising campaigns to generate publicity and unify a company's marketing strategy.

The phrases may be used to attract attention to a distinctive product feature or to reinforce the company's brand. [Dowling, Grahame R.; Kabanoff Boris]

Slogans are divided into: image and commodity slogans.

**Image slogan** – is a short phrase which presents company's style.

Commodity slogan is a short phrases which describes product.

The Conclusions consists of 4 parts.

First part. Peculiarities of Advertising Slogans.

This peculiarities are devided into:

Phonetic , Stylistic and Syntactic.

The most common a phonetic peculiarities and it's examples are shown on this slide.

The most important phonetic peculiarities are rhyme and rhythm.

You can read their examples. *“For all you do, this Bud's for you” (Budweiser Beer)*

*“The only light with vintage bite” (Kraft-pie)*

The third part is Stylistic peculiarities.

Metaphor, Epithets, Hyperbola and etc.

The last part of my conclusions is Syntactic peculiarities.

There are such syntactic peculiarities as Ellipsis, Parceling, Anaphor and etc.

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### **Difficulties of translating English humor**

A sense of humor is an individual characteristic of a person. Therefore, when it comes to the joint habitation of people at the national level, it always involves formation of their specific mindset. Humor – is one of the features that are included.

English people are well-known for their sense of humor. They enjoy teasing each other, and appreciate when the other person is able to tease himself. That is why the English culture is saturated with it. There are so many areas where one can find examples: literature, film industry, everyday life, anecdotes.

From the point of view of translation, one of the most important features of humor is its emotional coloring and, as a rule, fullness with national elements. The problem in the process of translating humor from one language to another is that in the original language in humorous works there are often separate parts that do not have an equivalent in the target language. The only way for a translator is to select from existing lexemes, word combinations, suitable in both meaning and in the stylistic coloring that they convey. Furthermore, the level of one translator's knowledge of English does not always help to make that kind of translation easy-to-understand, convey it interestingly and, above all, amusing. That is why a detailed study of the necessary features of transferring English humor into other languages is an actual topic in the modern world.

There are many works devoted to the translation of the nonequivalent vocabulary. Within them – articles about the translation of realities, terms, neologisms/archaisms, common words, slang and many others. Humor is singled out among these hard-to-translate units. Without any doubt, there are some difficulties in the process of translating jokes, puns, ironies and other humorous units. Sometimes a pun is simply

impossible to convey in the native language. English anecdotes can be discussed in the same way, because most of them are created with the help of so-called wordplays.

“I was arrested at the airport. Just because I was greeting my cousin Jack!

All that I said was "Hi Jack", but very loud.”

\*hijack – To seize control of (a vehicle such as an airplane or bus) by use of force, especially as a way of reaching an alternate destination or as an act of terrorism.

“A woman was driving in her car on a narrow road. She was knitting at the same time, so she was driving very slowly.

A man came up from behind and he wanted to pass her.

He opened the window and yelled, "Pull over! Pull over!"

The lady yelled back, "No, it's a sweater!"”

\*pull over – to force (a motorist or a vehicle) to stop at a curb or at the side of a road; a garment, such as a sweater, designed to be put on or taken off over the head.

Both of the presented anecdotes evidently cannot be transferred into Ukrainian without losing their peculiarity – the puns that they convey. Therefore, the equivalence of translation cannot be reached at its highest level. The only thing that lasts to a translator – is to use his skills to change the object of humor, at the same time saving the place of a given situation (an airport, a road traffic etc.) and a general atmosphere.

To perform an equivalent translation, the translator must take into account the reference function of the humorous story, which necessitates the culturological knowledge (e.g. knowledge about events, states, actions and processes characteristic of a culture, knowledge of prevailing stereotypes, standards of behavior, moral principles, dominant Values of society).

To achieve translation adequacy, a translator needs to have knowledge about the context and the situation, since one of the basic requirements for an anecdote is its relevance. Typical situations in which an anecdote may happen can be different in other cultures from British. For example, if the use of an anecdote to relieve tension is characteristic of both British and Russian cultures, the citation, as well as the construction of chains of anecdotes, characterizes the Russian tradition to a greater degree. A translator also needs to have knowledge about the addresser, as well as knowledge of the addressee, since the same anecdote can be accepted or not accepted by different groups (social, national, etc.).

Preservation of the poetic function plays an important role in the translation of the humorous story. To perform this type of translation, a translator needs to have knowledge about the lexical, grammatical, including syntactic features of the construction of humorous stories in various cultures. Often, these features are due to the type of the story.

Intercultural asymmetry in the description of the situation manifested, first of all, at the level of a system of characters, causes the use of denotative transformations that affect lexical elements of the objective situation. Among the characters represented in different cultural traditions, characters can be singled out as those that replace each other in any particular situation, and regularly used to describe similar

subject situations. Comparison of stereotypes belonging to different cultures shows the opposition of the pictures of the world.

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## **Aviation terminology: ways of translation from English into Ukrainian"**

The rapid development of the global aviation industry has led to the need for an intermediate language for the professional communication of aviation specialists who belong to different language communities. Various aspects of aviation terms and ways of their translation are covered in the writings of the researchers: Golovin, Danilenko, Superanskay, Karaban, Onischenko, Romanchenko, Asmukovich, Bondarchuk, Gilchenko, Gorokhova, Kovtun, Dupikov, Kirichenko, Malkovska, Skorokhodko, Yegorova, Komarova, Zitkin, McMillan, Kushing, Mod, Kmit, Emeri, Mitsutomi, O'Brien, Mel, etc.

The term is defined as a word or expression used in relation to a particular subject, often to describe something official or technical (Cambridge dictionary); any word or group of words considered as a member of a construction or utterance (Dictionary.com); a word or phrase used to describe a thing or to express a concept, especially in a particular kind of language or branch of study (Oxford Dictionaries).

In the course of the research it was found out that according to their structural peculiarities, aviation terms split into:

### **simple**

non-derived: *pilot, line, light, land, tube*; *кіль, пілот, ангар, азимут, вантаж, мотор*

derived: *bear-ing, circl-ing, control-er, safe-ty*; *бовт-ан-к-а, при-земл-енн-я*

**compound:** *runway, taxiway, tailplane, accident-free, air-craft, autothrottle, gyro-plane, leveling-off, check-in, circle-to-land, lock-on, noising-over, take-off, аеро-динамічний, радіо-маяк, само-пис, суцільно- металевий etc.*



**word combinations:** *radio communication equipment, snow clearing equipment, world area forecast, precombustion chamber fuel*; *двопалубний фюзеляж, фюзеляж з каркасом зі сталевих труб, бортова система відновлення працездатності після відмови, планарна система координат*;

**abbreviations:** *ANC (Air Navigation Commission) – АНК (аеронавігаційна комісія), SCAA (State Civil Aviation Authority) – ДС ЦА (Державна служба цивільної авіації); AIP (Aeronautical Information Publication) – ЗАІ (Збірка аеронавігаційної інформації)*;

**acronyms:** *LASER тж. laser [Light Amplification by Stimulated Emission of Radiation], ІКАО (англ. ICAO – International Civil Aviation Organization)*

The ways of translating the aviation terms from English into Ukrainian are as follows:

**transcription and transliteration:** *antenna – антена, composite – композит, briefing – брифінг, ARTRAC (Advanced Real-Time Range Control) – перспективна система управління «Артрак» з автоматичним перетворенням в реальному масштабі часу одержуваних при радіосупроводі сигналів, FORTRAN (Formula Translation) – процедурна алгоритмічна мова «Фортран», NOTAM code – код НОТАМ*

**corresponding equivalents in the target language:** *hydrogen – водень, tailplane – горизонтальне хвостове оперення; CAD (computer-aided design) – САПР (система автоматизованого проектування), SSR (secondary surveillance radar) – ВОРЛ (вторинний оглядовий радіолокатор), APU (auxiliary power unit) – ДСУ (допоміжна силова установка), ATS (air traffic service) – ОПР (обслуговування повітряного руху),*

**loan translation:** *data base – база даних, flying field – льотне поле;*

**descriptive translation:** *WIDE (Wide-angle Infinity Display Equipment) – призначена для наземних тренажерів ширококутна система представлення візуальної інформації про повітряну обстановку, що надходить від ЕОМ.*

At the level of concepts, the following varieties of terms are found by the researchers, namely: the terms of the original language and the language of translation, which are traditionally regarded as equivalent but have certain differences in the exact scope of concepts; the terms of the original language, which are characterized by the plurality of translations into the target language; and without equivalents.

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### **Specific features of expressing simile and comparison in Modern English**

Comparison and simile are the important material for studying the mechanisms of world knowledge by a human. Comparison represents the linguistic picture of the world, the standards and stereotypes of the national culture, the ideology of the entire linguistic group as well as individual characteristics of the people. In turn, psychologists interpret the comparison as a mental operation based on the comparison of objects and phenomena, the finding of similarities and differences between them.

The logical structure of the process of comparison is represented by the following components: a theme – the first structural element of the comparative unit (what is compared); an image – the second element, or what is compared with; a feature (a general characteristic feature on the basis of which the similarity of the theme and the image is established); the result of the comparison is the conclusion derived on the basis of extralinguistic factors. All of the components are in close interconnection with each other, and only their combination helps to understand the essence of the process of comparison.

In modern English, comparison and simile can be expressed by such lexical units as *like* and *as* (*as if*, *as though*), *similar* and *the same*. Also, verbs such as *to remind*, *to resemble*, *to remind one of*, or verb phrases *to bear the resemblance to*, *to have a look of* and *to be like* are also can be used.

Comparison and simile can be used in different texts. However, despite their versatility and obviousness, they are also the most hidden elements that reflect the richness of the content of the text. Therefore, the study of comparison and simile is always being an actual problem of the English language.

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### **Means of expression of politeness in English**

Speech communication is considered to be one of the major human activities. The politeness is the obligatory element of this communication which provides equal, successful and frictionless communication process. Being one of basic components of interpersonal communication, the politeness represents the most important regulator of behavior of the person which is necessary for achievement of effective social interaction.

There is a huge number of the theories connected with category of politeness. We will remember some of them further, but for a start we will define what is politeness. And also we will consider how it realizes itself in speech communication.

Many people think that they accurately represent what is politeness, the polite reference. But it is not as simple to give definition to politeness as it seems at first sight. Different people describe politeness differently.

Understanding of politeness is reflected in N.I. Formanovska`s work and also in the T. V. Larina`s monograph. So, T.V. Larina writes: "The politeness is understood as national and specific communicative category which content is the system the ritual strategies of communicative behavior (linguistic and non-language) directed to harmonious, frictionless communication and respect for public accepted standards at interactive communication (establishment, maintenance and completion of interpersonal contact)". She also notes that the concept of politeness of different cultures is various. In each culture there is the sense of a concept of politeness which is reflected in language.

In the dictionary we find many ways of expression of a concept of politeness in English - politeness, courtesy, civility, comity, urbanity, courtliness, decency, suavity, affability, mannerliness. All of them are translated as courtesy, politeness, courtesy with small differences in a connotation. The basic concept - politeness which is given in the dictionary - to behave or talk correct to be applied to a situation in which the person is; in view of feelings and need of interlocutors.

From the definitions listed above we can draw a conclusion that the politeness is an observance of rules of decency in the speech and in acts, manifestation of good breeding, it is a basis etiquette behavior, the integral sign of any communicative act. Patricia Brown and Stephen Levinson, developing Erving Hoffman's ideas about "social faces", marked out positive and negative politeness. The positive politeness is connected with language expression of solidarity, including to the interlocutor and other persons in one group with speaker whereas negative - with self-restrictions of speakers, the aspiration to avoid the conflicts, it strongly depends on structure of the hierarchical relations in society and a social distance between speaker and other people.

The strategy of positive politeness consist in expression of solidarity speaking with the listener and are expressed in the following lines of speech behavior: manifestation of attention and interest to the listener, i.e. direct citing, involvement of the listener in dialogue, aspiration to consent, accounting of desires and tendencies of listening; creation of the atmosphere of intra group identity, that is use of a dialect, slang, the reference on "you", elliptic educations.

The research of politeness in a wide communicative context focuses attention to its multidimensionalities and interrelations with the pragmatical part of communication. It is confirmed also by various classifications of politeness: positive and negative politeness; the politeness of solidarity and politeness focused on a social distance; strategic politeness.

Maintenance of the principles of a tactfulness in informal communication makes important linguistic and social characteristic of speech behavior of British that is noted not only by linguists, but also by writers and journalists. So, generalizing the observations over speech etiquette of British, V. Ovchinnikov writes: "The English politeness in general orders restraint in judgments as a sign of respect to the interlocutor who has the right to hold other opinion. From here tendency to avoid categorical statements or denials... (the thirst for plug-in turns it seems "seems to me", "I think", "perhaps, I am not right, but...", intended to emasculate definiteness and straightforwardness capable to lead to collision of opinions".

The etiquette in English is made by formulas of speech etiquette, speech stereotypes.

Working determination of category of politeness is a complex of language indicators, the set of signs (a cliché, stereotypic phrases), and their appropriate grammatical, syntactic, lexical and phonetic registration.

Formular behavior models play definitely bigger, than it is considered to be, role. The purpose of maintenance of the principle of politeness is in achieving the maximum social balance and friendship.

In English the category of politeness is represented by grammatical means in a complex with lexical and syntactic.

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## **Youth vocabulary and slang of modern German and English languages**

According to the Encyclopædia Britannica, the word *slang* can be interpreted as non-traditional words or phrases expressing something new or something old, but in a new way. There are at least two basic interpretations of the word slang:

- 1) a special language of subgroups or subcultures of a society;
- 2) the vocabulary of wide use for informal communication.

The main sources of slang are:

- Borrowing from other languages (mainly from English);
- Borrowing from jargon (criminal, computer, etc.);
- Borrowing from the general literary language with a changing of meaning;
- Word creation.

Currently, the development of youth slang is greatly influenced by computerization. Mechanisms for replenishing the vocabulary of youth slang are: semantic and morphological methods, antonomasia, onomatopoeia and foreign language borrowings.

The morphological method is one of the most common ways of youth slang word-formation. It includes various morphological mechanisms of word-formation: word-building, metathesis, a mirror image of the word, change in the root of the word, rhyming, the so-called "medical Greek" slang, affixation and abbreviation.

The main functions of the slang vocabulary include: communicative, cognitive, nominative, expressive, ideological, esoteric as well as the identificational and time saving function. The expressive function of slang is the main, since slang being colloquial, expressively colored layer of the vocabulary, often having a rough-humorous shade, is inappropriate to general literary standards.

Slang is characterized by some social constraints: it does not have a clear social and professional orientation; it can be used by representatives of various social and educational status, different professions, etc.

Most units of slang and jargon are literary units that have acquired specific meaning, so borrowing from non-literary subsystems in many cases leads to the emergence of semantic neologisms.

The modern vocabulary of the English youth slang contains more than 20,000 words, and the active vocabulary of the youth slang of the German language contains about one and a half thousand words and phrases.

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### **Ways of expressing modality in the English-Ukrainian translation**

Lexicology is the part of linguistics which studies words. This may include their nature and function as symbols their meaning, the relationship of their meaning to epistemology in general, and the rules of their composition from smaller elements (morphemes such as the English -ed marker for past or un- for negation; and phonemes as basic sound units). Lexicology also involves relations between words, which may involve semantics (for example, love vs. affection), derivation (for example, fathom vs. unfathomably), usage and sociolinguistic distinctions (for example, flesh vs. meat), and any other issues involved in analyzing the whole lexicon of a language(s).

Modality is a category of linguistic meaning having to do with the expression of possibility and necessity. There are different types of modality and the topicality of our paper is caused by the necessity to improve knowledge about the term modality and its expression.

The problem of modality as an object of interdisciplinary knowledge that is relevant to the modern science, has long been interested in the humanities scholars working in different fields research - logicians, linguists, psychologists, semioticians. A case of studying modality is complicated by multi-pronged approach to it, which leads to different interpretations. Linguistics borrowed the concept of modality from logic and philosophy which define it as the information related to the attitude of the statement to the reality, or its evaluative, temporal and other characteristics.

Among the scholars who investigate modality we can mention Sh. Ballie - he was the first to define the category of modality in West-European linguistics. And in Russian linguistics the prominent role in researching the category of modality belongs to academician V.V. Vinogradov. He wrote a lot of books connected with this notion and means of its expression. A lot of works are based on his understanding of modality. Among the other scholars who also tried to describe the modality phenomenon are V.Z. Panfilov, G.A. Zolotova, L.S. Yermolaeva, G.V. Kolshanskiy and others. Numerous linguistic scholars have created various modality classifications, for example N. Petrov, F.R. Palmer, G.J. Lyons, A.B. Bondarenko.

In modern English there are grammatical and lexical expressions of modality. Grammatical features such as modal verbs must, should, ought to, will/would, can/could, may/might, need. These verbs are weakening its initial value indicated, desirable, necessary, etc. and transmit only the speaker's relationship to the content of the proposition in General. Modal verbs convey different shades of modality, starting from the assumption of bordering the confidence to assert that speaking is not sure.

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## **Structure and semantics of English borrowings in the modern German language**

The term “Anglicism” encompasses all words and phrases that originate from the English lexicon or of which parts originate from the English lexicon, excluding proper names. The findings of the qualitative part of the study will be compared with the observations made in a similar contemporary study, Onysko

Anglicism is borrowed from English into any other language or formed in it by the English language model lexical or a syntactic entity, which in this language is perceived as "alien" to its lexical-semantic system.

According to S.V. Grinyov, anglicism is actually borrowing from a foreign language that resembles borrowed language or phonologically, or morphologically, or spelling or on two or all of the three levels mentioned at the same time.

B. Carstensen subdivides English borrowed words into the following categories:

1. The reduction of individual words.
2. The reduction of complex words.
3. The reduction of units over one word.
4. Morphologically modified forms.

The most active borrowing takes place in the following five areas:

1. advertising: communication between the provider and the consumer;
2. computer and information technologies, the latest media;
3. economics and politics;
4. leisure; fitness, fashion;
5. youth subculture including pop culture.

The result of borrowing is not only the replenishment of the lexical composition, but also certain changes in the structure of the vocabulary of the language.

It should be noted that there are three main ways of replenishment vocabulary of any language: word formation, change the meaning of the word, loan.

As research shows, borrowing is often used in such spheres as: communication, science, politics and the latest technology.

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## Ways of translating psychological terms from English into Ukrainian

The problems of coining, functioning and systematization of terms in the English scientific and technical terminology system, as well as difficulties of their translation from English into Ukrainian, are very relevant nowadays. The growth of interest in psychology in many countries became the basis for numerous studies (by A.S. Dyakov, T.R. Kiyak and others) on ways of translation of psychology terms.

