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Також приділено увагу сучасному законодавству, спрямованому на вирішення цих проблем. Матеріали згруповано у розділи, що відповідають секціям форуму і відображають сучасні тенденції та інноваційні розробки молодих учених, представників різних країн світу в різних галузях економіки.

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Section 01 Actual Problems of Economy and Sustainability of Economic Development

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Neuromarketing

In order to understand how a consumer's brain works during making a purchasing decision a new marketing field has been discovered - neuromarketing.

According to Victoria Phan: "Neuromarketing is an emerging branch of neuroscience in which researchers use medical technology to determine consumer reactions to particular brands, slogans and advertisements" [4]. While traditional methods of marketing research use surveys, interviews or focus groups, where people consciously report on their experiences and thoughts, the unconscious side of consumer behaviour is often not taken into consideration. Neuroscience has the potential to understand the unconscious drivers of choice.

Marketers should precisely understand how brands affect customers' minds, so that a company could be able to apply neuromarketing in their promotion strategies.

The first stage is representation and attention. This includes the motivations which initially drive the customer to the product and bodily responses.

The next stage is the predicted value. During this stage an outcome is expected, which could be either positive or negative.

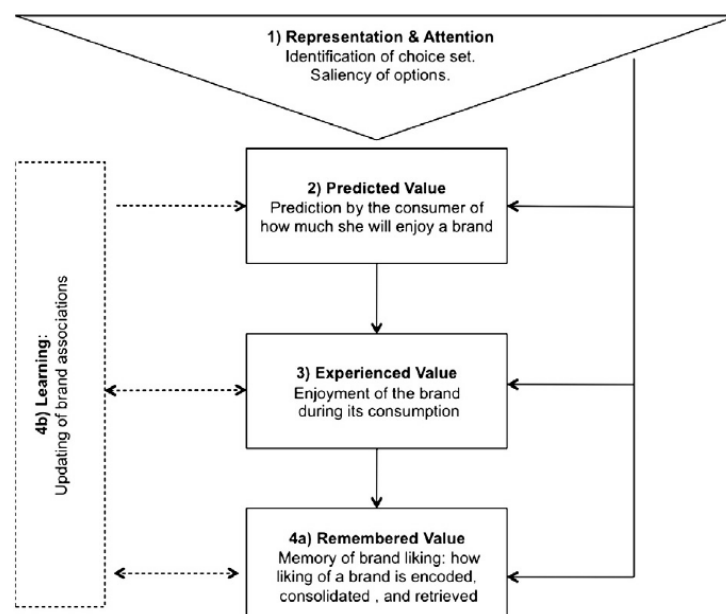


Fig.1 A model of decisions and branding effects

The third level is experienced value, and it is the stage when customer is experiencing the product. Consequently, based on the predicted value and

experienced value the brain forms memories of the product and associations to its brand, which is the final stage and is called remembered value.

As neuromarketing provides large amount of useful data about consumers' reactions and feelings towards the product, there are several ways how marketers can use it to their advantage.

Observing consumers' brain reaction helps in testing advertisements. While it is common to test advertisements in focus groups, brain scanning can provide much more accurate information as reactions in different brain areas can be easily seen. Therefore, this research could reveal whether the customer is pleased, upset, excited, bored etc.

Neuromarketing contributes to better segmentation. Marketers can see the consumers that have more vivid reactions and impulses in their brains while testing a product or watching an advertisement, and then a company could identify those people as their target audience.

The main tools of neuromarketing research are eye-tracking, computational neuroscience and brain imaging such as EEG (electro-encephalogram) and fMRI (Functional Magnetic Resonance Imaging). fMRI is considered to be the most popular brain-imaging technology in marketing research as it produces clear images of real time brain activity.