Psychology terms split into several large groups:

1) base root words (*will* – воля, *fear* – страх) and base root borrowed words (*stress* – стрес, *trance* – транс);

2) derivatives а) formed by suffixion (*identity* – індивідуальність, *suggestion* – навіювання); б) formed by prefixion (*the unconscious* – несвідоме, *underproductive* – непродуктивний);

3) compound words: *psychotherapy* – психотерапія; *claustrophobia* – клаустрофобія; *absent-minded* – розсіяний;

4) terminology combinations: *mood swing* – зміна настрою; *emotional intelligence* – емоційний інтелект; *prime target group* – основна цільова група;

5) terminology abbreviations: *CNS* (*central nervous system*) — ЦНС (центральна нервова система); *EEG* (*electroencephalogram*) — ЭЭГ (електроенцефалограма).

When translating scientific and technical literature, the interaction of the term with the context is important because it helps reveal the meaning of the word. A.I. Kovalenko considers two stages in the translation process: the first is to find out the meaning of the term in the context, and the second is to translate this very meaning into the native language.

As far as rendering of psychology terms from English into Ukrainian is concerned, the following translational transformations are employed: explication, for example, *infaivodance need* – потреба уникати приниження; loan translation, for example, *group psychology* – психологія груп; transcoding, namely а) transcription, for example, *hysteria* - істерія; б) transliteration, for example, *temperament* – темперамент; в) hybrid transcoding (transcription with elements of transliteration), for example, *neurosis* - невроз; г) adaptive transcoding (when form of the word in the source language is adapted to phonetic and / or grammatical structure of the target language), for example, *identification* – ідентифікація.

The term translation is an exact reproduction of the original term by means of another language, provided that its meaning is preserved. Context plays an important role as it helps to find adequate equivalents in the target language, specifying one in the variety of all possible meanings of the word.



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### **Onomatopoeia: differences between English and Ukrainian and difficulties of translation**

Different sounds make an important part of our life involving our everyday relations, industrial and natural process and others. This phenomenon is called “onomatopoeia”. This term means that by imitation of animal sounds or those which we associate with a certain action, or just those of the natural world we make new words. Both fiction and scientific and technical texts feature onomatopoeia and these elements create difficulties for translators and interpreters because they are realized differently in different languages. Thus, the purpose of the work is to analyze the main peculiarities of onomatopoeia and problems which translation/interpretation experts can encounter while translating from English into Ukrainian.

To begin with, onomatopoeia is the creation of a name or word (onoma) from natural sound, in other words, onomatopoeias are imitative words of these natural sounds. They are found in all languages of the world, and some linguists, in fact, believe they were the first words human spoke when language was developed. According to Kambuziya and Zeinolabedin’s study, we can classify the functions of onomatopoeia in the following way: calls of animals, sounds of nature, sounds made by human and miscellaneous sounds [1, 220]. Examples of those sounds are: “tweet-tweet” or “цвірінь-цвірінь”, “drop-drop” or “крап-крап”, “pew!” or “овва!” and “bang!” or “бац!” Moreover, according to Verba, sounds that accompany actions are similar in English and Ukrainian, while the way we hear “animal language” is different [2, 24]. For example, we similarly hear “boom” as “бум”, “ha-ha” is “ха-ха” and as for animal sounds, it may indeed be astonishing how dissimilarly we render them, “oink-oink” is “хрю-хрю” and “cock-a-doodle-do” is “кукуріку”.

We can translate onomatopoeia as verbs and as interjections. For instance, “meow” can be translated like “to meow” or “някати” and “meow-meow” or “няв-няв”. In the English text, this depends on the word’s position in the sentence and, in many cases, on the context. Translation is always subject to context and onomatopoeia is no exception. Through the context we can also understand where this or that sound comes from.

While translating onomatopoeia without direct equivalent in the target language, a number of difficulties may occur. There are indeed sounds in English which do not have Ukrainian equivalents, e.g. “snuffle-snuffle”, this is the sound of rabbits and “gobble-gobble” – turkeys make it. This can be explained by the fact that because it is only the representation of a sound sequence and each language has its own phonetic system; therefore, onomatopoeia varies from one language to another. If they are interjections, we can replace them with verbs or, according to the article “Translating sounds: the translation of onomatopoeia between English and Spanish”

[3], one of the best solutions is to choose a sound that is used in similar situation or associated with it. One more popular approach is the adaptation in the source language to the meanings and associations of the target one. Another problem when translating onomatopoeia from English is related to finding adequate translation in Ukrainian. This is caused by the ability of the English language to create nouns and verbs from onomatopoeic forms, which is not typical for Ukrainian. Thus, formal texts in English can also include onomatopoeia without affecting their tone, which is very difficult to do in Ukrainian.

In conclusion, we would like to emphasize that onomatopoeia is an interesting, yet complex phenomenon of languages that is worth considering. Although some English and Ukrainian onomatopoeic forms are similar and can be understood easily, one should not underestimate the importance of their adequate translation.

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### The economic terms: ways of translation from English into Ukrainian

According to dictionary definition, the word "term" is derived from the Latin "terminus", which means "end limit, the end." In the Middle Ages, this word acquired the meaning of "definition, designation", and in the ancient French language "terme" had the meaning "word". According to E. Littree, O. Bloch, V. von Wartburg, P. Robert, it produced the term "terme" in French, a term in the modern sense. In English, the word "term" was borrowed from Old French ("terme" - "межа").

Taking into account the fact that the economic term is a dynamic element that functions in a living language and is constantly subject to changes, the following should be distinguished among its main characteristics: 1) accuracy; 2) definition; 3) systemacy; 4) nomenclature; 5) stylistic neutrality; 6) motivation.

As far as their morphology is concerned, economic terms are divided into simple (*deal, lease, tax*), derived (*liquidity, hypothecation*), complex (*stockholder,*

*creditworthiness, markdowns*), terminological phrases/combinations (*expiration date*), abbreviations (*LLC - limited liability company*).

According to their meanings, economic terms split into: 1) monosemantic (IMF- МВФ); 2) polysemantic, e.g. *account*-1) рахунок (у банку); 2) розрахунок; підрахунок; лік; 3) кредит за відкритим рахунком (у магазині);... 9) (будь-який) замовник, покупець, клієнт.

There are such ways of translation of economic terms and terminological phrases as: loan translation (*payer*–платник; *monetary policy* –грошова політика; short-term financing –короткострокове фінансування; long-term bond– довгострокова облігація); transcoding, i.e. transcription and transliteration (*smartcard*-смарт-карта; *deficit*-дефіцит), generalization (*ideal vehicle* for industrialization – ідеальне середовище для проведення індустріалізації); concretization (*the range of possibilities* - набір можливих вирішень); antonymous translation (*failed to profit*-нічого не заробив, *failure to pay* – нездатність сплатити), descriptive translation/explication (*smart money* - вигідно інвестовані кошти, на основі неофіційної інформації; *account executive*- працівник рекламного бюро, що відає рахунками клієнтів); addition (*payment risk*- ризик недоодержання платежу), etc.

As practice shows, combination of several translation techniques at a time is widespread.

***Section 09 Globalisation and European Integration in Business and Law: Needs Analysis, Market Research, Experiences and Challenges***

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**Mathematical model of energy distribution in the working area of a bath of a ferroalloy electric furnace according to the method of integral equations**

The solution of the problem of maintaining the optimal charge, electrode and electric modes of a particular technological process of ore recovery electric furnaces (REF) is ensured by the choice of the optimal geometric parameters of the furnace bath; furnace circuit and maintaining a rational electric mode of melting, which creates the necessary from the point of view of thermodynamics, the distribution of the input energy in the working area of the furnace bath.

The authors solved the problem of developing a mathematical model of the distribution of current density in the cross section of a self-baking electrode, the specific active power in the working space volume of the REF bath using the secondary source method in the form of Fredholm II type integral equations with experimental data from existing kilns [1].

The structure of the reaction zone of the working space of a three-electrode circular electric furnace (for example, RKG-75 of the Tanabe company) is symmetrical to the axis of each electrode, therefore, based on the conditions of axial symmetry, the Merideal section of the electrode and the reaction zone with current flow through the superconducting alloy bath were considered [2].

The algorithm for calculating the current density field, the specific active power is as follows:

1. The distribution of secondary sources at the interface of media with different conductivity is cleared.  $\gamma_1 \div \gamma_6$

2. According to the distribution of secondary sources, the field tension intensity is calculated at selected points of the electrode cross section and the furnace working space.

3. Calculate the current density ( $j_i$ ) and power density at selected points in the working space of the furnace bath.  $j = \gamma_1 E_i$  и  $p_i = \gamma_i E_i^2$ .

Analysis of the results shows that the values of specific active powers in the selected calculation points of the working space coincide with engineering accuracy.

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### **Analysis and calculation of technological parameters of forging of shafts on hammers in conditions of "Dnepropress Steel" Co Ltd**

Forging and thermal workshop of Dnepropres Steel Ltd. is intended for the production of forgings from carbon and alloyed grades of steels, details of forging and press mechanical engineering. The production of the shop is small-scale, according to individual types of forgings, individual.

Production of forgings is carried out by free forging on hydraulic presses and steam-air hammers.

Depending on the type of forgings and the ratio of the sizes, it is possible to analyze what equipment and equipment it is necessary for the technological process, the hammer or press, to compile the list of basic and auxiliary technological operations and to develop the technology of obtaining forging.

For example, forgings of round, square and rectangular sections are obtained using an operation called a drag. A stretch is called a form-changing operation in which the elongation of the workpiece or its part occurs due to the reduction of the cross-sectional area. During the workpiece, the workpiece is continuously bent so that it can be evenly squeezed.

As practice shows, it is known that forging can get any product. Forging is carried out both on a hammer, such as steam-air and pneumatic, and on hydraulic presses. Forgings are of different types, from this it can be concluded that the technology of obtaining forgings is completely different. [1]

The temperature interval of forging is one of the main thermo-mechanical parameters, without which it is impossible to develop a technological process of forging.

The temperature range of forging depends on the chemical composition of the steel (alloy), the metallurgical technology, the structure (cast or deformed), the rate of deformation (hammer, press), the degree of deformation (crushed or single, private and total), schemes of a stressed state (sediment, stump) and mass forgings.

The required degree of deformation or the amount of forging work has an effect on the maximum heating temperature. If the heating is carried out for intense bending, that is, for large deformations, then the maximum heating temperature

should be higher than, for example, for the last pass or cut. The heating before the first removal should be different from the heating before the latter, which forms and determines the structure and mechanical properties of forging before and after heat treatment. In the case of intense bending, forging should be completed at a higher temperature than smoothing.

The stress state scheme also affects the temperature range of forging. For dragging, where tensile stresses predominate, the heating temperature should be higher than for precipitations where compression stresses predominate. [2]

The technological process of making forging consists of several basic and auxiliary operations:

Cutting of the workpiece, this operation is usually the previous one and is used to separate the necessary part from the main workpiece. Since the original workpiece we accept the grade.

The heating of the workpiece is already deformed metal, the size of their smaller ingots, therefore, and their heating mode is easier.

The extension of this operation is the most common and is intended to increase the length of the workpiece by reducing its cross-section. If the precipitate is carried out in one compression with full overlapping of the workpiece, then successive bending of the adjacent sections of the workpiece is required for success, with the parts of the preform being squeezed on one or both sides, there are needy areas (external sections of the workpiece). Significant duration of forging is due largely to the number of bends required during dragging. On the basis of this, sometimes incorrectly consider the whole process of forging as technologically imperfect.

However, one can not forget that it is precisely the periodicity of bends, the presence of a large number of joints of squeezed areas, as well as very favorable conditions for shear deformation, provide forging a high turbulence of deformation, which promotes rapid and diverse destruction of dendrites, accompanied by an intense increase in mechanical properties of the metal.

Control of WTC is the last operation in the technological process of obtaining a forging type flange. The essence of this operation is to check and control the product obtained. For forging, put a stamp, checked by ultrasound for the presence of internal cracks and checked on the chemical composition. [2]

The tool for free forging is divided into three groups: 1. The main technological tool: buoys, slabs, mandrels, firmware, rings, rolls, reels, clips, axes, etc. 2. Supporting tool: ticks, racks, cartridges, etc. 3. Measuring instrument: crowns - compasses, squares, intrometers, rulers, templates, etc. [2]

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### **Analysis of technological parameters of forging on presses**

Forging is a method, or process of metal treatment by applying deformation loads using a hammer or a press.

The technological process consists of a number of operations, since only one unit of equipment is used for forging: metal heating, forging on a hammer or press, preliminary heat treatment, quality control of forgings. The forging process may be multi-operational, then the semi-finished forging usually enters the furnace on the heating, after which the forging is completed on the same machine-equipment [1].

Forging operations can be divided into preliminary, main, auxiliary and processing. The assignment of separate operations to one or another group in some cases is conditional. Even such an operation, as a sediment, can be applied not only as a basic, but also as a preliminary or intermediate. Basic forging operations are the following:

Scheme of blacksmith operations are the same for forging relatively small items (weighing up to several hundred kilograms), produced on presses.

Precipitate is a technological process in which the transverse section of the workpiece is increased, perpendicular to the active force, and the size is reduced in height (along this force) [2]

Stretch is a process of plastic deformation, in which the elongation of the workpiece or part of it takes place by reducing the cross-sectional area.

Stretching contributes to the elimination of internal defects (cavities) and improves the mechanical properties of the metal in the axial direction of the workpiece. The operation of the drawer is used to deform the workpiece of the symmetric section. The main difference between these operations is that the deformation cell covers only part of the workpiece, unlike, for example, the operation of precipitation. Due to this, the process of drawing is characterized by specific characteristics, namely, absolute and relative feed.

The given technological operations of free forging are intermediate before the further redistribution, which will allow to receive in the future ready-made products with high mechanical properties.

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### **Model of FinTech development**

Financial technology (FinTech), which is viewed as one of the most progressive recent developments gained ground in 2008 when the economic industry was in crisis. Since then a lot of companies (McKinsey, CB Insights, Ernst & Young, Capgemini, etc.) have been analyzing FinTech market base on statistic and expert views. However, there is no established system for estimating FinTech development.

The purpose of this research is to offer a mathematical model for a forecast of the financial technology market changes.

The application of regression analysis for modeling process and expert opinions allowed to identify significant indicators that influence on the investments in the FinTech market: venture investments in FinTech (x1), venture investments in InsurTech (x2), venture investments in online lending (x3), venture revenue of cryptocurrency mining (x4). It should be noted that these indicators are **sensitive** to changes in the financial market. This can be illustrated by the 2017 Brexit vote in Europe which led to the reduction in the rate of venture investment or by the recognition of cryptographic currency as an official means of payment in Japan resulting in a considerable growth of venture capital. Regarding this, venture investment was accepted as significant index for mathematic modeling.

In order to forecast changes in the FinTech market mathematical model was built. Consequently, the above listed factors were identified as important ones by an expert assessment method. Total investment in FinTech was chosen as a variable factor (Y). Correlation analysis showed strong connection between the selected factors and the variation.

The next step of the analysis was checking model on multicollinearity. Calculations showed multicollinearity between venture investment (x1) and mining of cryptocurrency (x4). Whereas x1 has more influence on Y –  $R^2=0.77$ , and relation between x4 and Y is only  $R^2=0.67$  that is why x1 remained in model while x4 was excluded. Another attempt to check multicollinearity demonstrated strong influence of independent variables on each other. To eliminate strong connection between variable factors natural normalization methods were used. Autocorrelation and heteroscedasticity were not presented in the model. It proves that regression equation reflects interconnection without mistakes.

The FinTech model, which was obtained as a result of calculations, showed that venture capital might diminish by \$0.03bn on 1 % of investment changes, the funds for new projects in other sectors might increase by \$ 0.059bn and venture investments in online lending might grow by \$0.89bn. Consequently, the model can influence on attracting money for new FinTech projects and on the total amount of



investment in the industry. This model can be used by financial analysts to estimate possible income from different projects and to forecast future dynamics of FinTech market.

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### **Targeted Advertising**

Scientists believe that advertising appeared in ancient times simultaneously with trading. It used to be scripted on papyrus and stones. With the progress of humanity, new technologies have emerged, where in social networks are gaining their popularity very quickly not only among their users. Marketers consider social networks be an effective tool for advertising.

Targeting is one of the most popular ways to advertise a product or service. It is known as an advertising mechanism that helps to select a specific part from the general audience who meets the specified criteria (target audience) and to show advertising to them. Targeted advertising is based on the potential user's profile made using the content of his/her web page(s) with the focus on the user data.

The mechanism of targeting as advertising is complex. Generally, all users' actions in the Internet are tracked. So, firstly, a marketer collects a potential user data, not being limited to "open data" only (for example, gender, age and location). Interests are tracked through subscriptions, likes, news feeds. Cookies, which provide a way for the website to recognize a user and keep track of his/her preferences, are also collected as a small text file created by a website that is stored in the user's computer. Then, users are divided into groups which will be sent a specific advertisement chosen according to the data gathered about user(s).

It is necessary to choose advertising that is suitable for each segment of the audience. According to Brand Engagement in the Participation Age, 52% of consumers call relevance the first reason they responded to an advertising message. There are many prejudices and stereotypes that must be avoided to achieve the goal - to attract potential consumers. Below are some well-established ideas about the behavior of different groups of audiences and their disproof.

Games for kids only. In fact, more than 45% of video game searches come from people over 35 years old.

Sport is a purely male occupation. More than 60% of sporting goods buyers are women.

Housewives can only be women. 40% of all household goods are bought by men.

From the perspective of a marketer, there are some benefits of targeting as a type of advertising.

1. Exact blow to the target audience. Due to all collected information about a person, he or she will be provided the advertisement in which he or she is may be interested.

2. Large coverage. Millions of people use social networks. If to analyze the statistics, we can see that Instagram is used by five hundred million people daily. Facebook is daily used by one and a half billion people.

3. Opportunity to promote the product on the Internet without a website. This is useful, for example, for small businesses. All they need is to register their brand page(s) in social networks, place targeted advertising and wait for new customers.

4. Low cost (in comparison with other types of advertising). Compared with an outdoor advertising, targeting costs five times cheaper.

5. The ability to analyze the effectiveness. Social networks make it possible to thoroughly analyze the effectiveness of advertising.

However, there are some problems and challenges.

1. Moderation of content. Social networks sometimes impose strict requirements on the content of the published material.

2. There is an advertising need for permanent updates. Users may be oversaturated with content, so there is a necessity to constantly keep attention of a potential viewer by designing eye-capturing and original advertisements

To conclude, targeted advertising is one of the best modern ways to advertise products and services. If approach to the choice of a digital platform correctly as well as to realization of an idea, then targeted advertising will bring positive results rather quickly. The key here is to bear in mind specificity of targeted advertising and specificity of target groups.