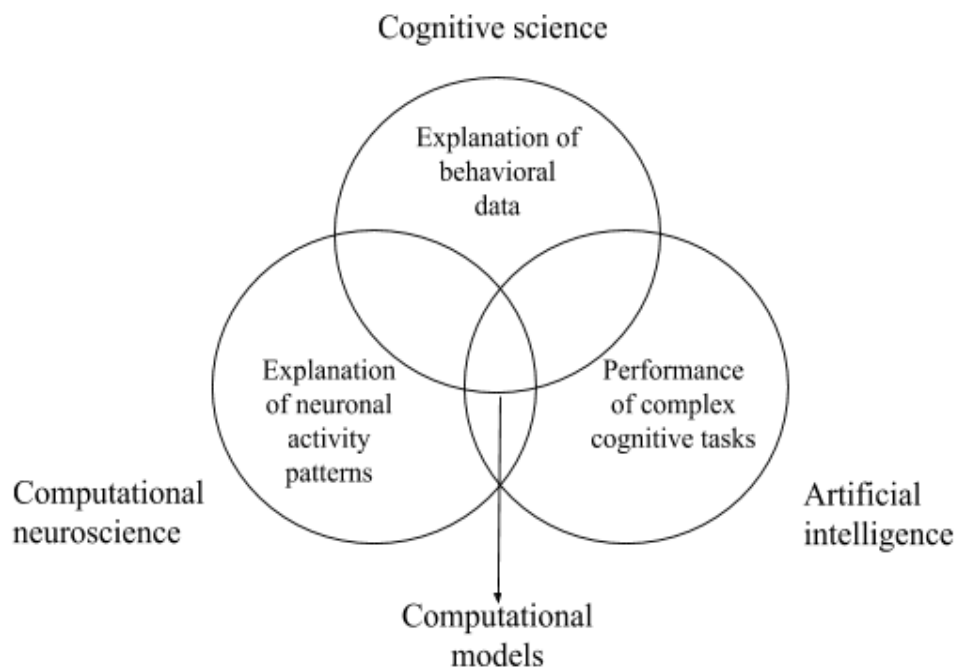


Fig.2 Constituents of computational neuroscience

Computational neuroscience is an interdisciplinary science the purpose of which is to explain in terms of the computational process how biological systems that make up the nervous system produce behaviour. This science connects neurobiology, cognitive science and psychology with electrical engineering, computer science, computer engineering, mathematics and physics. Computational neuroscience seeks

to build biologically and functionally adequate models of neurons and nervous systems, taking into account their physiology and dynamics. These computational models are used to build hypotheses that can be verified by staging biological or psychological experiments.

Eye-tracking technology detects exactly where consumers look while standing in front of a product stall or observing an advertisement campaign. This technology indicates what grabs consumers' attention, what confuses them and measures the speed of a recognition of a particular brand. This technology is usually used in marketing research the purpose of which is the improvement of packaging, a website design, or an advertisement. The main advantage of this technology is the fact that it is relatively inexpensive and easy to administer.

fMRI machine works by detecting blood flow in the brain associated with the increased neural activity. It is more useful in indicating detailed emotional responses of customers, which is why it is mostly applied with pricing decisions and branding improvement.

Another brain-imaging technology called EEG records electrical signals on the scalp from neurons inside the brain. It is able to detect the level of customers' engagement and detect neural responses in different parts of the brain. EEG is less accurate than fMRI brain-imaging, but it can measure changes in shorter periods of time.

The researchers tried to identify specific neural responses that would predict subsequent customer's choice by using fMRI technology [1]. A product was initially presented to the participants for four seconds. After that, they were shown a specific price for the product for four seconds. For four final seconds they were given the option to choose whether to buy the product or not for that given price. Prior to the study initiation they were given an amount of money that they could spend or save during the trial.

After the experiment, the researchers were able to go back to the data and look at the time of the product presentation, the price presentation, and finally the choice execution.

During the first four seconds they found that the strong reactivation in a particular part of the brain, the nucleus accumbens, part of the basal ganglia, was related to subsequent choice. The more activation they found in this particular part of the brain, the more likely it was that people would subsequently buy the product. Stronger activation in the other part of the brain, the insula, that is responsible for emotional responses, was related to longer likelihood of purchase. Finally, at the time of making the choice, stronger activation in the medial prefrontal cortex was predictive of choice.

The crucial aspect in the research was that the researchers also asked people when they felt like actually making the choice, and people responded that it was during the four last seconds.