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### **Recognizable advertising brand characters**

Nowadays - in times of great consumption, brands face a lot of difficulties. They are trying to survive among competitors and constantly looking for different ways to become recognizable to their potential customers. There are many characteristics that force us as consumers to choose a particular brand. It can be the quality of the product, the prestige of the brand, the time it has been on the market, packaging, labelling and recognition. As to the latter, many brands are recognizable by their memorable images also known as advertising characters. Such character should be associated with the brand, and the image should be unique and do not repeat the images of any competitors' products.

Images can be represented by animated characters, fictional characters, 3D characters, symbolic characters, cartoon characters, celebrity characters, animal characters, children's characters and so on. If ask anyone to give an example of characters in advertising, they may probably name at least three, among which may be "Nesquik" represented by the cartoon bunny or "M&M's" red and yellow candies, "Duracell" associated with the pink bunny-energizer or "Milka" with its purple cow. All of them are strongly associated with the brands.

Advertising characters must be associated with the product due to their appearance, manners and/or speech. That's why "Nesquik" bunny is dressed like a teenager: he wears a bright yellow shirt associated with children's energy and mobility. While purple cow is associated with softness, fidelity and indulgence. This chocolate is also the perfect example of exploiting the image. Nowadays, the "Milka" cow became a symbol of milk chocolate. The purple cow has become recognizable all over the world that brought Milka taking a leading role in the chocolate market.

Unfortunately, advertising not always use positive images which cause pleasant feelings. Negative characters known as anti-heroes are also widely used. Such images cause rejection of some if not the majority of customers. As a rule, they are presented in the form of monsters that symbolize diseases (cough, heartburn, etc.) or various germs and bacteria in the dirty kitchen or in the bathroom.

Thanks to the chosen character, the consumer develops an attitude towards the brand or product. Thus, if the consumer trusts the image, then this trust will be transferred to the trademark. A well-developed advertising image can become the face of the brand. The sympathetic hero will project this sympathy on the product and will help it stand out among the competitors. Such images evoke people's emotions, and emotions have an important role in choosing.

### **Some tips on how to make exciting headlines**

Nowadays Instagram (IG) has become infiltrated in people's lives, and its popularity is increasing every day among users of various ages. This social network is not just a way of wasting time, it is also a big financial internet platform which can be used for doing business by the potential suppliers and/or sellers. One of the ways of earning money in Instagram is creating a blog. Making suggestions, sharing offers and discussing real-life problems are all about blogging. However, this type of employment demands lots of hard work, wherein one of the main challenges is finding out an appropriate title for a publication which will attract potential consumers/buyers. A good headline is a key to success and popularity of the post on IG. The most useful and cognitive message will probably be skipped, if its headline does not match its content and/or catch an eye. The majority of users identify whether an article is of any interest to them only by glancing at its title.

Some tips on how to attract attention and engage the audience in order to increase the number of followers are given below.

1. Use numbers. Many researchers point out that people tend to believe any information which is supported by numbers. According to them, titles with numbers attract thirty percent more viewers than those without any titles.

2. Make an intrigue. Links with 'I could not believe that this will work out like that' are activated more often. This trick is especially useful for selling accounts. Moreover, articles with this type of headlines exactly incline to make a good profit on the products described.

3. Use personal experience. It is a popular rule of marketers how to make someone do something – just tell them that someone else has done this before. Attaching an exciting story will only underpin results.

4. Negativism. Although many scientists claim that negative statements push the potential (or real) audience away, IG statistics highlights that articles of such type as '5 fails in blogging' are more likely to be read.

5. Make a question. This tip is maybe the most popular among marketers regardless of the kind of activity. Making a question is a simulation of real-life talk/interaction, so subconsciously people would like to find an answer by reading the article.

To conclude, every kind of earning money is demanding, especially those done in the internet where the competition is growing each second. There, hard working on creating a post is the key to success as every detail is important, including the headline considered to be "a face" of the content presented in the text.

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### **Regulated electric drive for pumping installations**

The high energy consumption of pumping installations attaches great importance to the problem of energy saving at these facilities. Unfortunately, most pumping stations do not work economically. As a result of the application of non-economical methods of pumps operation of in water supply and wastewater systems, 5–15% of the consumed electric power is lost, and in some of them the loss reaches 20–25% [1].

The wide distribution of economic methods of regulation in these systems, based on changes in the frequency of rotation of pump impellers, will reduce electricity consumption by 14-15 billion kWh, that is, save about 4% of the electricity generated by the country's energy systems.

The use of modern methods of pump control also allows increasing the unit capacity of pumping assemblies and thereby reducing their total number at pumping stations. Under certain conditions, the construction volumes of pumping stations can be significantly reduced. In addition, the use of regulation methods at the expense of pressure stabilization reduces the level of leakage and consequently reduces water consumption in water supply systems by 3-5%.

Growing technological requirements to the quality of production processes determine a steady trend towards the introduction of controlled electric drives into industrial production [2].

In this regard, of course, of particular importance is the task of developing a control system of a frequency-controlled asynchronous electric drive. An equally important task of designing a frequency-controlled asynchronous electric drive of centrifugal pumps is the task of synthesizing the parameters of control systems and optimal control of the electric drive of the pump.

Considering the fact that during the direct start of an asynchronous motor with a squirrel-cage rotor, large electromagnetic moments and currents can occur, the need to calculate the optimal control system is an important component in the future operation of an industrial facility and its economic costs [3].

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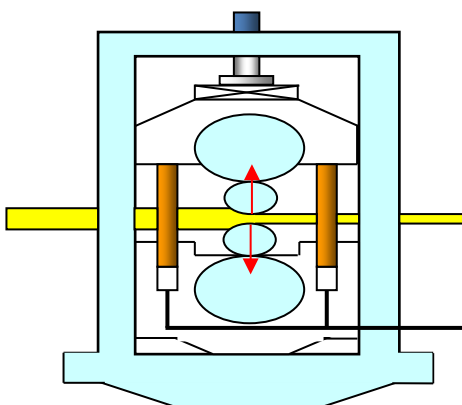
## Systems for automatic rolling thickness control in hot rolling mills

At present, in the metallurgical industry, the bulk of sheet products from ordinary and high quality steel in the thickness of 1.2-12 mm is rolled on continuous broadband hot rolling mills (CBHRM). The productivity of the modern broadband hot rolling mill reaches about 7 million tons a year.

The rolling precision (boundary deviations in thickness, width and length) of hot rolled strips and sheets is regulated mainly by GOST 19903-74. Limit deviation in thickness depending on the width and thickness of the band, the accuracy groups fluctuate in the range from  $\pm 0,05$  to  $+0,50$ ;  $-0,80$  mm [1]. Limit deviation in the width of the strip when supplying broadband steel in rolls of continuous mills should not exceed  $+5$  mm at widths up to 1000 mm and  $+10$  mm at widths exceeding 1000 mm.

These indicators can be provided only with the application of integrated automation throughout the technological process. Therefore, all CBHRM, both newly built and upgraded, are equipped with automated process control systems.

A characteristic feature of modern continuous broadband mills is the consistent location of stands and rolling in one direction in each stands of the mills. Therefore, from the point of view of the control theory CBHRM should be considered as a multidimensional system with random inputs and outputs.



In this report, an attempt will be made to solve one of the tasks of automation CBHRM - stabilization of bands. During the report, the main technological factors affecting the accuracy of rolling through the thickness, the advantages and disadvantages of different types of automatic thickness control systems (ATCS) are analyzed, the basic requirements are formed, and the structure of ATCS for the finishing group of stands is proposed.

Fig.1: Rolling mill

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## **Social Media Marketing, its potential consumers and possible reactions**

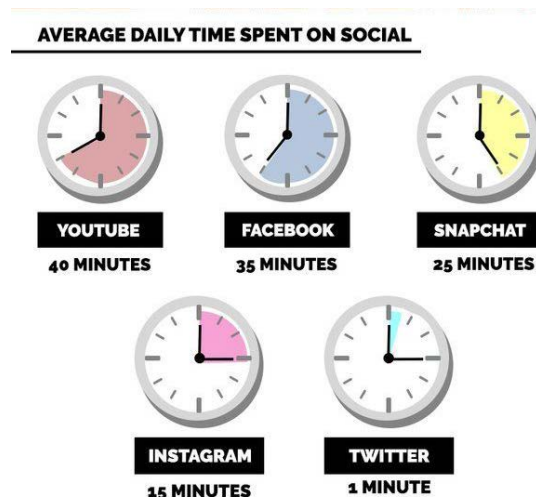
Nowadays, every modern person uses different social networks, the number and variety of which growing from day to day. Since the attention of consumers is gradually being transferred from the real world to the world of the Internet, marketers have penetrated there, too. One type of marketing in the Internet is Social Media Marketing (SMM). SMM is a set of activities for using social media as channels for promoting companies or a brand and solving various business problems. In other words, SMM is communication with a potential consumer through social networks.

The focus in SMM is on creating a message (text or visual), which will be distributed through social networks on their own, without the participation of any organizer(s).

The major tools of SMM are blogging in social networks, informational messages in various communities, chatting in comments, communicating in forums. SMM includes hidden marketing, direct advertising and viral marketing, monitoring positive and negative background, optimization of media space etc.

The series of research and SMM specialists point out that the most popular networks used by potential consumers are Facebook, Instagram, Google+, Twitter and YouTube.

To give marketers a better understanding of the social media landscape, Mediakix calculated the time spent on the most popular platforms. See the figure below.



According to the Mediakix research, the average user spends almost 2 hours in networks daily that is rather surprising for Ukrainians who spend much more time in virtual social communities, young people and teenagers. Sometimes it seems they live there. The consumption of digital media continues to grow in Ukraine at an unprecedented rate, and the total time spent in networks exceeds the time allotted for food, communication and self-care. Platforms also take time from users in different ways.

For marketers it is important to know what exactly consumers do in these networks. The results of the research show that the social network users often look for the likes of their pictures and/or information shared as well as put likes on the important (sometimes not very important) news; communicate with their friends, colleagues, relatives; look for, order and buy the necessary goods. Ultimately, each of the potential consumers have faced advertising, while enjoying time spent a particular social network.

What feelings an advertisement can cause within the Internet user are of great importance to a marketer and/or advertiser. The ranked list of these feelings is given below.

1. Anger due to annoyance with advertisings, which he/she could see not for the first time and/or the ads information of which is of no interest to him/her.
2. Interest, when the information which appears or pops up is interesting and useful for a consumer. For example, an event in the city, an offer of various services that is beneficial for the consumer etc.
3. Calmly treated due the absence of any reaction by the consumer who has already seen it and simply clicks on the cross or scrolls further.
4. Fear. This feeling arises because of the emergence of advertising for the goods or services, which s/he wanted to buy, but did not search for it in the Internet before.

When advertising in social networks, marketers should bear in mind potential consumers of the goods or services being advertised and their feelings. To avoid fear, the capabilities of the Internet and facilities of browsers, cookies saved should be described. Understanding of their function may change the reaction from fear and annoyance to interest and curiosity, if the Internet users treat SMM ads as prompters, time saving for search of the products they need or wish.

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**The project of electric drive reconstruction of the bridge crane trolley movement mechanism**

Automated electric drive today is the most important, rapidly developing field of technology that has found one of the leading places in the electrification of industrial enterprises. The invention of new units in engineering opens up opportunities for creating new and improving traditional types of electric drives. As a reconstruction, it was proposed to establish a contactless control system based on a pulse-width microcontroller for a direct current IGBT transistor [1].



The mechanism of movement of the bridge crane trolley includes an asynchronous motor with a phase-rotor of the type MTF 111-6 with a power of 3.5 kW. The cam controller is designed for starting, regulating the rotation speed and reversing the motors with a phase rotor by changing the main circuit, as well as incorporating resistances into the rotor circuit.

The structure of a pulse contactless motor control system for a bridge crane movement mechanism based on a PWM microcontroller type TL494 was proposed for controlling an IGBT transistor with a MOSFET structure type 2N6766

A comparative analysis of the mechanical characteristics of the electric drive on the rheostat and impulse control was fulfilled. In the proposed pulse system mode, the engine operates on a family of characteristics with constantly changing rigidity (due to a constant change of additional resistance). The mechanical characteristics of a pulse electric drive are similar to the mechanical characteristics at changing the resistance in the rotor of the induction motor. Compared with the rheostatic control method with the pulsed method, the possibility of flexible changes in the stiffness of the mechanical characteristic has appeared due to a change in the pulse filling factor.

The simulation of transient processes of a pulsed electric drive was also performed. The model of the electric drive is built on the principle of subordinate regulation of coordinates. The main control loops are the speed loop and the motor circuit. The calculation results satisfy the operating conditions of this drive. Designed structure of the drive in full reflects the properties of the control system [2].

The efficiency of a pulsed electric drive, calculated in terms of the pulse filling factor, has not changed compared with the passport data.

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### **Automation of Lathes**

Mechanical engineering and metallurgic engineering use metal-cutting equipment to work with semi-finished products for obtaining appropriate detail.

Metal-cutting equipment its mechanical tool for size working with semi-finished products usually by using cut chips. Lathe is used for processing both outer and inner surfaces of rotational bodies, screwing and some other procedures.

Modern lathes have CNC (Computer Numerical Control) to improve quality of surface of details, to decrease defective products and work time, to increase amount of equal products in serial production. [1]

“Smart machine tools” are used not only in heavy industry, but also in a lot of other fields of human activity. Eg. in advertising - for making club emblems, tablets, drawings on glass and so on. In modeling - for creating prototype devices, architecture models and punched forms. In electronic engineering - for cases, circuit boards and cooler production.

By using detail drawing, operator design software and install it to microcontroller. CNC generates control signals. Execution units get those signals and make some operations. In case of malfunctions, the CNC informs the operator by error messages. If CNC have some problems its show message with errors. The following sensors are used:

- sensor of clamp detail;
- sensors of moving transverse drive and longitudinal drive;
- sensor for cooler liquid supply;
- sensor of oil flow;
- sensor of speed spindle.

Automation of lathes gives some advantages:

- high performance and precision moving of cutting tools;
- flexibility of loading semi-finished products and unloading details;
- automatic or remote control of replacement tools;
- it can be part of the main automation control system;
- regular temperature conditions in lathe mechanisms for decreasing thermal deformations.

But also, exist some disadvantages:

- relative high cost in implantation CNC.

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### **Metal forming. Forging**

The history of forging goes back thousands of years. Since a man made his friend a fire and, then, metal, this union has been strengthening and opening up new opportunities for the man, making him stronger and more powerful. [1]

Forging is a common way of artistic metal processing. In modern life forging is used to process many metals, but most often this term is associated with blacksmithing, with iron processing. This is due to the fact that iron is less cold-treated than other metals and can be heated to temperatures above 1000 ° C to obtain the desired shape or any image on the surface of the product. [2]

In the process of forging, the metal undergoes either hammer blows or pressure and changes its shape — it becomes deformed. There are two types of deformation: elastic and plastic. Elastic deformation disappears immediately after the termination of the force, plastic does not disappear after the cessation of external forces. Plastic deformation takes place when heated metal is forged. Forging is based on the ability of a metal to change its shape without destruction, that is, on plasticity.

In the modern world, forging is widely used in mechanical engineering. With the help of forging shafts for motors and internal combustion engines as well as other critical parts are manufactured. In order to make these parts more mechanically durable, they are heat treated (quenched).

The forging process is divided into several basic operations. Sediment is a forging process in which the work piece height is reduced and the cross-sectional area increases. The metal structure is also worked out and the metal strength increases, which allows the part to withstand heavy loads. Broaching pass is used to increase the length of the forging. Piercing is used to create a hole in the work piece. Rolling on the mandrel is used to increase the outer diameter and height of the ring, but to reduce the wall thickness of the work piece. [2]

Forging can be performed on various equipment and with the help of various tools. It all started with a hammer and anvil, and now forging is performed on hammers and presses. Now, the largest press in the world in is installed China with a force of 75,000 tons.

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### **Production technology of sintered alloy steel bushings**

In this thesis project deals with the technology of production of structural parts - sintered alloy steel hub. The detail is constructional, medium loaded. Copper and nickel in the amount of up to 2% and 4%, respectively, were selected as the main alloying elements.

Copper, as an alloying element, has a strengthening effect and the ability to regulate shrinkage.

Nickel is a gamma-stabilizer, with an increase in the composition of nickel from 1 to 10 percent, the strength of steel increases.

Joint alloying of nickel and copper gives a greater strengthening effect than each element separately.

To give details of the following specifications:

- Durability 750 MPa;
- Relative lengthening of 4%;
- Hardness HB 1800 MPa;
- Porosity 10 - 15%;

The following flow chart is selected, which includes:

- Recovery annealing;
- Dosing;
- Mixing (to the coefficient of heterogeneity is less than 1%);
- Pressing (bilateral,  $P = 700$  MPa);
- Sintering ( $T = 1220$  ° C,  $t$  (time) = 1.5-2.0 hours);
- Calibration.

The technological scheme includes also grinding rejected compacts for further use in a mixture of powders.

The developed technology allows to make a product of sintered material with high strength and technological parameters.

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## Improvement of methods for determining the rheological properties of electrode pitch for the production of carbonaceous materials

The production of carbonaceous products is conditioned by the process of the interaction of carbon fillers (graphitized coke, graphite, thermoanthrosite, needlelike oil coke, etc.) with molten pitch - the binding component of electrode masses. It is important to note that the effectiveness of the interaction of the liquid phase of the pitch in the process of obtaining carbon products depends to a large extent on the marginal angle of wetting, which is formed on the boundary of liquid and solid phases [1].

Thus, using the method of a "lying" drop, an average temperature pitch was estimated at the margin of wetting according to the method proposed (Fig. 1): the mark "B" pitch in the amount of 15 grams is pressed by a stamping press to a briquette, and then is installed on a reference graphite substrate, which is in a quartz glass with a tiled lid. The quartz glass is then filled with argon through the aperture with the tap and is installed in a drying cabinet with doors having a viewing window. The heating mode in the oven is set automatically from 0 to 250 ° C at a rate of 3 ° C / min. and, as necessary (depending on the used pitch), every 10 ° C, the test sample is fixed to the digital camera through the inspection window. After the experiment, the edge angle of humidity is determined depending on the temperature and is displayed as a graphical interpretation (Fig. 2).

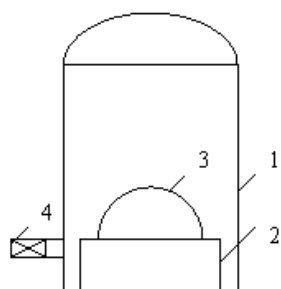


Fig. 1. The scheme of getting briquettes from a pitch: 1. Quartz glass with a lid; 2. Graphite lining; 3. Pike briquettes; 4. A crane for argon

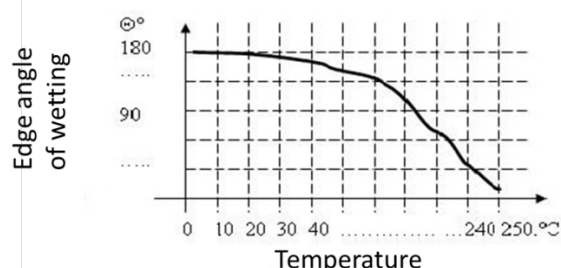


Fig. 2. Graphical interpretation of the wetting process

Thus it is established that the determined index makes possible more accurate the processes evaluation that are taking place in the production of graphite products [1].

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## **Ukrainian Legal System in the Context of Globalization and European Integration**

The rapid development of information technology and the formation of large international monopolies has led to the process of global economic, political and cultural integration and unification called “globalization”.

In addition to the world economy, finance, the media, the spheres of state and public life, the globalization also covers the legal sphere. Moreover, the main tasks of law include the management of globalization, the harmonization of its processes and the neutralization of negative consequences. Thus, the law is an instrument of globalization and at the same time a means of managing its processes. [5]

Following the signing in 2014 of the “Ukraine-European Union Association Agreement” and the consolidation of the amendments to the Constitution of Ukraine “On the strategic course of the state to acquire Ukraine’s full membership in the European Union and the North Atlantic Treaty Organization” on February 21, 2019, the European integration vector of the country’s development was finally proclaimed. Taking into account the chosen path, the study of the coexistence of the states of the world in the context of global political, economic, legal and social processes, as well as the role and place of Ukraine in these processes has both theoretical and practical value.

Among global and regional trends, one should first of all highlight the tendency towards universalization and unification of law. Universalization and unification of law can be seen in all historical stages of state-legal development, but in the conditions of globalization, it is most evident and has no evolutionary but explosive and revolutionary character. [4]

The manifestation of the influence of globalization processes on the legal system of Ukraine is the ratification of international treaties by Ukraine. A striking example of such a treaty can be the “Convention for the Protection of Human Rights and Fundamental Freedoms” ratified by the Verkhovna Rada on July 17, 1997. The ratification of the European Convention enables all persons within its jurisdiction to apply to the European Court of Human Rights if they consider that their rights have been violated. The Article 55<sup>th</sup> of the Constitution of Ukraine secures this right to the citizens of Ukraine.

A bright example of the impact of globalization on the Ukrainian legal system is the Law of Ukraine “On the implementation of the decisions and application of the practice of the European Court of Human Rights”. This normative legal act is the demonstration of the rule of law, the confirmation of the fact that in Ukraine a person, their life and health, honor and dignity, inviolability and security are the highest social value, which is confirmed by the Article 3<sup>th</sup> of the Constitution of Ukraine.

Thus, we have an obvious positive impact of globalization on the country's legal sphere, first of all, on the protection of human rights.

Within the globalization processes, supranational institutions for the regulation of public life (the European Union, the Council of Europe) began to form in the world. The country's accession to one of these organizations undoubtedly partly means recognition of the priority of international law over the national one. Because of such recognition the universal international law that is also applied by member states is being formed. We should point out that the transformations caused by globalization touch upon such an important aspect as the problem of the identification of a nation. It is worth agreeing with those scientists who emphasize that proclaimed as universal determinants of "universal values" are not always relevant to national legal systems. Models that are mechanically transposed are often unviable, because they do not take into account the peculiarities of the mentality and legal culture that have been formed in a particular society in the process of historical and cultural development. [1]

According to O. Martyshin: "Expansion of an alien culture is always counter-productive. At the practical and emotional level it manifests itself in the resistance of national culture, at the theoretical level – in the awareness of the need for the correspondence of state and legal institutions to real, namely, national conditions." [3]

Unfortunately, not all states in the modern world adhere to international obligations. Such states continue to operate in relations with other states from the standpoint of force, including the military, brutally abolishing almost all of the above principles of international law. The most striking example in this regard is the present day Russia in its relations with Ukraine and other post-Soviet states. [2]

To sum up, an important direction of Ukraine's legal integration into the EU is the adaptation of Ukraine's legal system to EU standards, providing human rights. Such an adaptation involves convergence with the modern European system of law; it involves reforming the legal system of our state, gradually bringing it in line with European standards. However, no matter what spheres of state life and law are influenced by globalization it is necessary to harmoniously preserve the identity of the national law.

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### **Simulation of the monitoring device for the electric drive of skip hoist mechanism**

This work presents the mathematical model of electric drive for skip hoist mechanism of the blast furnace with the loading mechanism diagram with observer at compelled adjustment of the parameters with the ability to ensure smooth movement. Synthesized observer for estimating engine speed and static load, which, using measured anchor current and engine speed, estimates acceleration of the actuator. The system is influenced by the excitation field in the form of diagram of electric drive load mechanism.

In order to ensure a smooth motion of the actuator at low values of the mass ratio of the electric motor, information about its speed and acceleration is entered to the system. This system uses observing device instead of direct measuring of the actuator speed which, using the measured current of the anchor and engine speed, or the speed difference, estimates the acceleration of the actuator [1].

The load moment is identified and described by the system of differential equations that are included in the general system. After that full order observer is completed which it restores the vector of the coordinate system and the pollution vector. If the pollution is random then its mathematical description is unknown. The exact reproduction of coordinates in this case is carried out in stable position. When changing the load in transient modes, the observer will restore the coordinates of the system and the moment of loading with error.

When making speed difference correction, there is static error due to the effect of load moment. In the static the signal of the load moment is fed to the speed contour input through the corresponding link for compensation of the static error.

This model of the system of subordinated coordinate control with the speed and load monitor is used for the electric drive of the skip hoist to ensure smoothness of motion.

The basic parameters that influence the dynamics of the observer are determined. The obtained mathematical model with the speed and load current observer was used for the electric drive of the skip hoist system to ensure smoothness of motion.

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### **Analysis of existing drawing technologies and the study of the effect of wire drawing temperature on mechanical properties**

One of the most common methods of metal forming is drawing. With the help of drawing, various metals and alloys are treated, including alloyed steels. Most often, the process is carried out in a cold rolling mill. The essence of the drawing process is that the workpiece is drawing through the channel of the tool, the cross section of which is smaller than the cross section of the workpiece [1-4].

Several existing drawing schemes have been reviewed. When considering the *backward pull drawing*, it was found that due to the backward pull force, elastic deformation appear at the entrance to the die. The backward pull tension can reach  $\sigma_v$ , but it is not recommended to increase it by more than  $0.35\sigma_v$ . The pressure of the tool on the metal in the presence of backward pull is significantly reduced; the friction coefficient  $f$  also decreases. With a dry soap lubrication, it may decrease from  $f = 0.06-0.08$  to  $f = 0.02$ , which significantly reduces the work of the deformation, but there is no gain in the drawing force, since a part of the backward pull force increases the drawing force [1-3]. At *vibrating drawing*, the vibrations of drawing, metal, drawing force and die with metal are used. At a small drawing speed, vibration with a frequency of about 300 Hz can reduce the drawing force  $P_b$  up to 60%, but with increasing speed the effect decreases, therefore this method is rarely used for making wire. As for *drawing in the dies* with moving contact surfaces, the most common are disk dies. They are used in the manufacture of construction fittings of small sections, non-circular profiles etc. Due to the rotation of the non-driving discs during the drawing, the sliding friction it is partially replaced by rolling friction, which significantly reduces the drawing force. When *drawing in ball or roller dies*, the component of the rotational force will deflect the resultant force  $P$  and reduce the dragging force  $P_b$ . The effect can be achieved only with a low speed of drawing. At  $\text{tg}\beta = 1.5-2$ , the drag force may decrease by 12-15%, but for this it is necessary to ensure the rotation speed up to 100 thousand rpm. *Step drawing*. The process is implemented with the help of several dies mounted in a single unit. It is used for the production of shaped profiles of complex sections, when it is difficult or impossible to manufacture a channel in one die [1-3].

During a scientific study of the effect of wire drawing temperature on mechanical properties, a series of experiments were carried out and the results of the study were obtained.

For the experiment, three samples from steel grade: SAE1008, St1kp and St70 were selected and a different range of heating temperatures. During the experiment,

18 samples were deformed. At the end certain results were obtained, namely, for steel SAE1008 the relative compression per pass does not exceed 10%. Minimum relative reduction per pass for this steel is 8.19% for the first three samples of steel SAE1008, which were unheated. The maximum reduction is observed on samples heated to a temperature of 800° C. Under conditions of increasing the initial temperature of the workpiece, the yield stress decreases, which leads to a decrease in the drawing force and, consequently, to a decrease in the elastic deformation of the die. In the end, with the initial preheating of the workpiece at the exit, we get a wire of smaller section (on samples that were preheated, the diameter is 5.23 mm, compared to non-heated samples - 5.27 mm), the reduction capability of the deforming tool increases, although not significant. The greater the heating of the workpiece, the more the negative impact of elastic deformations of the die decreases, the less the drawing force. Similar results are observed for steels 1KII and  $\sigma 70$ .

Analyzing the data obtained, the following conclusions can be made:

- 1) Compared to wire drawing without preheating, drawing with heating is characterized by lower values of breaking strength and tensile strength on the finished profile. For example, when comparing samples of steel SAE1008, without heating and steel SAE1008, heating to 800 ° C, a decrease in the sample breaking force by 3.65 kN (by 37%) and tensile strength by 154 N / mm<sup>2</sup> (by 34%) is observed.
- 2) In the framework of a series of experiments where deformations of specimens made of steel SAE1008 were duplicated without heating under the same conditions, there were no significant deviations and vibrations of the obtained mechanical properties.
- 3) An increase in the temperature of the rod from room temperature to 100 ° C has almost no effect on the change in mechanical properties at the outlet. This fact is due in no way to a significant change in the yield strength when the metal is heated to 100 ° C and the absence of recrystallization processes.
- 4) The effect of preheating the metal will be observed at a metal heating temperature of 0.5–0.7 Tr and above (Tr - the melting point of the metal), which characterizes the temperature ranges of incomplete hot and, accordingly, hot deformation. Under these conditions, recrystallization and recovery processes begin to occur in the metal.

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### **Development of the method of ring samples for evaluation of mechanical properties of the metal in the transverse direction**

The requirements of the standards governing the technical conditions for supplying pressure-operated tubes, for example [1-5], involve testing samples to determine the ability of a metal to withstand loads both in longitudinal and cross-sectional directions. These tests can be divided into two groups:

1. Tests, which result in quantitative values of absolute or relative values that characterize the tested sample. These tests include stretching tests [6], hardness measurements [7], impact strength tests [8], durability [9] and fatigue [10]. All procedures for conducting tests in group 1 are standard and are used not only to evaluate the properties of pipes.

2. The test, which results in the decision on the permissibility of the pipe to operation. These tests usually involve making a quality decision based on a visual analysis of the test sample. These include the following specific tests used for pipes: bending [11], joining [2], lubrication [12], turning [3], testing a ring sample for expansion [4], testing a ring sample for stretching [5], as well as a number of others that are used for harmonization. This group also includes tests for the tightness of pipes by hydraulic or pneumatic pressure.

The most common criterion for assessing the ability of a metal to withstand a load is the data obtained as a result of tests of longitudinal specimens for stretching [6]: strength (boundary), yield boundary (boundary), relative elongation / narrowing. To obtain such data during trials along the creature is possible for all pipe sizes. However, the use of stretching tests to evaluate the properties of the metal in the transverse direction is difficult. Thus, in [13 (Appendix A2)], it is not recommended to conduct such tests for pipes with an outer diameter of  $\leq 219$  mm. If necessary, after the test, thermal treatment is required - the normalization of the samples before their straightening (expansion). [6 (add. E2.2.)] Does not allow the samples to be straightened before the test. At the same time, the maximum stresses acting in the pipe under the internal pressure are tangential [14]. Thus, the quantitative determination of the mechanical properties of pipes in the tangential direction is still not developed.

#### Features of mechanical properties of pipes

Seamless pipes are made according to technologies that provide coefficients of extraction during hot work 10 ... 40, and with cold deformation - 1,5 ... 8 [15]. In this case, the deformation in the rolling of pipes differs considerable unevenness. Thus, with longitudinal rolling, the possibility of reducing the diameter of the pipe is

associated with the inevitable ovalization of the cross section in the lateral parts of the caliber [16].

If we consider the cross-sectional area of longitudinal deformation in rolling tubes, the compressive stress prevailing at the top caliber as it approaches its edge gradually reduced and transformed in stretching [17]. If we consider the deformation zone along the axis of rolling, there is unevenness caused by compression (compression) in diameter and pipe wall thickness and the difference in terms of friction on surfaces "metal-roll" and "metal mandrel" [18]. Large degrees of deformation coupled with its unevenness cause the anisotropy of properties in seamless tubes.

In welded pipes, the anisotropy of the properties has less causes of deformation. Most often, it is caused by the difference in stresses on the inner and outer surfaces, which occurs when the pipe is formed, and also, which is the main, zone of thermal influence of the weld seam [19].

In addition to the properties of the metal, the topography of the surface of the pipes is also affected by tangential stresses. In this case, the external surface is usually subjected to mechanical or electrochemical treatment to improve the appearance of the tubes. At the same time, most defects arise precisely on the inner surface. These defects are traces of metal sticking to instrument risk, folds and cracks. These defects mainly oriented along the generatrix tube and having width to depth ratio  $\leq 1$  [20]. Such a form and orientation of defects promotes their development under the influence of internal pressure. In addition, these defects during the operation of the tube tend to become dangerous corrosion concentrators, especially in combination with material fatigue [21].

However, today the concept of reducing the weight of machines requires reliable criteria for assessing the anisotropy of the properties of the metal and the effect of surface defects on the ability of the pipes to withstand internal pressure [22, 23]. In addition, based on these criteria of evaluation of properties, data can be obtained for changing the conditions of receiving pipes and adjusting technological regimes in order to reduce anisotropy and improve surface quality [24]. Such criteria can be developed on the basis of investigations of the properties of pipes in the transverse direction.

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### **Automated Plasma Cutting System**

Metal cutting is a technological process, the purpose of which is the division of sheet or high-quality metal into parts and blanks, or the manufacture of parts of specified shapes and sizes. At the moment, there are several types of metal cutting: thermal and mechanical. The mechanical cutting of metal includes: cutting a metal with a guillotine, cutting with a circular saw, a band saw and hydro-abrasive cutting. Thermal types of cutting metal include: laser, plasma and oxygen cutting [1].

The use of oxygen cutting is limited only by low carbon steel, this type of cutting is not effective for stainless steel or aluminum. Oxygen cutting of high carbon steels also results certain technological difficulties, such as preliminary and subsequent heating of the workpiece. Performing such operations is time consuming. Plasma cutting provides fast cutting of metals and non-metals due to the high plasma temperature: 25000° C [2].

Plasma cutting machines are designed for cutting sheets and other forms of workpieces with minimal use of manual labor. Such machines are used in various industries. They allow you to get a good quality cutting of the workpiece, which eliminates the additional processing of the part. These machines are equipped with CNC, which provides almost complete automation of the process of cutting products for a given contour, a drawing, the geometric shape of which can be of any complexity. Plasma cutting machines are effective when cutting non-ferrous metals and alloys based on them [3]. The use of such equipment is economically advantageous in cases of processing products from:

- cast iron up to 90 mm thick;
- carbon and alloyed steels whose thickness does not exceed 50 mm;
- copper and its alloys, up to 80 mm thick;
- Aluminum and alloys based on it, up to 120 mm thick.

The positive economic effect of plasma cutting is the use of compressed air as a protective and plasma-forming gas. Special software for plasma cutting machines increases the efficiency of the torch movement, makes it possible to maximize the cutting speed of similar products in the sheet, with the calculation of thermal effect. The amount of metal that goes to scrap is not significant, when using optimal, from the point of view of saving the workpiece, cutting plans.

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### **Deformation analysis of beams reinforced with mixed basalt-plastic and metal bars**

Using basalt-plastic reinforcement in constructions becomes more regular not only in Ukraine, but in foreign countries as well. Such tendency has appeared due to reinforcement's high ultimate tensile strength, high resistance to corrosion and its inertness to vast majority of aggressive environments. [1] The state innovative standard for reinforcement use in constructions has been developed. [3]

Basalt-plastic reinforcement has higher strength values, but is less elastic module comparing to the metal one [1,2,4,5]. Those characteristics make the bend elements reinforced by this reinforcement type more prone to the deformation. Applying the mixed reinforcement (when tensile area is reinforced both with metal and basalt-

plastic solutions) allows using advantages of each reinforcement: high strength of basalt-plastic reinforcement and metal reinforcement's stiffness (in bend). There is very little experimental research of such constructions abroad. [5] According to the open information sources, there were no similar research activities within Ukraine.

Due to the fact mentioned above, a series of experiments with reinforced rebar concrete constructions have been conducted. The reinforcement type and concrete additives within the deformed zone were different for each example. Half of rebars were concreted using the silica sand as additive, second half used the small hard-dispersed wastes from Mining and Concentration Complex instead of sand. (Concrete class C25/30 (B30)). Experiment program included creation of six beams sets, three pieces in each: BM and BMD – metal reinforced beams (2Ø12A400); BB and BBD – basalt-plastic reinforced beams (2Ø12AKБ); BMB and BMBD – basalt-plastic (2Ø12AKБ) and metal reinforced (2Ø12A400) beams. Composite reinforced rod diameter is limited to the same reinforcement percentage as in other beams sets. Beam sets' names ending with "D" stand for samples made with adding small hard-dispersed wastes from Mining and Concentration Complex as additives. Cross-section and rebars length were equal for each set,  $b \times h = 120 \times 220 \text{ mm}$ ,  $l = 2000 \text{ mm}$ .

Samples were created at Private Joint Stock Company "Kryvorigindustrbud". Basalt-plastic reinforcement was provided by "Technobasalt-Invest" Ltd.

Samples tests were conducted on hydraulic press P-215 according to the scheme of free-located single horizontal beam. The concentrated pressure was applied at two points within each third of beam.

The samples deformation differed depending on the type of beam reinforcement. Beams sets BM and BMD were deformed due to the reinforcement yield value exceeding in tensile area followed by concrete destruction in compression area. Basalt-plastic reinforced examples (BB/BBD) were deformed due to the concrete load capacity exceeding in compression area. Basalt-plastic bars did not suffer any breakages or slips within concrete constructions. Beams with mixed reinforcement were deformed due to the concrete destruction in compression area within part or full basalt-plastic bars breakages in tensile area. Reinforcements have complete or partial basalt-plastic fibers rupture.