The conclusion is that by using fMRI brain-imaging technology researchers were able to predict product choice 8 to 12 seconds prior to the actual decision making.

The neuromarketing research continues to expand and provide insights to the important questions like how consumers feel and what they think when they are buying or interacting with products. Brands typically apply neuromarketing to improve their campaigns, messaging and positioning.

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The economic effects of refugee return

Doubtless, the importance of the return issue in advanced countries is underscored by the surge of refugees into Europe and the political cleavage between those who oppose their entry in the first place and want them returned at the first opportunity, and those who welcome them and support their integration.

The paper addresses a relatively narrow aspect of the return question: is it in the *economic self-interest* of advanced countries to return forcibly displaced persons? The overall objective of return policy would be to foster living standards and inclusive economic growth in the host country. In the best of all worlds, the return policy of advanced countries would also aim to foster development of the country of origin, and enhance the economic welfare of the forcibly displaced. The weaknesses of data on the return of immigrants are well known. However, I believe that the evidence presented below allows drawing the conclusion that the costs of hosting asylum seekers and refugees are front-loaded, while the benefits accruing from their integration into the labor market and the host economy are often significant and typically take many years to materialize. It follows that from the economic perspective their return after a short stay may represent a far costlier option than continuing to invest in their successful integration.

It cannot be denied that truly voluntary return of migrants from a rich country to a poor one is a rare phenomenon. Even when turned down for asylum and officially expected to leave, most asylum seekers do not in fact do so. The voluntary return of refugees is even less common.

One reason that returning failed asylum seekers and refugees (under the cessation clause) is rare due to the high cost of implementing forced return, which is often overlooked. According to an EUobserver probe of some 100 joint return flights coordinated by the EU's border agency Frontex, it costs €5,800 to deport one person. Of course, the price depends on the flight duration, its route, and the number of escort personnel needed.

Certainly, a refugee contemplating voluntary return confronts two critical issues, security and livelihood. Many other considerations play a role, of course, such as family links, the availability of social services, the ability and willingness to integrate culturally in the host country, and so on. Nevertheless, personal security and the ability to provide for oneself and the family are the overriding ones.

Focusing next on livelihood, how much would it take to compensate the worker who returns home to a developing country? It appears that real wages in developing countries are about $\frac{1}{4}$ those in advanced countries. Applying this benchmark, if the immigrant from a developing country is fully employed throughout their stay and their working time horizon is 25 years, the present value of the

immigrant's foregone earnings if their return is approximately \$262,000 at a discount rate of 3%. This sum is at least 10 times larger than the highest known grant offered to encourage return.

In comparison with migrants, the calculus of a refugee is somewhat different, since refugees take longer to integrate in labor markets than typical migrants and are paid less on average. However, even applying a further discount to expected earnings of 30% and even if one assumes that the refugee will immediately find a job when they return, the essential message of the calculation does not change, as the difference in the present value of expected earnings remains in the vicinity of \$200,000. As far as I am concerned, when the refugee has access to welfare benefits, as well as to health and education services, those benefits alone may be worth more than what they would earn at home.

As refugees find jobs, they have effects like those of economic migrants in terms of stimulating increased capital formation. Investment is needed to equip the new workers with machines, as well as to house them. I believe that in the long-run, refugees are likely to induce expansion of sectors such as construction and utilities (electricity, water, etc.), which are among the most capital intensive. The increased capital formation can be financed from domestic savings or from capital flows from abroad.

However, such issues as the arrival and on-streaming of large numbers of inexpensive working staff are politically controversial, but a potential positive effect on long-term economic growth is well established in development thinking.

According to its official projections, Germany, for example, will see the population decline of working age by about 30% by 2060 in a low immigration scenario. It is perhaps not surprising that, given its low unemployment, competitiveness, balanced budget, and large current account surplus Germany has been more open to the prospect of receiving refugees than other countries. However, the expansion of the capital stock implied by the arrival of new workers may not be the only way of economic growth boost. Micro-level studies suggest that migrants may also induce accelerated productivity growth by providing a disproportionate share of entrepreneurs and innovators, by taking on jobs or moving to localities where native workers are reluctant to go, and by providing a source of labor services that respond more readily to the business cycle. None of these benefits are likely to accrue if the refugee is forced or encouraged to return early in the cycle of his or her economic integration. In fact, voluntary return programs in these circumstances may not only be directly costly, but also deprive the economy of the benefits of refugee integration.