Table 1

Average solidity values of samples

№	Beams Set	Breaking Force, $F_{ui}$ , kN	Strength Relative Value, $F_{ui}/F_u$
1	BM	70.22*	1
2	BMD	75.87*	1.08
3	BB	100.88	1.44
4	BBD	96.06	1.37
5	BMB	96.1 (45.13*)	1.38
6	BMBD	99.24 (49.7*)	1.41

Remarks:



1.  $F_u$  – BM beams set's breaking force;
2. \* - force, which starts to exceed metal reinforcement yield value.

Table 1 data points out the basalt-plastic reinforcement effectiveness during bend constructions reinforcing process.

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**Section 10 German Language Section**

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**Erholungsland Deutschland**

Deutschland ist ein Tourismusland mit einer bemerkenswerten Vielfalt von Städten und Landschaften auf relativ kleiner Fläche. Hohe Gebirgszüge und die Küste, Ebenen, Hügel, Flusstäler - all diese Vielfalt ist typisch für die deutsche Landschaft. Einige Teile des Naturraums sind geschützt: in nationalen Parkungen und Biosphärenreservaten.

Ein erheblicher Teil des Territoriums Deutschlands gehört zu den Ländern der Erholungsdestination. Es gibt ungefähr 500 geschützte Gebiete. Werte in der Natur bedeuten Naturparks, die auch die Hauptbereiche der Erholung und des Tourismus sind. Sie befinden sich ausschließlich in Bergwaldgebieten, jedoch in relativer Nähe zu Großstädten. Ihre Gesamtfläche beträgt 65.000 km. Der Tourismus in Deutschland trägt 8 Prozent zum Bruttoinlandsprodukt des Landes bei. Neben dem Handel ist dies der größte Sektor im Dienstleistungssektor. Es gibt vor allem kleine und mittlere Unternehmen, die Start-up-Unternehmern Möglichkeiten eröffnen. Jährlich besuchen etwa 18 Millionen Touristen Deutschland.

Nach der Gesetzgebung können diese Länder sowohl öffentliches als auch privates Eigentum sein. Das deutsche Bürgerliche Gesetzbuch sieht vor, dass diese Befugnisse über Land verfügen: Eigentum, Erbbaurechte, Grundschuld, Rentenschuld, Reallast, Hypothek, Dienstbarkeit, Nießbrauch, Wohnungseigentum.

Grundlegende Informationen zu den Grenzen des Ortes und der Größe von Grundstücken sind in den Katastererhebungen und der Buchhaltung enthalten. Landgrenzen werden hauptsächlich durch geodätische Koordinaten bestimmt und auf der Katasterkarte angezeigt. Jeder Standort verfügt über eine eindeutige Identifikationsnummer in einem speziellen Nummerierungssystem, das einen digitalen Code des Bundesstaates, des Bezirks und der Gemeinde enthält. Alle Grundstücke, mit Ausnahme derjenigen, die sich im Besitz des Staates befinden und praktisch aus dem Verkehr gezogen werden, sind im Grundbuch eingetragen. In diesem Fall basieren die Landbücher auf den Messergebnissen der Katasterabteilungen.

Für Erholungsgebiete in Deutschland gibt es einige wirtschaftliche Einschränkungen. Das deutsche Recht sieht Beschränkungen der freien Verfügung von Erholungsflächen im öffentlichen Interesse vor. Deutschlands Erholungsressourcen umfassen: sozioökonomische Ressourcen, natürliche Ressourcen (klimatisch, geomorphologisch, Wasser, Wald) und soziokulturelle Ressourcen.

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## **Mineralwasser**

Grundwasser ist einer der wichtigsten und der meistgenutzte Rohstoff. Dieser Wasser sich unterhalb der Erdoberfläche entwickelt, in der Regel geratend das durch Versickern von Niederschlägen.

Mineralwasser ist eine der Grundwassersorten. Nach Ansicht der ukrainischen Forscher sollten Mineralwässer Folgendes beinhalten: 1) die Gewässer der Ozeane; 2) Wasser von Mineralseen; 3) mineralisches Grundwasser (einschließlich Wasserschlammvulkane).

In hydrogeologischen Untersuchungen kann Mineralwasser unterschieden nach Temperatur, chemischer Zusammensetzung und Gaszusammensetzung, Radioaktivität usw. werden. Sie können auch durch äußere Merkmale unterschieden werden, nämlich: Geruch, Geschmack, Farbe und Zuordnung von Gasblasen. Jedes der Anzeichen beeinflusst den Wert von Mineralwasser signifikant. Basierend darauf ist das Mineralwasser eine der interessantesten und vielversprechendsten Varianten von Grundgewässern.

Natürliche Mineralwässer decken einen sehr breiten Mineralisierungsgrad ab. Das am wenigsten mineralisierte, sehr frische Wasser sind beispielsweise Tuvanische Quellen. Das salzige Wasser und die Salzlasten zahlreicher artesischer Becken werden dominiert.

Bei der Beurteilung solcher Wässer berücksichtigt die ionische Zusammensetzung Makro- und Mikrokomponenten. Entsprechend der Zusammensetzung der Mikrokomponenten wird Mineralwasser auf der Grundlage der Bedingungen bewertet, die für industrielle und therapeutische Wässer gelten.

Das Vorhandensein organischer Substanzen in Mineralwässern erlaubt es auch, sie als therapeutisch wertvoll einzustufen. Für therapeutische Zwecke aus radioaktiven Gewässern ist Wasser mit hohem Radongehalt von größtem Interesse.

Gase sind ein konstanter Teil von Mineralwasser. Sie liegen in Form molekularer Lösungen im Wasser vor. Unterscheiden Sie Hauptgase (Stickstoff, Methan, Kohlendioxid) und Gase-Verunreinigungen.

Die Wassertemperatur bestimmt den Phasenzustand, die Struktur sowie die physikalischen und chemischen Eigenschaften. Die Temperaturschwankungen in Mineralwässern sind extrem hoch: von -5-10 bis +300 ° C und mehr.

Unterirdische Gewässer, die in das Erdinnere eintauchen, unterliegen dem Einfluss regionaler Geothermie-Felder aufgrund des allgemeinen Geothermie-Gradienten oder lokalen thermischen Anomalien, die bei der Einführung magmatischer Massen auftreten.

Das Warmwasser aus den Gebiete mit moderner vulkanischer Aktivität und neo-seismische Gebiete mit Thermalwasserauslässen an der Oberfläche sind sehr interessant am meisten mit dem Wert der Wärmeenergie.

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### **Unternehmer und Unternehmerinnen in Deutschland**

Heute gilt der Unternehmer als Elitefigur, die auch maßgeblich zur Entwicklung und Stabilisierung der Wirtschaft beiträgt. Mitarbeiter eines mittelständischen Familienunternehmens sind in der Regel anfälliger für die Krise als Mitarbeiter eines von einem Manager verwalteten Unternehmens.

Große Familienunternehmen sind nicht nur in Bezug auf die Beschäftigung besser als Nichtfamilienunternehmen, da ihre starke Innovationsorientierung auch einen wesentlichen Beitrag zur Wettbewerbsfähigkeit der Wirtschaft in Deutschland leistet. Eigentum und Familienbetrieb sind in einer Hand, der Inhaber kann jedoch sehr flexibel in seinen Ideen und Plänen sein. «Denken Sie global und local» - eine führende Meinung von Unternehmern, mit der sie die Führungsstrategie im Nischenmarkt mit lokaler Integration in ihrer Region einnehmen: Sie produzieren hochspezialisierte Produkte in engem Kontakt mit Kunden, die sie weltweit verkaufen und deren Unterstützung sie erhalten.

Häufig versuchen selbst große Unternehmen, eine Führungsrolle zu übernehmen, indem sie kleine Unternehmen hinsichtlich ihres Nutzens kopieren. In großen und globalen Unternehmen zum Beispiel die Tatsache, dass bestimmte Unternehmensteile ausgelagert werden, um die Flexibilität eines kleinen Unternehmens zu simulieren.

In Deutschland steht das Familienunternehmen jedoch nicht in direktem Wettbewerb mit großen Unternehmen, sondern häufig zusätzlich zu diesen. In vielen Regionen gibt es beispielsweise kleine und rechtlich unabhängige Unternehmen, die Verwaltungs-, Vertriebs- und Serviceaktivitäten von großen Unternehmen übernommen haben. Dennoch ist die erfolgreiche Entwicklung des Familienunternehmens in Deutschland auf der ganzen Welt anerkannt und es gibt sogar Länder, die versuchen, dieses «Mittelklassemodell» auszuleihen, um ihre eigene Wirtschaftskraft zu stärken. Man darf jedoch nicht vergessen, dass besondere Geschäftsstrukturen herrschen, die sozial, kulturell, regional und historisch gewachsen sind, so dass dieses Modell «Mittelstand» nicht ohne weiteres in die Bedingungen eines anderen Staates übersetzt werden kann, ganz zu schweigen von einem anderen kulturellen Raum.

Nach dem Zweiten Weltkrieg wurden viele Familienunternehmen in staatliche Unternehmen in der DDR überführt. In der Zeit des Sozialismus haben nur wenige private Handwerke überlebt. Nach der Wiedervereinigung in den 1990er Jahren wurden die Voraussetzungen für die Entwicklung mittelständischer Unternehmen in den neuen Bundesländern geschaffen. Seit Mitte der 1990er Jahre wurde der Unterstützung einer Vielzahl von Start-ups, einschließlich Universitäten und der Ausbildung von Unternehmern, viel Aufmerksamkeit gewidmet.

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## **Das Problem Der Verwertung Der Haushaltsabfälle In Der Ukraine**

Die Haushaltsabfälle wurden immer durch menschliche Lebensprozesse gebildet. Da man in den frühen Stadien der Entwicklung der menschlichen Gesellschaft nur Produkte natürlichen Ursprungs verwendete und konsumierte und eine zerstreute Lebensweise führte, war der Hausmüll für ihn kein Problem. Der einfachste Weg der Verwertung solcher Abfälle war die Verbrennung oder die Endlagerung. Die intensive Urbanisierung und die Verwendung einer erheblichen Menge künstlicher Materien verstärkten das Problem des Hausmülls.

Das Problem der Abfallverwertung ist relevant für die Ukraine, da das Land der Leader in Europa in der Abfallmenge pro Kopf ist. Gleichzeitig bleibt die Situation mit ihrer Verwertung auf demselben Niveau. Die Zusammensetzung der ukrainischen Haushaltsabfälle ist ähnlich immer mehr dem westlichen (Wegwerf-Geschirr, Aluminiumdosen für Getränke, Kunststoffverpackungen), ihre Zahl nimmt jährlich zu. Die typische Zusammensetzung von Haushaltsabfällen ist wie folgt: Papier und Karton - 41%, Müll - 17,9%, Gummi, Leder und Holz - 8,1%, Lebensmittelabfälle - 7,5%, Metalle - 8,7%, Glas - 8,2% usw. - 1,6%.

Die Frage der Verwertung und Wiederverwertung der Polymerabfälle, die im Boden nicht zerfallen, ist lange nicht entschieden. Kleine Polymerabfälle reduzieren die Fähigkeit des Bodens zur Selbstreinigung, ihre Verbrennung führt zur Freisetzung giftiger Produkte in die Atmosphäre. Das andere Problem ist die bestehende unorganisierte Ableitung der flüssigen Haushaltsmüll in das Abwassersystem, das verschlechtert stark seine Arbeit und die Qualität der Abwasserreinigung an den biologischen Reinigungsstationen, das beeinflusst auf die Qualität des Meerwassers. Angesichts der Tatsache, wie die Menschheit zum Hausmüll behandelt, kann man beurteilen, wie die zivilisierte Gesellschaft ist. Je höher der Entwicklungsstand ist, desto akuter ist das Problem der Verwertung der verschiedenen Haushaltsabfälle. Gleichzeitig sind die Anforderungen an diejenigen, die in den Straßen Müll fallen lassen, ebenfalls strenger. Wir haben ein veraltetes Müllproblem, vor allem das Problem der Verwendung von Industrieabfällen, das sich nicht von einem toten Punkt entfernt. Die Unternehmen sind daran nicht interessiert, eigene Fachabteilungen und Gebiete der Verarbeitung und Verwertung der Industrieabfällen aufzubauen. Die unverarbeiteten Haushaltsabfälle schädigen der Ökologie. Die Hausmülldeponien, wo die Tonnen des Mülls faulen, die Luft, den Boden und das unterirdische Gewässer vergiften, sind die ernsthafte Gefahr für den Mensch und die Umwelt. Deshalb suchen die Wissenschaftler die Verfahren der Verhinderung der Umweltverschmutzung.

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## **U-Bahn-Bau**

Heute ist der Bau der U-Bahn eine dringende Aufgabe im Bereich des städtischen Verkehrs. Es ist ein bequemer, schneller und geräuscharmer Transport, der sich unter der Erde befindet. Die U-Bahn muss schnell und effizient gebaut werden, da der Bedarf dafür wächst und die Anzahl der Passagiere ständig steigt.

Der Bau der U-Bahn erfolgt in folgenden Schritten: Es wird eine Karte der U-Bahnlinie erstellt, die geologische Erkundung des Bodens, Abisolierarbeiten, der Bau eines Tunnels, der Bau von Stationen, Lüftungskanälen, die Verlegung von Kommunikationsmitteln und andere Arbeiten werden durchgeführt.

Die Hauptphase des Baus der U-Bahn ist die Bohrung des Tunnels. Heute sind drei Verfahren zum Bohren von Tunneln bekannt: die offene Bauweise, die Neue Österreichische Tunnelbauweise und das Bauverfahren mit dem Schildvortrieb.

Der Tunnelbau durch die offene Bauweise ist wie folgt. Der Graben wird zuerst vorbereitet, dann werden die Wände errichtet und die Decke installiert. Danach wird die natürliche Bodenbedeckung wiederhergestellt und der Bau der U-Bahnlinie weitergeht. Die Vorteile sind Kostengünstigkeit, Schnelligkeit und einfache Wartung. Der Nachteil ist ein erhöhter Geräuschpegel.

Die Neue Österreichische Tunnelbauweise wird verwendet, wenn der Tunnel im Gestein errichtet wird, wo die Gefahr von Verschiebungen und dem Zusammenbruch des Bodens besteht sowie wenn der Tunnel zu Stationen gebaut wird. Der Tunnel ist wie folgt aufgebaut: Löcher werden entlang des Durchmessers des zukünftigen Tunnels gebohrt, Metallstrukturen werden in sie eingebaut und mit Beton gefüllt, so werden Betonpfähle geformt. Danach wird der Tunnel selbst gebohrt und die restlichen Arbeiten werden fortgesetzt. Der Vorteil der Methode besteht darin, dass Tunnel sicher getunnelt wird. Der Nachteil ist die Bauzeit.

Die letzte Methode zum Bohren von Tunneln ist das Bauverfahren mit dem Schildvortrieb. Diese Maschine erfüllt beim Bau der U-Bahn gleichzeitig drei Funktionen: Tunnelbohren, Tunnelverstärken und Sicherheitsgewährleistung. Der Bau des Tunnels beginnt mit dem Absenken des Schildes auf die Tiefe der U-Bahnlinie, dann erfolgt das Bohren und die gleichzeitige Installation der Auskleidung. Die Vorteile sind schneller Aufbau und Kombination von Arbeitsvorgängen. Der Nachteil ist eine hohe Energieintensität.

Jede Methode wird in Abhängigkeit von den geologischen Bedingungen angewendet und manchmal kombiniert.

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**Section 11 Russian Language Section**

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**Особенности эллиптической трансформации коллокативов**

Современные реалии жизни общества требуют от носителей языка максимальной реализации языковых средств за определенный, часто ограниченный, временной промежуток. Отчасти поэтому в речи формируются устойчивые – коллокативные – структуры, способные в перспективе формально (но не семантически!) редуцироваться. Например: ванная комната – ванная, газовая плита – плита, заносить в протокол – протоколировать, зачетная книжка – зачетка, детеныш волка – волчонок, пять пальцев – пятерня и т.п.

Коллокативные словосочетания, или коллокации, отличаются, например, от идиом. Они, как и свободные сочетания, имеют ясную внутреннюю форму, их семантика выводима из значений компонентов. Но эти единицы обладают функциональными особенностями: они легко интерпретируются и воспринимаются носителями языка, однако их воспроизведение для инофонов затруднительно, они требуют запоминания. Например, русскоговорящий скажет: *претерпевать трудности*, но не станет говорить *\*претерпевать качку*, или *питать любовь*, но не *\*питать боль*, или *отдавать предпочтение*, но не *\*отдавать приоритет* [1]. Возможности валентности и, наоборот, ограничения валентности являются обязательной составляющей языкового опыта носителя языка.

Коллокации занимают промежуточное положение между свободными сочетаниями и идиомами. Именно коллокации чаще всего подвергаются эллипсису или эллиптической универбации. Изучением и описанием таких словосочетаний, определением их основных дифференциальных и интегральных признаков занимаются не только лексикологи и фразеологи, но и специалисты в области теории номинации в целом, словообразования, прикладной и компьютерной лингвистики.

Случаи, когда словесная интерпретация номинативной единицы с коллокативной доминантой «создается путем эллипсиса, сокращения сочетания слов в слово, которое по своей природе является его компонентом» [3, с. 135] представлены так:

а) эллипсис в направлении зависимого слова (*гостиная комната – гостиная, столовая комната – столовая*);

б) эллипсис в направлении главного слова (*электрическая плитка – плитка, детская площадка – площадка*);

в) эллиптическая универбация (*подсобное помещение – подсобка, молотильная машина – молотилка, укладывать асфальт – асфальтировать*).

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### **Приемы перевода русских имен существительных на польский язык (на материале романа В. Сорокина «Сахарный Кремль»)**

Приемы, или способы, перевода и адаптации иноязычных имен существительных могут быть разными. Но все они должны служить одной цели – донесению необходимой культурно-художественной информации до читателя – носителя конкретного языка.

Контекст данного произведения позволил выделить ряд приемов перевода.

1. Транслитерация. «Откинула *Марфуша* ногой одеяло, потянулась, увидела на стене живую картинку с Ильей Муромцем, на долгогривом *Сивке-Бурке* скачущим, и вспомнила — последнее воскресенье сегодня» [1, с. 1]. «*Marfusza* odrzuciła nogą kołdrę, przeciągnęła się, ujrzała na ścianie żywy obrazek ze staroruskim bohaterem *Ilją Muromcem*, na długogrzywym *Siwku-Burku* gałopującym, i przypomniała sobie- dziś ostatnia niedziela» [2, с. 7].