It is clear that many refugees are unskilled and the fear that high inflows of unskilled migrants will take jobs away from unskilled natives is widespread. Most – though not all – studies of the effect of unskilled migration on the wages of unskilled workers find only small negative effects, essentially because migrants boost investment but are far from close substitutes to native unskilled workers. Immigrants who do not speak the language, often cannot read and write in Latin script, have scant

social networks, and relatively low expectations, tend to get and do different jobs than unskilled natives, so compete with them only indirectly.

At the same time, unskilled migrants can reduce the price of many market services and decrease the cost of many public services. I think that an important gain that natives – whether they are skilled or unskilled – get from unskilled migrants is that they help reduce the prices of non-traded goods and services that natives use intensively, such as home care, food preparation, gardening, and construction.

Experts in this area are convinced, that the overall fiscal impact of refugee flows is likely to be small. It is negative at first as they are costly to house and support when they first arrive, and it takes some time for them to learn language and find job after getting permission to work. Since most refugees are young, studies suggest that their fiscal impact becomes positive on a cash-flow basis in less than a decade and positive on a present value basis a few years later.

After year 8, the refugee is budget-positive on a cash-flow basis and has ‘paid-back’ by year 13 or so.



It should be concluded that spending of hosting refugees are front-loaded while the economic and fiscal benefits that accrue from their eventual integration in the host economy are back-loaded and potentially significant. However, the economic gains associated with refugees will not be materialized unconditionally and the most important step to be taken is maximizing those benefits to accelerate the vetting process and allow emigrant start working as quickly as possible. As the demand for migrants is bound to increase, it makes little sense to incur the high fiscal, political and humanitarian costs associated with returning refugees resulting in illegal arrival of greater number of economic immigrants.

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Challenges and perspectives of project management in entrepreneurship

Modern economic conditions require new changes and approaches in business management, because traditional methods of production management entail a decrease in the efficiency of business activity. One of the most effective modern business approaches is project management, which allows focusing on the activities of the separate centers of responsibility. What is more, project management reduces the activity risks because project development and implementation require detailed planning. So, project management can be a relevant solution for Ukrainian enterprises to overcome any crisis and increase the efficiency of business activity.

But first, it is necessary to determine what project management is to understand its functions and the essence of the notion. According to L.E. Dovgan: «Project management is the process of managing a project team and resources using specific methods that make the project successful and allow reaching its goal» [2]. The main point of project management is to manage business goals, enabling companies to be the first among competitors, quickly respond to internal and external factors of the economic environment, save time and money. A manager must pay a particular attention to the following three points: time, budget and quality of work. Therefore, project management is a special instrument that helps manage business projects at today's pace of development and conditions.

Project management includes internal processes such as planning, organizing, executing, production controlling, and it also comprises such disciplines as computer programming, law, statistics, the theory of probability, logistics and HR management [4]. Therefore, one of the project management challenges is to provide a perfect combination of these processes.

As it has already been mentioned, the main task of project management is to achieve a specific result under certain conditions, such as time, budget, quality, and quantity. To further explore the benefits of project management, it is necessary to find out the reasons behind this process. The first is the increase in the production rate. The second is the changes in the market conditions and the amount of projects. The third reason is that project management differs in its special skills, tools and structure from traditional management. The fourth is the problem of integration during the implementation stage.

The effective coordination of business projects depends on several major factors:

- project size, cost and volume;
- complexity of project implementation;
- the number of internal and external participants of the project and their relationships;

- the need for changes inside the project: its structure, conditions, environment and necessity to respond to them quickly;
- competitors;
- leadership knowledge and skills in designating a separate project management structure.

L.E. Dovgan divides the functions of project management into basic and additional. Basic functions are responsible for project goals, and additional functions deal with the objects managed by the leaders of a certain business. That is, a project manager must manage the goals and objects of the projects [2].

Like other economic processes, project management has factors of influence. These factors are a part of the project environment. L.E. Dovgan and O.M. Filipenko mention that the environment of the project is a number of external and internal factors that influence the implementation of the project negatively or positively. There are political, economic, social, legal, scientific, technical, cultural and natural external factors. Internal factors are all the factors that relate to the project arrangement [4].

Due to the quick development of the world, 25% of entrepreneurs do not keep up with these changes and go bankrupt. For example, military industry often works at a loss and it is forced to reduce production or working places. But the experience of Germany, Japan, the United States and the United Kingdom shows that project management is one of the effective means of overcoming the economic crisis and solving industrial, scientific and social problems. This method is appropriate in the period of instability and uncertainty, because project management needs to manage time requirements, financial possibilities and product quality.

Today Ukraine has all the necessary conditions for project management implementation: change in property relations, formation of the investment project market, development of information technologies and change in the management ideology. But at the same time, there are some state-level restrictions: unstable functioning of the economy, decrease of the investment activity, insufficient development of credit and financial sphere and others [1].

Like any economic process, project management also has certain negative factors, which also influence its implementation in Ukraine:

- absence of experience among Ukrainian project managers;
- inability to create an effective team for project implementation;
- managers or other people are not interested in learning project management or do not have financial opportunities to acquire new skills;
- inability to define clearly the goals of the project;
- inability to calculate correctly the financial side of the project;
- managers are not able to manage project risks;
- inability to manage time.

These factors do not allow Ukrainian businesses to develop project management at the professional level and on a large scale. However, there are some successful examples such as NJSC Naftogaz of Ukraine, PJSC "Ukrtelecom", PJSC "Lvivoblenergo" and others. It may seem that these businesses look inert, produce

intangible products, characterized by an unfinished production cycle, which is immediately consumed, and they have high demands on the quality of communication services and uneven time loads. However, they understand that it is time to modify their organizational structure and implement new approaches to managing business processes in order to be competitive in the market [3].

Project management is a special and unique management process, because each project needs its own approach and the projects themselves are not similar. Uniqueness is manifested by the project features, parameters, structure, time, financial or resource constraints, so project management needs more research.

To develop project management in Ukraine, it is necessary to encourage present and future managers to actively study this managerial approach. That is, to be the members of associations or clubs of project management, teach project management in higher educational establishments, attend business trainings. All these measures will develop leadership and team building skills in project management to properly plan the project scope, and consider all possible limitations and risks for its implementation.

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Reasons for the slowdown of the Ukrainian economy in the fourth quarter of 2019

For the start, let's consider the definition of economic growth and its connections with different economic terms. As we already know, economic growth is an increase in the volume of output of goods and services in the considered economic system (in a country, region, world). A measure of economic growth is an increase in real GDP as a whole or per capita GDP.

Gross domestic product (GDP) is a monetary measure of the market value of all the final goods and services produced in a specific time period. GDP (nominal) per capita does not, however, reflect differences in the cost of living and the inflation rates of the countries; therefore using a basis of GDP per capita at purchasing power parity (PPP) is arguably more useful when comparing living standards between nations, while Nominal GDP is more useful comparing national economies on the international market.

An IMF publication states that, "GDP measures the monetary value of final goods and services—that are bought by the final user—produced in a country in a given period of time (say a quarter or a year). Assessing the situation of the third and fourth quarter of 2019, we can see the objective reasons for the decline in economic growth. Analysing the statistics provided by the Ministry of Economic Development and Trade of Ukraine, we can identify 4 main reasons for the slowdown in the economy.

Firstly, Ukraine remains an integral part of the industrial market in Europe. Accordingly, trade wars affected not only developed countries, but also developing ones. We can argue that among the factors that had a negative impact are negative trends in foreign industrial markets.

This year, the intensification of world trade wars was the result of a drop in industrial production in many markets, including Europe. In addition, prices for ferrous metals fell significantly - by an average of 10-15% compared to 2018. As a result, metallurgical production decreased by 3.1% per year (by 10% in December), which had the largest contribution to the overall decline in industry.