2. Транскрибирование. « – Слыхала, на *Вспольном* мальчишки по-матерному ругаются. На «х» и на «п»» [1, с. 4]. « – *Zali* złyszałaś, na *Wspolnym* chłopaki przeklinają bezecnie. Na „ch” i na „p”» [2, с. 16].

3. Транскрибирование с элементами транслитерации. «Чешет бороду рыжую *Хопров*» [1, с. 6]. «*Choprow* drapie się po rudej brodzie» [2, с. 24].

4. Калькирование. Расстелили себе газету «*Возрождение*», разложили на ней то, что за утро насобирали, и жуют, распивают бутылку самогона.» [1, с. 7]. «*Rozścielili* sobie gazetę „*Odrodzenie*”, rozłożyli na niej to, co o poranku uzbierali, i rojadają, rozpijają butelkę samogonu» [2, с. 25-26].

5. Транслитерация, калькирование и функциональная замена. «Играла до обеда, но *баозцянь* так и не смогла найти» [1, с. 8]. «*Grała* do obiadu, ale *baojianu* w końcu nie mogła znaleźć» [2, с. 28].

6. Транскрибирование и прямое включение. «Зато, Колька Башкирцев рассказывал, как баоцзянь найдешь – сразу все враги падают замертво, а молодой Государь женится на принцессе *Сунь Юн*, а для девочек есть ветка: свадьба» [1, с. 8]. «A Kolka Baszkircew opowiadał, że jak baojian znajdziesz, od razu wszyscy wrogowie padają trupem, a młody Monarcha żeni się z księżniczką *Sung Jung*, a dla dziewczynek jest „gałązka”: wesele» [2, с. 29].

Но бывают случаи, когда полнота и адекватность перевода может нарушаться по определенным причинам. Например: «Просто полгода назад Марфушин папа вырезал столоначальнику из Палаты Связи *киот* усадебный со Спасителем да апостолами» [1, с. 6]. «Po prosy pól roku temu tata Marfuszki kierownikowi referatu z Izby Łączności wystrugał we włościach ołtarzyk ze Zbawicielem i Apostołami» [2, с. 23]. Слово *киот* – устаревшее, в значении «шкафчик для икон» не имеет перевода.

1. <http://knijky.ru/books/saharnyy-kreml>

2. <https://www.livelib.ru/book/1001287798-cukrowy-kreml-wadimir-sorokin>

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### Вопросительные предложения в эпистолярном тексте

В письменных посланиях отражаются особенности монологической и диалогической речи, причём диалогизация рассматривается лингвистами в качестве одной из базовых категорий эпистолярных текстов (Н. И. Белунова). Эта категория реализуется посредством обращений, вопросительных и побудительных высказываний, глаголами и местоимениями 2-го лица, эмоционально-оценочными суждениями, подписью и т. п. Мы рассмотрели функционирование вопросительных предложений как средства диалогизации на материале писем русского писателя Б. К. Зайцева.

В эпистолярных текстах Б. К. Зайцева присутствует всё разнообразие структурных типов вопросительных предложений: собственно-вопросительные (обще- и частновопросительные), вопросительно-утвердительные, вопросительно-риторические и фразеологизированной структуры предложения, а также рефлексивные вопросы. Чаще всего Зайцев использует частновопросительные предложения (*Когда увидимся? А как Ваша пьеса?*); вопросительно-утвердительные, в которых адресант догадывается о том, каким может быть ответ, но желает убедиться в этом (*И, пожалуй, дело с изданием идет у Вас к концу? Говорят, собираешься нас навестить?*).

Среди средств связи в вопросительных предложениях можно наблюдать инверсию и связанное с ней вынесение в начало вопроса слов-доминант,

вопросительные частицы и местоимённые слова, вводные слова и конструкции, передающие разные оттенки модальности, например, предположение (*Может быть, где и встретимся?*), указание источника информации (*Говорят, собираешься нас навестить?*). Эти средства способствуют реализации в вопросах элементов диалога, живой речи, общения, когда прагматической установкой автора является желание узнать интересующую его информацию, предложить что-либо, выяснить реакцию адресата. Вопрос может задавать эмоциональный тон в начале письма, актуализируя ту или иную проблему (*А что «Возрождение»? Мало в нем пишу, но все же тревожно за него*).

Вопросительные предложения в письмах Б. К. Зайцева становятся также средством авторской рефлексии, размышлений о социокультурной обстановке в стране (*Ты понимаешь, чем это пахнет по теперешним временам?*), о своих жизненных принципах (*Разве я мог отказать?*), о будущем (*Что ещё предстоит видеть?*)

Таким образом, основные коммуникативные цели, в которых Б. К. Зайцев использует вопросительные предложения в своих письмах, сводятся к следующим:

- поддержание контакта (*Дорогой Соломон Юльевич, знаете ли Вы, что у меня почти готова третья книжка?*);
- выяснение ситуации (*Правда ли, что в Москве будете?*);
- экспрессивность (*Знаете ли Вы то ощущение, когда человек, полный сил, лезет напролом?*);
- коммуникативное воздействие (*Дорогой Виктор Иванович, что же Вы не едете?*).

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### **Функции обращений как компонентов поливокатива в письмах Ф. М. Достоевского**

Одной из основных конструктивных особенностей эпистолярного текста является обращение к адресату, причём нередко автор письма не ограничивается начальным обозначением адресата, а неоднократно обращается к нему в разных местах одного и того же послания. Например, в одном из писем к своей жене Ф. М. Достоевский использует 18 вариантов обращений: *ангел Аня; друг мой; милая; ангел мой радостный, ненаглядный, вечный и милый; ангел мой, милая, радость, небо мое бесконечное, жена моя добрая; радость моя* и др. В результате образуется особая лингвистическая фигура, для которой Е. К. Куваровой был предложен термин *поливокатив*. Целью нашего

исследования было изучить функциональные возможности адресующей номинации адресата в составе поливокатива в письмах Ф. М. Достоевского.

Если начальное обращение в письме содержит интродуктивную номинацию адресата, то последующие обращения в составе поливокатива представляют иной тип номинации – повторную. Называя по-новому своего адресата, автор письма может вводить новые, значимые для него оценочные характеристики своего собеседника, наделять обращение новыми прагматическими целями, отвечающими коммуникативной задаче самого послания. Например, в письме к брату Михаилу Достоевский использует следующий номинативный ряд: *добрый брат мой; милый брат мой; брат; милый; жалкий человек; милый, добрый брат* и др. Обращения отражают даже изменение настроения автора письма, его эмоциональную оценку адресата. Варьирование вокатива помогает устранить в тексте стилистически некорректные повторы, монотонность и однообразие речи. Спектр вариантов номинации достаточно широк и зависит от таких факторов, как характер отношений между корреспондентами, их возраст, социальный статус, каноны эпистолярия во время создания письма и т. д.

Обращения в составе поливокатива выполняют разные функции. В письмах к издателю Н. А. Любимову обращения *многоуважаемый Николай Алексеевич, глубокоуважаемый Николай Алексеевич, милостивый государь уважаемый Николай Алексеевич* выполняют апеллятивную и контактоустанавливающую функции. Обращения к жене А. Г. Достоевской *мой ангел, золотое ты моё сокровище, умненькая ты моя красавица* выполняют экспрессивную и эстетическую функции. В послании к своей племяннице С. А. Ивановой писатель использует обращение *милый инок моя Соня*, выполняющее национально-культурную функцию.

Таким образом, поливокатив является важным структурным компонентом эпистолярного текста. Номинативное варьирование в составе поливокатива отвечает заданной адресантом прагматике письма, экстралингвистическим факторам, коммуникативной задаче. Отправитель, размещая варианты номинации адресата так или иначе в тексте послания и используя уместный, по его мнению, вокатив, задаёт тональность письма, что возможно благодаря широкому спектру функциональных возможностей поливокатива.

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### **К вопросу об изучении языка польских народных сказок**

В статье рассматриваются особенности использования традиционных формул в польских волшебных сказках, которые отражают категории времени и пространства в картине мира.

В сказках как особом виде устного народного творчества проявляется дух народа, его культурные ценности, национальные образы и символы. Это помогает нам лучше понять представителей других культур, правильно выстраивать межкультурное общение.

Характерной особенностью построения сказки являются устойчивые выражения, традиционные формулы, благодаря которым можно познакомиться с культурой народа, поскольку различные «...качества характера, внешность героев описываются формулами, через них также можно проследить сюжетные ходы, композиционные особенности сказок» [2].

Согласно исследованиям О. А. Егоровой, понятие традиционной формулы охватывает явления всех уровней языка – от одного слова до целых предложений и даже абзацев. Такие формулы представляют собой широкий спектр разнородных явлений: постоянные эпитеты, сравнения, устойчивые выражения, встречающиеся в строго определенных местах текста, лексические и синтаксические повторы [2].

В фундаментальном исследовании Н. Рошияну, посвященном языку фольклорных текстов, приводится классификация традиционных формул, а именно: инициальные формулы (пространства и времени); финальные формулы; медиальные формулы (внешние и внутренние) [5].

Н. М. Герасимова предложила классифицировать традиционные формулы таким образом: 1) инициальные формулы – формулы существования героев; 2) формулы наличия или отсутствия чего-либо; 3) формулы времени; 4) топографические формулы; 5) формулы недостоверности [1].

В своих исследованиях Лутфуллина акцентирует внимание на том, что «наиболее значимыми являются инициальные формулы, которые подразделяются на формулы времени (хронологические) и формулы пространства (топографические)». Традиционные формулы сказки — это универсальные модели, сохраняющие форму, часто используемые в повествовании в текстах с модифицированными сюжетами. Традиционные формулы довольно разнообразны. Они наблюдаются в сказках, выражая устоявшиеся понятия о времени, месте, количестве, красоте, «описывая аспекты и явления сказочной действительности, придавая красочность текста и эпическую стройность сюжета» [3].

Материалом для исследования были польские волшебные сказки: «Черный леший», «Королевна-упырь» и «Волшебная гора», в том числе и тексты, переведенные на русский язык.

Каждая сказка начинается со слов «датирования» действий происходящих в сюжете этой сказки. Так, традиционным началом польских сказок являются квантитативные фразы: *Pewnego razu w jednej wiosce był biedny wieśniak...* (Жил-был в одной деревне бедный крестьянин – тут и далее перевод авт.); *Dawno, dawno temu, za siedmioma górami, za siedmioma lasami i siedmioma rzekami był sobie zamek...* (Давным-давно, за семью горами, за семью лесами и реками был замок) [4]. Это распространенные начала в русских, украинских, польских и других славянских сказках, которые указывают на давность. Такое начало сказки имеет традиционный оттенок, который в ходе длительного времени передается из поколения в поколение, что придает сказке неопределенность сказочного времени и места.

Другой тип формул это: «*Czy wiele, czy to nie...*» (Много ли, мало ли...); «*Długo lub krótko szedł*» (Долго ли, коротко ли...); «*...pozostanie tam na wieki wieków...*» (останется там на веки-вечные) – временные «формулы» [4], часто встречающиеся в сказках, отражающих языковую и этнокультурную картину мира поляков.

Таким образом, наше внимание привлеч язык фольклора. В сказках выявляются различные формы экспрессивности языка: лексические и стилистические повторы, сравнения и интенсификаторы значения высказывания. Каждая сказка имеет свои постоянные законы построения. Это передается при использовании различных традиционных формул, описывающих культуру народа, и выражаются посредством квантитативных понятий, которые мы наблюдаем в языке польских народных сказок.

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### Способы перевода польских фразеологизмов на русский язык (на материале рассказа Г. Сенкевича «Янко-музыкант»)

Изучение фразеологизмов в составе языка является одним из наиболее перспективных направлений в переводоведении, поскольку устойчивые выражения обладают наиболее яркой культурной семантикой. М. Голикова говорила о том, что «фраземы, будучи знаками вторичной номинации, отражают особенности этноязыкового сознания носителей языка» [2]. Вопросом изучения фразеологизмов в переводоведении занимались такие ученые, как Е. В. Шепелева, В. А. Лавриненко, Е. В. Приказчикова, И. А. Краснова, О. О. Сорокина, А. Н. Паршин, В. Н. Комиссаров, О. В. Аверкова, В. С. Яковлева, Ю. В. Казанкова, П. Ньюрмак, И. В. Казакова, В. С. Виноградов и другие.

Язык художественных произведений Г. Сенкевича наполнен глубокой образностью. Писатель использует оригинальные окказиональные сравнения, постоянно обращается к клишированным формам, связанным с религиозным сознанием носителя языка. Г. Сенкевич активно обращается к национальному фразеологическому фонду, не только включая фразеологические единицы в повествование, но и трансформируя их.

Цель исследования – описание возможных способов перевода польских фразеологизмов на русский язык в рассказе Г. Сенкевича «Янко-музыкант».

Ученый В. С. Виноградов предложил такую классификацию фразеологизмов в переводоведении: а) лексические фразеологизмы; б) предикативные фразеологизмы; в) компаративные фразеологизмы. В рамках лексических фразеологизмов он выделил: 1) полноэквивалентные единицы; 2) эквивалент с таким же или близким значением и стилистической окраской, который совпадает по внутренней форме; 3) эквивалент с таким же или близким значением и стилистической окраской, который не совпадает по внутренней форме; 4) ситуация, когда слово может являться смысловым аналогом при переводе, сохраняя эмоциональную окраску [1].

В рассказе Г. Сенкевича «Янко-музыкант» самую многочисленную группу составляют **лексические** фразеологизмы. Полноэквивалентными фразеологизмами являются единицы языка оригинала тождественны единицам в переводе, например: «*doszedłszy lat - войдя в лета*» [3, с. 12-13], «*nie żartem – не на шутку*» [3, с. 18-19]. Вторая группа лексических фразеологизмов – это единицы со сходной семантикой, но один элемент устойчивого выражения заменён на синоним, например: «*niknącym z powierzchni ziemi – исчезать с лица земли*» [3, с. 4-5]. В третьей группе мы наблюдаем разницу во внутренней форме языка оригинала и языка перевода, при этом стиль эквивалентен и значение является близким, а именно: «*został oczkiem w głowie – стал зеницей ока*» [3, с.



26-27]. Последняя группа в выбранном тексте представлена единицами, когда при переводе происходит замена слова на фразеологизм и фразеологизм на слово: «*zaciął się – хватил через край*» [3, с. 18-19], «*o całej sprawie zamilczał – ни слова не сказал*» [3, с. 20-21].

**Компаративные** фразеологизмы – это устойчивые сравнения, которые при переводе могут быть изменены: «*milczał jak pień (как пень) – молчал как рыба*» [3, с. 18-19], в приведенном примере происходит замена слова, так же как и в следующем случае: «*chodził jak struty (отравленный) – ходил как убитый*» [3, с. 24-26]. В составе фразеологизма «*wytruscytowali na mnie gęby jak armaty – вытаращили на меня глаза*» [3, с. 12-13] переводчик не включил в переводной текст выражение «*jak armaty*». Дословно на русский язык это переводилось бы «как пушки», однако данное выражение не свойственно русскому литературному языку. Мы считаем, что его все же следовало перевести с помощью калькирования, так как данное сравнение, использованное в реплике персонажа подчеркивает его образ.

Таким образом, в рассказе Г. Сенкевича «Янко-музыкант» при переводе мы выделили лексические и компаративные фразеологизмы, опираясь на классификацию В. С. Виноградова. Язык отражает процессы, идеалы и установки существующие в сознании его носителей, которые наиболее ярко они представлены во фразеологизмах. Это и обуславливает трудности в переводе таких единиц. Зачастую перевод разрушает те скрытые смыслы, которые были заложены во фраземе. Русский и польский языки близки друг другу, что позволяет проводить более глубокий сопоставительный анализ и выявлять принципиальные сходства и различия.

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**Функциональная трансформация аффиксов в русском языке:  
грамматикализация и деграмматикализация**

Согласно Е. А. Василевской, грамматикализация представляет собой такую разновидность трансформации, при которой самостоятельная или служебная часть речи становится частью слова (морфемой), дополняя его значение не только своим грамматическим, но и оттенком лексического значения.

Наличие значения у служебных морфем является результатом трансформации знаменательных / служебных частей речи в части слова (приставки, суффиксы, постфиксы). Отсюда – не только формообразующая, но и словообразовательная функция аффиксов. Кроме грамматического значения служебных частей слова есть еще и доля лексического значения, соотносящего слово в целом с его внутренней формой.

Процесс грамматикализации сопровождается семантический способ исторического словообразования: *перед* (существительное) – *перед* (предлог) – *перед* (приставка); единственным образцом сращения в данном случае может выступать модель глагол + возвратное местоимение *с#*). Эволюционируя, данный способ интерпретировался (благодаря грамматикализации) как морфологический. Затем закрепились на его базе определенная словообразовательная модель. Это произошло, вероятно, после утраты грамматикализированным словом своей самостоятельной функции (предлог + глагол – приставка + глагол; глагол + местоимение – глагол + постфикс и т.п.).

Грамматикализация, таким образом, является словообразовательным механизмом организации современных простых слов. Посредством акта грамматикализации слова, образованные исконно из нескольких единиц служебных / знаменательных частей речи, воспринимаются уже долгое время как простые производные.

Обратным процессу грамматикализации является деграмматикализация. Сущность ее заключается в семантической трансформации аффиксов: от значимых служебных морфем к асемантическим структурным элементам производного, чаще сложного, слова.

Например, наличие у сложных производных интерфиксов является результатом деграмматикализации, поскольку очевидной является десемантизация исконных флексий и суффиксов, употребляющихся в упомянутых случаях уже в качестве интерфиксов: пятидверный, двухэтажный, долгоиграющий.

Итак, процессы грамматикализации и деграмматикализации являются полярными трансформационными по своей функции и значимости.

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### Компрессионная универбация в русском языке

Компрессионная универбация занимает свое место в ряду процессов, в результате которых «словесный дублет номинатемы с коллокативной доминантой создается путем композитной компрессии словосочетания» [2, с. 135]. Среди них выделяют а) аббревиацию (*Днепровский национальный университет – ДНУ, профессионально-техническое училище – профтехучилище, заведующий складом – завскладом*); б) собственно формальную компрессию, при которой наблюдается простое интерпретирование коллокации как слова (*спаси Бог – спасибо, быстро растворимый – быстрорастворимый, обоюдо острый – обоюдоострый*); в) компрессионная универбация, при которой компрессия сопровождается имитацией словообразования (*с белыми бровями – белобровый, ученик десятого класса – десятиклассник, дельфин с белыми боками – белобочка, автомобиль с пятью дверями – пятидверка*).

Последний случай представляется наиболее интересным. Он является разновидностью универбации и может быть исследован наряду со случаями эллиптической универбации (*декретный отпуск – декрет, детеныш тигра – тигренок, жена генерала – генеральша, цифровой фотоаппарат – цифровик, покрыться пылью – запылиться*). Различие между этими двумя явлениями заключается лишь в том, что при эллиптической универбации результативная единица имеет в своей структуре один корень (основу), а при компрессионной универбации – два корня (соответственно – прерывистую основу).

Причинами таких структурных (но ни в коем случае не семантических!) трансформаций являются стремление языка к словности, экономия усилий устной и письменной речи, что обусловлено все ускоряющимся темпом жизни, а также тенденцией компенсаторности, призванной сохранить определенное значение за контекстуальным дублетом той или иной аналитической номинативной единицы.

Компрессионная универбация развивается на базе коллокаций. Коллокацией считают словосочетание определенного типа, которое имеет признаки синтаксически и семантически более или менее целостной единицы, в рамках которого выбор одного из структурных компонентов осуществляется семантически, а выбор второго компонента зависит от выбора первого. Такие словосочетания занимают место между свободными и связанными, фразеологизированными. Именно относительная связанность их компонентов предполагает замену таких словосочетаний синтетическими единицами – словами – без изменения целостного значения соответствующих аналитических конструкций – коллокаций.

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#### Об особенностях формирования русскоязычного лексикона геймеров (на материале игры Dota 2)

Вопрос о русскоязычном лексиконе геймеров становится актуальным в связи с активным развитием игровой индустрии и популяризацией киберспорта в странах СНГ. По своей сути данный языковой пласт является жаргоном, так как обслуживает нужды ограниченного социального круга (геймеров) и в большинстве случаев является непонятным для людей, незнакомых с игровыми реалиями. Слова, принадлежащие к геймерской лексике, мы предлагаем называть *геймеризмами* наряду с уже существующими *компьютеризмами*, *сленгизмами* и *жаргонизмами*. На русскоязычной почве геймеризмы образуются различными способами, доминирующий признак которых – сокращение слов для удобного использования их в текстовых чатах и кратких языковых командах.

Изначально лексика, связанная с видеоиграми, чаще всего появляется в английском языке, который как пласт мировой культуры поддерживают процессы глобализации, в той или иной степени объединяющие людей всего земного шара. Поэтому большинство геймеризмов являют собой англицизмы, воспринятые русским языком и трансформированные им. Так, можно выделить «классические» способы словообразования на базе заимствований: суффиксацию (Пуджик от Pudge, дизармить от to disarm), аббревиацию (ДК из Dragon Knight, СиЯ из Sange and Yasha), универбацию (Легионка от Legion Commander, Фантом от Phantom Lancer), сокращение, или усечение (Арк от Ark Warden, Шейкер от Earthshaker) и другие. Довольно часто геймеризмов для русскоязычной версии транскрибируются (ивэйжн – evasion) или транслитерируются (байбэк – buyback).

Однако и русскоязычная словообразовательная база, несмотря на её вторичность по отношению к первородной английской, служит для номинации игровых реалий. Она применяется в нечастых случаях перевода лексем (Сыр –

Cheese), при языковой игре с применением фонетической мимикрии (Оксана – Ахе, Леший – Leshrak), ассоциативной связи (героя Io называют «Шар» из-за того, что он выглядит как парящая синеватая сфера), метонимических переносов (героя Sniper называют «Хо-хо Ха-ха» по одной из его реплик), культурологических моментов, которые не имеют непосредственной связи с языком, но отражают историю игры и её связь с геймерским сообществом (герой Wraith King назван «Папаня» в честь стримера EvilArthas с аналогичным прозвищем). Также нами выявлен совершенно уникальный способ именования – денотативно-пиктографический, основывающийся на визуальном компоненте игры в разрыве с его языковым оформлением (заклинание Remote Mines («удалённые мины») называется «Бочка» из-за того, что имеет пиктограмму и реализацию в игре в виде зелёной бочки).

Геймеризмы нуждаются в дальнейших исследованиях, так как отражают современные процессы в русском языке в его связи с иностранными языками. Знакомство и работа с данной лексикой поможет людям невовлечённым лучше понять особенности тех или иных компьютерных игр, и, возможно, стать частью геймерского сообщества.

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### **Критерии определения лексикона спортсменов исторического средневекового боя**

Эволюция общества предполагает появление и развитие новых социальных групп внутри него. Например, конец восьмидесятых – начало девяностых годов прошлого столетия ознаменовались расцветом «эпохи толкиенизма». Особенность ее заключается в том, что почитатели произведений Дж. Толкиена стали моделировать его вымышленный мир в реальности. Такое движение получило название «ролевое моделирование». Несколько позже, в 90-х гг. прошлого века, из этого движения выделилось направление реконструкторов – сообщества заинтересованных людей, пытающихся реконструировать по историческим источникам материальную культуру определённого исторического периода. Позже из этого сообщества выделились те, кто хотел заниматься только историческим фехтованием. Так появился исторический средневековый бой (ИСБ), участники которого создали уникальный лексический комплекс, элементы которого лишь изредка на периферии своего функционирования могут быть использованы в других, смежных, областях подобной деятельности. Жаргонная лексика всех указанных направлений, в принципе, универсальна; возможны лишь незначительные отличия.

Все существующие определения жаргона и арго имеют как общие черты, так и отличия (О. С. Ахманова, О. С. Жеребило). Мы не думаем, что следует

считать определения этих двух лингвальных реалий разными, ибо критерий социальной обусловленности присутствует в обоих случаях. В данной ситуации сложнее обстоит дело с разграничением арго и жаргона. Ведь согласно словарю, разница между жаргоном и арго определяется только тем, что арго относят к тюремно-воровской речи. Однако люди, употребляющие арго, относятся к определённой социальной группе. То есть, по мнению О. С. Жеребило, арго всего лишь разновидность жаргона.

Одним из факторов отличия жаргона от арго становится возможность проникновения данной группы слов в разговорную речь широкого употребления или же вообще в литературный язык.

Можно ввести следующие критерии дифференциации жаргона, арго, сленга:

- наличие пейоративности;
- принадлежность к определённой социальной группе;
- закрытость/открытость.

Жаргон пейоративен, используется определёнными социальными группами, закрыт. Арго не пейоративен, принадлежит только одной социальной группе, закрыт. Сленг не пейоративен, принадлежит к определённой социальной группе, открыт.

Для определения принадлежности исследуемого нами лексикона к арго, жаргону или сленгу нам представляется целесообразным осуществлять его анализ по следующим критериям:

- степень открытости/закрытости;
- выявление языковых функций;
- выделение вербальных типов кодов;
- выявление и изучение способов кодирования.

Лексикон спортсменов исторического средневекового боя относится к закрытой структуре, т.к. представлена только в речи определённой субкультуры и за её пределы не выходит. Основная же функция данных номинаций – сокращение времени речевой коммуникации.

Итак, исследуемый лексикон принадлежит к определённой социальной группе, частично закрыт, ему присуща пейоративность и он не создавался для криптолалических целей. Исходя из вышесказанного можно сделать вывод, что данный материал составляет жаргонный пласт русского языка. Эту категорию слов нельзя отнести ни к вульгаризмам, ни к просторечным словам, так как она имеет все признаки жаргонной лексики.

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### Особенности композитной компрессии коллокативных словосочетаний

Несмотря на то, что в русском языке (прежде всего – в речевой его реализации) активна тенденция к синтагматическому сокращению, содержательный компонент лексических единиц остается неизменным. Коллокативные конструкции способны сворачиваться в слова, в том числе с несколькими основами, дублируя значение этих основ в новой моновербальной (словесной) форме.

Широкий подход к определению состава коллокаций предполагает отнесение к нему всех лексических единиц, проявляющих тенденцию к совместной сочетаемости в одних и тех же контекстах. Данное понимание вопроса было предложено «английским лингвистом Дж. Р. Ферсом в 1950-х гг. и получила развитие в трудах его соотечественников (например, М. А. К. Халлидэй, Р. Хасан, Дж. Синклар). По мнению М. А. К. Халлидэя и Р. Хасана [Halliday, Hasan, 1976], основная функциональная роль коллокаций – обеспечение связности текста» [1].

Большинство западных лингвистов предпочитает узкую трактовку данного термина, где коллокация определяется как связь двух и более языковых единиц, вступающих в синтаксические отношения и характеризующихся особой лексической валентностью и связанностью. Это определение было предложено в работах по теоретической лексикографии И. А. Мельчука [1], чьи исследования в наибольшей степени определили направление развития лингвистической мысли в рамках данной проблематики.

Случаи, когда «словесный дублет номинатемы с коллокативной доминантой создается путем композитной компрессии словосочетания» [3, с. 135] могут быть репрезентованы:

а) аббревиацией (*собственный корреспондент – собкор, Национальный технический университет – НТУ, высшее учебное заведение – вуз, Министерство иностранных дел – МИД*);

б) собственно формальной компрессией, при которой наблюдается простое интерпретирование коллокации как слова (*долго играющий – долгоиграющий, вяло текущий – вялотекущий, с ума сшедший – сумасшедший, быстро растворимый – быстрорастворимый*);

в) компрессионной универбацией, при которой компрессия сопровождается имитацией словообразования (*широкий в плечах – широкоплечий, ученик первого класса – первоклассник, с белыми боками – белобокий, ива с белыми листьями – белолистка*).

Очевидно, что в представленных случаях, кроме тенденции к сокращению речевых и письменных усилий, реализуется и компенсаторный

принцип. Последний регулирует адекватность плана выражения, то есть внешней синтетической формы, плану содержания, то есть значению.

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### **О некоторых языковых приемах в побудительных конструкциях русскоязычной рекламы**

Основной задачей рекламы является убеждение приобрести предлагаемый товар. Для этого рекламные тексты используют различные стратегии влияния на сознание покупателя. Проведенное исследование показало, что одним из действенных средств рекламы являются побудительные конструкции. Влияние на покупателя реализуется через «мягкое» побуждение. Чтобы преодолеть нежелательный эффект настойчивости, излишней навязчивости, возникающий при употреблении в рекламе повелительного наклонения, реклама обращается к так называемым «мягким» глаголам, которые не приказывают, а скорее советуют («Гексорал. Почувствуй себя, а не свое горло!», «Анаферон. И вы забудете о больничном!»), подсказывают («Если кашляешь – поможет Бромгексин Берлин-Хеми!»), предлагают («Сделай паузу – скушай Twix»), рекомендуют («Аллергия? Ответ один – прими раз в день Кларотадин!»), приглашают (Присоединяйся к нам – здоровым людям! АСТИМЕЛ, молочный напиток).

Коммуникативная направленность побудительных предложений раскрывается через их основную функцию – суггестивную, которая заключается в убеждении, влиянии на реципиента.

Особым действенным средством рекламы представляются конструкции, в которых побуждение совмещается с другими приемами экспрессивного синтаксиса, а именно:

1) включено в вопросно-ответное единство: «Аллергия? Ответ один – прими раз в день Кларотадин!»;



2) представлено в парцеллированном виде: *«Попробуйте нашу селедку. Нежную. Ароматную»* (Рекламная брошюра в ТЦ);

3) совмещено с обращением: *«Студент? Используй свое преимущество!»* (танцевальная студия «Only Dance»); *«Дамочка, внимание! Соблюдай режим питания!»* (советский лозунг);

4) оформлено как параллелизм: *«Сохраните тепло – сохраните драгоценное здоровье»* (лечебные накладки с жадеитом «Green Stone»); *«Сделай паузу – скушай Twix»* (шоколадный батончик); *«Поделись хрустом – поделись настроением»* (сухарики «Кириешки»).

Русскоязычная реклама проявляет определенную избирательность в выборе приёмов экспрессивного синтаксиса и опирается лишь на некоторые из них. Это обусловлено тем, что при создании рекламного текста учитываются экстралингвистические факторы, т. е. речевая ситуация, потребности адресата и адресанта, а также непосредственно лингвистические факторы – знание языковых правил и норм.

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### **Имена собственные в текстах И. Иртеньева**

Современные поэты выходят за рамки языковых норм в своих текстах, трансформируя язык под описываемые ими реалии; обогащают языковую систему новыми формами и способами создания слов; экспериментируют со смыслами с помощью игры слов. Наше внимание привлёк современный российский поэт-сатирик Игорь Иртеньев, который является представителем иронического направления в современной русской поэзии.

В 1990-е годы XX в. С. Афанасьев отмечал, что *«поэзия Иртеньева стилем, интонацией целиком вписана в сегодняшнее российское пространство – редкий в постперестроечное время пример гармонии поэта с окружающей средой»* [1]. А. Скворцов обращает внимание на то, что *«стиль Иртеньева – причудливый сплав традиционной возвышенно-романтико-символистской интонации с советским новоязом, блатаризмами, жаргонизмами, канцеляритом, обломками научного стиля и, наконец, с мощным пластом бытовой, разговорной фразеологии»* [3]. На творчество И. Иртеньева обратили внимание такие исследователи как И. Васильев, Л. Зубова, М. Кронгауз, В. Кулаков, В. Санников, А. Скворцов, Н. Попкова.

Актуальность работы заключается в том, что активные процессы русского языка отражаются, в частности, в лирике И. Иртеньева. Поэт использует и обыгрывает стилистически разноплановую лексику, создаёт или

расширяет коннотативные значения имён собственных, наполняет современную поэзию прецедентными текстами.

Целью исследования является анализ имён собственных в лирических произведениях И. Иртеньева (сборник «Жанр кризиса», 2015).

Разного рода онимы широко применимы в поэзии для создания художественного мира автора: топонимы, теонимы, эргонимы и т.п., однако «имена собственные, в комплексе с языком и стилем произведения, занимают особое место в системе художественно-изобразительных средств, служащих для выражения авторского замысла» [4, с. 133].

Стихотворения поэта-«правдоруба» Иртеньева освещают злободневные темы российской действительности, в описании которых невозможно опустить имена известных российских политических деятелей с **ироническим подтекстом**, например: «...*Пароход „Владимир Путин” / Погружается на дно...*» [2, с. 147], где автор обыгрывает социокультурную, экономическую и политическую нестабильную ситуацию в России с отсылкой к трагедии подводной лодки К-141 «Курск», которая также «погрузилась на дно» в 2000 году. В строках «*Ведь при всей комичности лужковской, / При его фантазии дурной / Было видно – это наш, московский, / Плоть от плоти. Однокоренной*» [2, с. 32] отражена рефлексия автора относительно Ю. М. Лужкова, который на протяжении 18 лет занимал пост мэра Москвы, и в словосочетании «комичности лужковской» отождествляет комизм с чертами характера и периодом правления мэра. И. Иртеньев использует **квалитативные имена** со значением любой субъективной оценки, образованные от полной или сокращенной основы для усиления экспрессивности, акцентирования внимания: «*Что-то вроде Меншикова Сашки – / Та же страсть к заморской новизне, / Те же неформальные замашки, / То же непочтение к казне*» [2, с. 32], где автор употребляет разговорную форму имени с суффиксом -к- (Сашка), образованную от сокращённой основы, и выражает отношение к исторической личности А. Д. Меншикову (сподвижнику Петра Великого, крупнейшему государственному деятелю первой трети XVII в.), сравнивая с ним политика Ю. М. Лужкова, который является современником писателя. В контексте поэт косвенно отождествляет этих политических деятелей, одновременно указывая на их индивидуальность и иронизируя по поводу сходства. В текстах поэта также встречаются случаи, когда использованы поэтонимы с **усечёнными суффиксами**: «*Но никаких там райских куц / И близко не видал. / Не зря, наверно, мудрый Хруц / Хохлам его отдал*» [2, с. 140]. И. Иртеньев, как поэт-иронист, использует часто «антисовковский» пафос, обращаясь в текстах к реалиям периода СССР. В стихотворении «Крымские напевы» автор размышляет над тем, что полуостров Крым является объектом территориальных разногласий между Россией и Украиной. Используя сленговое «*Ещё когда-то при совке...*» – поэт подчёркивает продолжительность конфликта, и также с помощью игры слов («*мудрый Хруц*») указывает на то, что в 1954 году Первый секретарь ЦК КПСС Н. С. Хрущёв издал указ о передаче Крымской области УССР.

Таким образом, сатирические тексты И. Иртеньева в большинстве своём обращены к читателям с советской и постсоветской языковой картиной мира. Он часто использует прецедентные тесты и в частности прецедентные имена собственные, которые наполняют его произведения различными аллюзиями. Тем самым автор воссоздаёт чаще всего исторические события, которые иронически обыгрывает, преобразует и трансформирует при помощи современных языковых средств (усечения суффиксов, использования качественных имён, игры слов и семантики и т.д.). Используемые реальные имена в произведениях принадлежат к нескольким понятийным сферам в разных временных отрезках: мировая культура и политика. Иртеньев – приверженец строгой силлаботоники и его излюбленным метром является четырёхстопный ямб. Для сохранения такого ритма автор часто прибегает к трансформации единиц текста, тем самым придерживаясь также определённой рифмы, и порой не сохраняя смыслы в новых культурных, языковых и литературных условиях.

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### Сравнения в сборнике Н. В. Гоголя «Вечера на хуторе близ Диканьки»

Наиболее простым языковым средством образности является сравнение. Его образная сущность состоит в сопоставлении двух или нескольких названных словами явлений, действий, качеств, имеющих близкие или одинаковые признаки. Многие писатели используют данное художественное средство в своих произведениях. Оно является излюбленным средством изобразительности Н. В. Гоголя.

Цель нашей работы – исследование сравнений в сборнике Н. В. Гоголя «Вечера на хуторе близ Диканьки».

В своих ранних повестях писатель использует такие структурно-грамматические типы сравнений: 1) сравнения, выраженные сравнительным оборотом или сравнительным предложением, которые вводятся сравнительными союзами *словно, будто, как будто, как*: «...волосы её, чёрные, как крылья ворона, и мягкие, как молодой лён...», «Водка щипала его язык, словно крапива...», «...ветви дерев убрались инеем, *будто заячьим мехом*», «...мелькали лёгкие, как *будто тени*, девушки в белых, как луг, *убранный ландышами*, рубашках», «...изредка лепечут листьями, *будто сердясь и негодую*»; 2) сравнение, выраженное формой творительного падежа имени существительного: «... она ещё в позапрошлый четверг *черною кошкою* перебежала дорогу»; 3) сравнения, выраженные прилагательными в сравнительной степени в сочетании с формой родительного падежа именных частей речи: «... это животное *проворнее* всякого *франта* в чулках ...», «Поди прочь, у тебя руки *жёстче железа*», «Водка ... казалась ему *горше полыни*».