Secondly, state policy regarding seaports has changed. These changes have not yet managed to earn full force. Last year, the load on the Black Sea ports increased significantly, which was associated with an increase in the transshipment of grain, coal and metals, which reoriented from the European direction and the Azov ports. As a result, permanent bottlenecks arose both in the ports and at the entrance to them by rail and road.

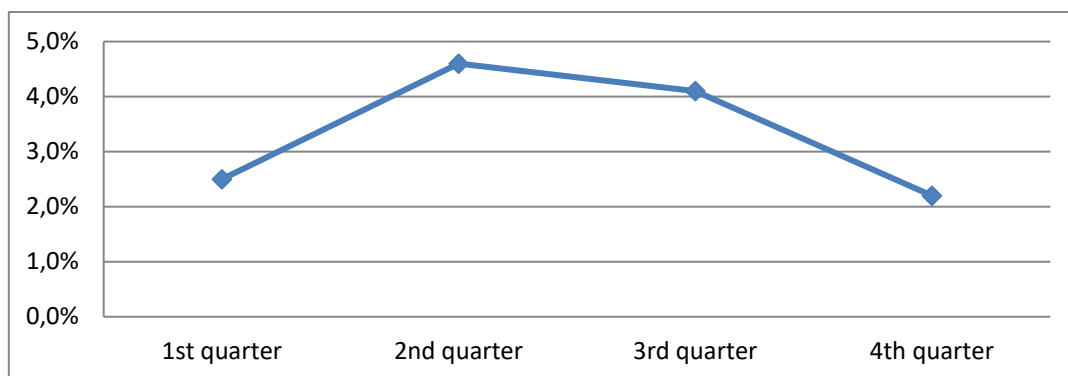
Thirdly, an abnormally warm winter took place. Its great impact on the world economy and on sensitive agriculture sector in general results in economic decrease.

What concerns Ukraine - warm weather did not contribute to economic growth either. It has become a significant factor in reducing energy demand (along with a decrease in production in the main energy consumer sectors) and a corresponding drop in the supply of electricity, gas and steam - by 4.1% (and by 15.7% in December). If we consider statistics in the agricultural sector in more detail, we can make some conclusions.

Warm weather led to an early harvest, as a result of which, in contrast to the same year 2018, the main grain harvest took place in the third quarter. And accordingly, during this period, agriculture showed good performance against a record crop, and a significant decrease in the fourth quarter. In my opinion, agriculture industry is one of those sectors of the economy you can count on and planning a budget for this sector can be done on a long time base.

Fourthly, factors were aggravated by a decrease in the price competitiveness of domestic enterprises due to strengthening exchange rate and high growth rates of wages due to high competition between employers in the labour market.

The result of the influence of these 4 factors was the minimum growth in real gross domestic product (GDP) of Ukraine in the fourth quarter of 2019, which amounted to 1.5% compared to the same period of the previous year, slowing down from 4.1% in the third quarter of 2019. We can see this statistics on a graph “GDP growth rates for 2019 (quarterly)”.



Graph “GDP growth rates for 2019 (quarterly)”

By summing up and making statistics analysis based on previous years, we can conclude that slowdowns are a common reaction to market trends. The end of last year was followed by the events having influence on global economy. Among them such examples as a trade war between China and the United States, new sanctions against Russia, the epidemic of the virus in China, the transition of Saudi Arabia to joint-stock form, the conflict between the US and Iran, and the conflict between Turkey and Syria can be listed.

Analysing these political and economic factors gives more understanding of the reasons making global economy to be so "stormy". Economic laws are considered to

be stable, substantial cause-and-effect thus creating stable relationships between economic phenomena and processes.

The economy cannot develop predictably in such a number of factors having negative affect on it. The world is strongly required to calm down and appreciate what is more profitable to live at that pace with the unknown tomorrow or plan their budgets for decades to come.

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The problem of overtourism and how it can help Ukraine

Nowadays, more and more people can afford travelling abroad and, of course, everybody has their own list of desired countries to visit. The name of places that can be heard from parents, friends, or just be found by surfing the Internet. And every souvenir taken from tourist trips reminds about wonderful places and pleasant memories.