Многие сравнения у Гоголя являются развёрнутыми. Существительное в них распространяется другими словами (прилагательными, существительными, местоимениями). Это делает картину, создаваемую писателем, более образной и конкретной, например: «...у него висел хвост, такой острый и длинный, как *теперешние мундирные фалды*», «Чуб в это время вылез из мешка и стал посреди сеней, потягиваясь, как человек, *только что пробудившийся от долгого сна*».

Сравнения у Гоголя выражают разные эмоциональные оценки. Неодобрительное отношение говорящего к референту, его поступкам выражено, например, такими сравнениями: «...полковники и есаулы грызутся, как *собаки*, между собою», «...тебя женить пора, а ты дуреешь, как *молодой лошак*». Другие сравнения выражают восхищение говорящего, например: «... стоит, как *царица*, и блестит черными очами!», «Дивились гости белому лицу пани Катерины, чёрным, как *немецкий бархат*, бровям».

Сравнения являются ярким экспрессивным средством. Художественный образ, используемый для сравнения, придаёт описанию особую выразительность. Н. В. Гоголь использует сравнения при описании внешности человека, для характеристики поведения героя, его физического и эмоционального состояния, переживаний. Употребляются сравнения и в описаниях природы.

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### Метафора в письмах М. Цветаевой Б. Пастернаку

Полифункциональность метафоры ярко проявляется в эпистолярном тексте, обогащая письменную речь автора. Учитывая когнитивную природу метафоры, причина её возникновения в тексте обусловлена поиском новой словесной формы для описания явления, наделения его определенными качествами. В нашем исследовании была поставлена задача изучить метафорические высказывания в письмах М. Цветаевой, адресованных Б. Пастернаку [1], определить типы метафорических переносов, описать семантические модели и стилистические функции метафор.

Весь массив метафор в переписке М. И. Цветаевой с Б. Л. Пастернаком сводится к нескольким направлениям, областям её использования, в частности таким, как **эстетизация бытовой жизни**: *накапает большое письмо* (с. 231), *вырвать клочок бессмертия у жизни* (с. 247), *Чехию я изжила* (с. 214), *буду одурять себя ходьбой* (с. 243), *кипеть в быту* (с. 111), *дала письму остыть* (с. 13); **наделение адресата дополнительными характеристиками**: *ты сведение всех слоёв внутреннего* (с. 239), *Борис, мой абсолютный слух!* (с. 243), *ты моя единственная проверка: слуха* (с. 153), *Я вас чувствую главой поколения* (с. 107), *ты мой слух и зрение в России* (с. 156), *ты – душа. Лицо души* (с. 175); **область авторской концептосферы**: *это письмо – перелом гордости, гордость – хребет* (с. 110), *мои черновики – белейшая скатерть* (с. 111), *все письмо – один вопль* (с. 157), *душа растёт* (с. 155), *гора – это прежде всего мои ноги... моя точная стоимость* (с. 194), *встреча для меня – расправа, удар в сердце* (с. 187), *ваша книга – ожог, та – ливень* (с. 36). Отдельно укажем **авторрефлексивные метафоры**: *океан я* (с. 137), *я у тебя наболела* (с. 239), *я пламень и камень* (с. 168), *я – народ* (с. 104), *я была нянькой при поэтах* (с. 32).

Чаще всего метафорическое значение у наименований предметов развивается по модели переноса с неживое на живое, приёмом олицетворения. Относительно живых существ, мы прослеживаем обратный процесс – использование овеществляющей метафоры. Нередко автор прибегает к механизму опредмечивания в случаях, когда автору необходимо описать сложные мыслительные процессы посредством более простых образов, сделать их осмыслемыми: *твое письмо звучит как тяжёлый вздох облегчения* (с. 239), *я буду молчать в тебя, расти в тебя, писать в тебя* (с. 175).

Функциональная нагруженность цветаевской метафоры зависит от тематики и тональности текста. В письмах бытовой тематики актуализируются номинативная, эвфемистическая и прагматическая функции, в изображении глубоких переживаний – экспрессивная и моделирующая. Общей для всех

типов метафор исследуемого эпистолярного текста является функция эстетическая, в то же время её можно назвать стилеобразующей.

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**Section 12 French Language Section**

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**Dynamique des Processus Langagiers**

La seconde moitié du XX<sup>ème</sup> - début du XXI<sup>ème</sup> siècle est caractérisée par la croissance rapide de la communication de masse et des nouvelles technologies d'information. Le développement dynamique des médias traditionnels - presse écrite, radio, télévision, l'émergence et la diffusion du World Wide Web (Internet) a conduit à la création d'un espace d'information unique, un environnement virtuel constitué de nombreux flux de médias. Tout cela ne pouvait qu'affecter les processus de production et de diffusion de la parole, les particularités de l'utilisation des mots et la nature des changements de langue. Le volume principal d'utilisation de la parole relève aujourd'hui de la communication de masse. Les textes médiatiques sont l'une des formes les plus courantes de la langue moderne.

Le concept d'un seul espace d'informations est essentiel pour comprendre la dynamique des changements linguistiques. Cela nous permet de présenter les activités multiformes du monde et des médias nationaux dans un système unique. L'un des concepts qui permet de mieux comprendre et présenter les caractéristiques du fonctionnement d'un seul espace d'informations est le concept de «infosphère». Le terme «infosphère» est formé par une analogie avec le terme introduit par l'académicien V.I. Vernadsky - "noosphère" (sphère d'esprit) et désigne l'ensemble de processus d'information, à la suite de laquelle un certain continuum d'informations est formé, une sorte d'enveloppe d'informations de la Terre. Ainsi, le terme «infosphère» définit avec le plus de succès la couche d'information créée et gérée par les médias, qui consiste en un ensemble infini de textes médiatiques produits et distribués quotidiennement.

Le concept d'infosphère permet de mieux comprendre les caractéristiques de l'organisation de l'espace d'information, les lois du mouvement des flux d'informations, ainsi que de présenter une image globale de l'information du monde en dynamique. Également associé au terme de science naturelle «atmosphère» (enveloppe aérienne de la Terre), le concept d'infosphère permet d'utiliser des paramètres aussi pratiques que la transparence, la conductivité, la pollution, etc., pour décrire les processus d'information, ce qui nous rapproche progressivement le concept d'écologie des médias.

Finalement, la composante structurelle la plus importante de l'infosphère est l'espace linguistique et culturel. Compris comme l'aire de répartition d'une langue et d'une culture dans le paysage médiatique mondial, le concept d'espace linguistique et culturel vous permet de démontrer la discordance réelle entre les frontières d'un territoire, d'un État et celles d'un domaine d'influence.

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### **Observation, déduction, interprétation: compétences basiques en Sciences de la Terre**

Les Sciences de la Terre, comme toutes les autres sciences naturelles ont l'avantage de mêler observation, déduction et interprétation. L'essentiel du travail d'un chercheur est d'analyser et de quantifier des résultats obtenus en laboratoire. La partie la plus divertissante et la plus importante relève de l'observation sur le terrain.

L'observation est donc à l'amont de toutes démarches d'investigations, c'est l'observation qui permet le questionnement sur ce qui entoure l'homme sur Terre comme dans l'espace. Pour compléter une formation universitaire en sciences de la Terre, ou géosciences, cette notion d'enquête et de questionnement sur l'environnement est à valoriser. Par ailleurs, il est privilégié dans certains cursus et diplômes.

Les études au sens le plus formelle du terme, visent à acquérir les connaissances qui permettent de traduire l'environnement, mais les compétences, elles, s'acquièrent sur le terrain, une manière de se poser les bonnes questions, avoir les bons réflexes de savoir où regarder pour trouver telle ou telle chose. Cette notion d'observation dépend donc uniquement de l'observateur, cela ne va s'en dire. La curiosité pour la nature ou l'univers est une des qualités nécessaire à la science.

Pour pallier à ce besoin de savoir, les institutions culturelles - musées, planétariums, sites naturels - sont des lieux qui permettent les questions et les dialogues.

Pour ma part, ayant travaillé en tant qu'animateur au planétarium, j'ai fréquemment pu rencontrer des personnes, enfants, non scientifiques et pourtant intéressé par ce qui les entoure. Mon travail était à mon sens de les pousser à toucher du doigt le raisonnement scientifique que même les plus anciens sages avaient. Aristote, Euclide, Galilée, pour ne citer qu'eux. Aimant la nature, j'ai rapidement pris du plaisir à sortir de chez moi et d'observer les paysages et de comprendre leurs formations. C'est la base de la géologie.

C'est pour cela que ma conclusion se base sur l'encouragement les néophytes des sciences comme aux plus aguerris de ne pas hésiter et de profiter de ce que la nature nous offre, nous cache et nous donne le plaisir à contempler sur cette Terre comme sur d'autres.



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### **Le rôle du français en tant que plateforme pour la carrière**

Actuellement, les compétences en langues étrangères sont essentielles pour avoir accès aux opportunités professionnelles: communiquer avec les locuteurs natifs d'autres langues, étudier les ressources internationaux, se développer et évidemment pour trouver un bon travail. Vous aurez un avantage parmis d'autres candidats, en connaissant des langues étrangères.

Tout d'abord, on parle de l'embauche. Maintenant, si on a l'expérience et si on est un spécialiste excellent, il est probable de trouver un poste prestigieux. Le monde ne reste pas immobile, mais change constamment, de façon permanente et dynamique. «Il faut courir le plus vite possible pour rester en place, mais pour aller quelque part, il faut courir au moins deux fois plus vite!». Cette citation populaire d'«Alice au pays des merveilles» de Lewis Carroll décrit parfaitement l'état actuel des choses. C'est nécessaire d'améliorer toujours vos compétences, de vous engager et de savoir “vous vendre” en face d'un employeur.

Aujourd'hui, près de 300 millions de personnes dans le monde parlent français. Le français c'est la langue de 68 pays. C'est la langue de la communication internationale et celle-ci est activement utilisée dans le monde moderne des affaires. Les personnes qui veulent réussir en affaires doivent maîtriser le français des affaires si elles ont envie de travailler avec des partenaires de la France, de la Suisse, de la Belgique, de la province canadienne du Québec et de nombreux pays africains.

Ensuite, on raconte les possibilités de la connaissance des langues étrangères, en particulier du français. En qualité de futur entrepreneur, on dit qu'il y a la multitude d'entreprises françaises en Ukraine, comme les compagnies agro-alimentaires, les banques ou les hypermarchés. Dans mon cas à moi, j'ai eu l'occasion de m'entretenir avec des représentants de la chambre de commerce d'industrie de ma ville natale, Dnipro, et de créer des liens pour exercer avec eux à l'avenir ou pour un travail à part entière. Tout cela est accessible pour les autres entrepreneurs qui parlent français couramment. Grâce au niveau du français qu'ils possèdent, ils auraient la possibilité de communiquer directement avec les représentants des entreprises françaises.

Pour conclure, on peut dire qu'on doit apprendre les langues pour soi-même et cela ne soit pas superflu. Comme Goethe a dit, "combien de langues vous connaissez, autant de fois vous êtes une personne". Je me permets de reformuler la citation du génie en disant “combien de langues nous connaissons, autant d'opportunités sont ouvertes pour nous”.

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## **Formation et comparaison des registres fonciers de l'Ukraine et de la France**

Le cadastre terrestre français est l'inventaire le plus complet des pays européens. Il représente un système cohérent de comptabilisation de la quantité et de la qualité des terres à des fins fiscales. Le gouvernement français a commencé à reprendre le cadastre en 1925. Depuis 1953, le pays a connu un renouvellement régulier du cadastre conformément aux exigences modernes. Le renouvellement et l'inspection du cadastre reposent sur le service d'état permanent de la propriété foncière, qui comprend les départements central, régional et départemental.

Le processus d'enregistrement foncier en France prévoit la résolution de trois groupes de tâches: techniques (rédaction de plans cadastraux), foncières (identification et description des parcelles, établissement de leurs propriétaires), taxes (évaluation foncière et évaluation foncière foncière). La principale unité d'évaluation du cadastre français est la parcelle. La parcelle est divisée en terres agricoles, ainsi qu'en parcelles occupées par des bâtiments, des entreprises industrielles et commerciales. L'exception concerne les terres du département militaire, les rochers, les marécages, c'est-à-dire les terres qui ne génèrent pas de revenus.

En ce qui concerne l'Ukraine, la formation d'un système cadastral moderne s'est faite principalement sous l'influence de la réforme agraire en cours depuis 1991. Au cours des premières années de l'indépendance de l'Ukraine, le cadastre foncier d'Etat a largement hérité des approches "soviétiques" en matière d'enregistrement des terres et de la technologie "papier" de la documentation. Depuis 2003, pour remplir le cadastre des terres de l'État, les informations sur les terres ont été diffusées pour la première fois par voie électronique.

La "Révolution" dans la comptabilité du cadastre foncier a toutefois eu lieu en 2013, lorsque la loi ukrainienne "Sur le cadastre", adoptée en 2011, peut être considérée comme plutôt progressive même après l'entrée en vigueur des normes des pays développés. La loi prévoit également que les informations du cadastre foncier sont sujettes à la divulgation publique sur Internet.

Un problème le plus grave réside dans le fait que les organes de l'État chargés de la gestion du cadastre foncier ignorent souvent les exigences de la législation, s'ils les considèrent "défavorables" du point de vue des intérêts des ministères. Par exemple, malgré la demande directe de la loi, les droits sur les parcelles enregistrées avant 2013 n'étaient pas transférés du cadastre foncier au registre national des droits immobiliers et à leurs gages.

Pour conclure, le cadastre terrestre en Ukraine est une structure jeune, mais déjà bien structurée, qui traverse les sentiers du "tâtonnement", mais qui avance. En France, ce système est plus parfait en raison de son âge plus respectable. L'Ukraine

doit prendre en compte et adopter l'expérience de la France en matière de développement du cadastre et des relations foncières en général.

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### **L'influence de l'Arabe sur les autres langages**

Tout d'abord la langue est une chose vivante, qui évolue quotidiennement depuis que le langage existe, au gré des usages, besoins et apports des autres civilisations et cultures. Quelle que soit la domaine - d'alimentation, de la mode ou encore de l'art, l'influence arabe sur la langue française est bien réelle.

En outre, ces deux langues ont une histoire commune. C'est à partir du 18ème siècle que l'arabe a donné de nouveaux mots à la langue française grâce à Al Andalus, l'Espagne musulmane. Par ailleurs, pendant la période d'installation française au Maghreb, les français utilisaient des mots usuels de l'arabe pour communiquer avec les habitants de la région. Dès le réveil, *tasse de café* avec *sucre* dans une main, jus d'orange dans l'autre, une évidence s'impose: nous parlons tous arabe sans le savoir. Même des langues comme l'anglais, qui a relativement eu peu de contacts directs avec l'arabe, a emprunté beaucoup de mots arabes. La France a reçu également un certain nombre d'apports en ce qui concerne les noms de vêtements : satin, jupe, mohair, gilet .

A la fois langue de l'Islam est un support de culture et d'apprentissage pendant cinq derniers siècles, l'arabe est entré en contact avec plusieurs autres langues. Les croisés européens de différentes origines linguistiques ont interagi avec les Arabes et les mots acquis sont relatifs à l'alimentation, l'habillement et d'autres aspects de la vie quotidienne. Les mots suivants illustrent l'étendue de l'impact culturel et l'influence linguistique que la langue arabe a eu sur l'anglais : *admiral*, *alcohol*, *alcove*, *algebra*, *algorithm*, *almanac*, etc.

Enfin, notons que la langue arabe a eu un impact considérable sur différentes langues, en particulier pour l'anglais et pour le français. Et aussi, la plupart de ces mots sont utilisés dans le langage de tous les jours, dans divers domaines d'activité.

## **Section 02 Sustainable Management of Ecology and Land Use**

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### **Enhancing the efficiency of the state environmental protection as a condition for sustainable socio-economic development in Ukraine**

Environmental protection, rational use of natural resources, provision of ecological safety of human life is an indispensable condition for the sustainable socio-economic development of any country. The problem of the interaction of human society and nature has become one of the most important problems of our time. The situation, which is formed in relations between man and nature, in many cases becomes critical. Rapid industrial progress is increasing the pollution of the environment, the destruction of natural systems, the depletion of natural resources.

In Ukraine, the present ecological situation has a sign of crisis. The economy of our country is characterized by a high proportion of resource-intensive and energy-intensive technologies. The low level of environmental consciousness of the society has led to significant degradation of the environment of Ukraine, excessive pollution of surface and groundwater, air and land, reduction of fertility and increased mortality, which threatens the extinction and biological and genetic degradation of the people of Ukraine. Therefore, due to the deterioration of the environment, it is necessary to pay attention to the procedure of state environmental protection, which is associated with organizational and technical measures to improve the ecological state of Ukraine.

The environment is a complex of all objects, phenomena and processes external to this organism, population or a combination of organisms. Interaction inside the complex is carried out through the cycle of substances. The environment is characterized primarily by concentrations of chemical compounds that are consumed by living organisms. The environment interacts with the environment, that is, the environment in which living organisms do not function. [1].

Natural environment, being influenced a little by anthropogenic factor, is an aggregate of natural conditions of the existence of human society, animal, plant and other organisms, which, however, constantly experience the direct or indirect influence of mankind, which is associated with economic activity. The natural environment is the source of the most important natural resources, such as biodegradable soils, water, minerals, heat carriers (oil, gas, coal, uranium, peat), which ensure the existence and development of the biosphere [2].

The notions «environment» and «natural environment» do not coincide in content. Environment includes the social environment, but the notion of «natural environment» excludes the part of the biosphere that is radically transformed into objects of economic activity, that is, belongs to the technosphere.

From the above definition of the term «environment» it follows that the state of environmental protection is determined by the state of protection of society and the natural environment.

In Ukraine, the Law «On Environmental Protection», which provides certain rights and obligations for citizens in the field of natural resources, is in force. So, regardless of whether citizens are natural resources users or not, they are obliged to protect nature, rationally use its reserves, and do not harm. [3].

Thus, the fee for special use of nature is established on the basis of payment standards and limits on the use of natural resources. These standards are determined taking into account the proliferation of natural resources, their quality, the possibility of use, location, the possibility of processing and storage of waste. In addition, subjects of special environmental use are required to pay certain funds for pollution of the environment. [4].

Control in the field of nature use and environmental protection is carried out through inspection, supervision, inspection, inventory and expertise. It can be carried out both by authorized state bodies and by public organizations. The Council of People's Deputies, state administrations and the Ministry of Environmental Protection are in charge of state control. [5].

Thus, the state task is the issue of ecologization of public life, people's consciousness, industrial production, an effective and consistent system of state regional and local measures aimed at introducing qualitatively new resource-saving, environmentally safe types of equipment and technology into practice. In Ukraine, the protection of the natural environment should be considered as an independent political and socio-economic task.

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# **Розширюючи обрії**

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