As tourism industry is growing and developing very fast a lot of tourists can make their dream true and visit their beloved destinations. The growth comprises low-cost flights, easy AIRBNB in use, social media and some Instagram influencers whose experience demonstrates that any dream can be realized very easily. During the last 50 years the world's population has doubled thus enlarging market share.

If we consider such issue as overtourism impact, folks and citizens who have been living in the tourist destination since their birth and have grown up there, are facing the flow of the people, who just want to go sightseeing and make selfie at popular destination.

Moreover, such overcrowd causes noise and damages to the pieces of ancient architecture and make harm to surrounding environment. As a result of these negative factors citizens start hating tourists and it doesn't matter if that is just overnight traveler, excursion group or foreign full-time job employer.

Most of the tourist attractions are located in the city centers and during the tourist season, which is the whole year now, locals have to avoid most of the streets, that they used to use as the way to work, home or university. Moreover, as some small restaurants, cafes and local shops were made to close their business the government has to open more hotels, hostels and attractions for tourists. The cost of renting apartments is increasing with each passing year.

As for me, that situation causes such terrible things as racism and intolerance, not because folks do not like people, just because they are different and they do not want to accept them in their community. That happens because they have faced the problem of overtourism.

However, there are pros and cons of this phenomenon. First of all, as usual tourism it helps economy of visited country to develop and grow, get more income due to increased export and import. Secondly, it gives more job opportunities for locals, especially for students who love travelling and use such opportunity for foreign language improvement. It does increase the population and keeps its balance.

Of course, there are a lot of solutions to this problem, and one of the most popular is developing and increasing the popularity of places, that are usually not the mostly visited. One of those places is Ukraine, and for the past few years the coefficient of tourist visits has increased, but unfortunately, the tourists are aware

about only such common destinations as Kyiv, Lviv, Odessa and the Carpathian resorts.

But, I am sure, that we can develop our tourism industry and get the majority of pros from this situation. First of all, local authorities of Ukraine should improve the tourist attractions of less visited cities by financing restore activities of some old galleries, museums, parks etc. Secondly, accommodation problem should also be taken in consideration as most of the renting apartments either do not have a great location and do not meet requirements or they are located in the city center with perfect facilities, but the cost of rent is really high. We do not really have great hotels, and the main hotel in the city reminds the USSR period of history. Thirdly, tourists should be well informed about the history of our Ukrainian cities thus raising their interest to visit main historical places closely connected and associated with our glorious past.

The final step is to understand what is the city famous for and make a great ad, then share it in social media. Local authorities can sign the contract with local or better foreign bloggers, so that he/she can promote the country and cities to visit. Nowadays, Ukraine cannot boost positive image about the country and negative social opinion still prevail abroad.

To my mind, as most of eastern and central parts of Ukraine are large industrial districts, we can make this factor attractive. Dnipro city can be chosen as a great pattern for developing and implementing this idea. A lot of guide tours can be elaborated by providing visits to mines and great plants. INTERPIPE is already offering very interesting excursions. So, Ukraine as the less visited country can provide substantial help in solving such great challenge as overtourism and due to developing tourism industry and attracting more travelers, our economy will be growing and the whole situation will be improved.

It should be emphasized that tourism is a significant source of job creation, and it is projected that 2,500 new jobs will be created every day over the next five years. This is one of the few sectors of the economy where the involvement of new technologies does not lead to staff reduction. This is really important because by absorbing more labor force, tourism industry reduces social tensions in society.

The impact of tourism on the economy of the host country can be investigated by assessing the direct and indirect effects. The assessment of the economic impact of tourism is based on the costs of tourist trips. If we consider the tourist costs, we will see that the main ones are received by tourist enterprises that directly serve tourists. Part of these funds comes from economic circulation to pay for imports of goods and services consumed at the place of residence and these funds no longer play a role in the economic activity of the territory. The rest of the money is used to purchase local goods and services, cover its own energy costs, pay, taxes and more.

In each cycle of expenditures, part of the funds is accumulated, part is paid to the state in the form of taxes and they cease to circulate in the economy of a territory. 20-25% of the funds are spent by tourists in a particular area or country on additional services, souvenirs, transport, etc., some of which continue to circulate in the local

economy and the rest goes to the state and settles in local residents in the form of savings.

56 billion hryvnias, that is how much the state budget of planned revenues for January-November 2019 missed. The deficit of foreign trade in goods and services in January-October 2019 was almost \$ 10 billion, having deteriorated by 3.3% compared to the same period last year. So far, this trade deficit has been mitigated by an increase in remittances, so the current account deficit for the first 10 months of 2019 was \$ 3.4 billion.

To improve such financial situation and make things better, tourism industry should be paid more attention.

Unfortunately, current situation with COVID-19 has great impact on all business, and tourism industry is facing an unprecedented challenge. A lot of hotels and airports are closed and tourists are restricted to make trips. The tourism sector is estimated to be losing around 1 billion euro in revenue per month. According to forecasts, it will take up to 10 months for the tourism industry to return to its normal levels once the disease is under control. Domestic travel and tourism will be expected to substitute foreign tourism demand.

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Some aspects of the land market in Ukraine and the experience of other countries

The problem of the land market in Ukraine is really burning today as the issue of adopting the Land Market Law is being discussed in our country. Ukraine is on the list of five countries of the world where there is still a moratorium on the sale of agricultural land. It means that the land at the moment cannot fully belong to its owners in Ukraine, since they cannot sell it but can only rent and lease it.

According to 2019 data, 60% of arable soil belongs to large agricultural holdings in Ukraine, because medium and small farmers are not able to provide the material and technical support for land maintenance, and it is beneficial for large corporations to rent land for a relatively small fee and use it in order to get the highest profits.

When choosing the right decision about adopting the Land Law, the experience of other countries should be taken into account. To analyze some aspects of the land market that can be applied in Ukraine, two European countries have been considered: France and Poland. It is obvious that the land market of Ukraine is not identical to the markets of France and Poland, as each country has its own history and characteristics. On the other hand, it can be useful to analyse some relevant experience and mechanisms of successful land markets in the neighbouring countries.

First of all, it is necessary to clarify that an open land market is a specific market in which the purchase and sale of land shares is carried out. For example, in France, the existing land market is strictly regulated by SAFER (Society for Land Management and Rural Development). It affects the acquisition and sale of the land. Along with the above, the company has the right to acquire an agricultural parcel if it was bought for speculative purposes, or if a foreigner wants to acquire the land, but a French farmer claims it. Moreover, the minimum rental period for agricultural land in France is 9 years, while such a lease is almost automatically extended for a new 9-year period if the farmer fulfills all the conditions specified in the contract of use. French law also prohibits foreigners from acquiring agricultural land such as vineyards, which are considered the national wealth. One of the differences between the Ukrainian land market and the French one is that French farmers feel completely protected by the state, because there are certain rules and laws that are followed by everyone.

When adopting the Land Market Law, Ukraine could use some experience of France: firstly, to ease the conditions for prolonging the lease and creating new agreements; secondly, to create a society that will protect the rights of Ukrainian farmers and control the transactions taking place on the land market. Then it would be advisable for land owners to invest in new technologies for cultivating the land,

they would take care of the land condition, knowing that their business would cover costs and generate income.

No less interesting is the experience of Poland. There is also an open land market in Poland, but there are some restrictions:

- foreigners are allowed to buy land if they are married to the citizens of the country and have lived in Poland for more than 2 years;
- if foreign citizens have lived in the state for the last 5 years and received the resident status;
- the maximum property area is 500 hectares and a tax on the land sale is 2-5% of the cost. Further, the tax on agricultural land is not paid. Those tenants who have been renting a land parcel for 3 years or more have a preemptive right to purchase it.

So, having analyzed the land market in Poland, it could be recommended for the tenants in Ukraine: firstly, to approve the prerogative right to purchase land for those who have been renting it for a long period; secondly, in order to protect the land from buying up by foreign investors, it is necessary to introduce restrictions on the sale of land to foreigners, taking into account a certain period of time they live in Ukraine.

Having examined the experience of the two countries, we can conclude that the land market is an integral part of a developed state. But for the adoption of the Land Market Law, it is necessary to carefully amend the laws related to this issue and create a body that will monitor all operations carried out with the agricultural land.

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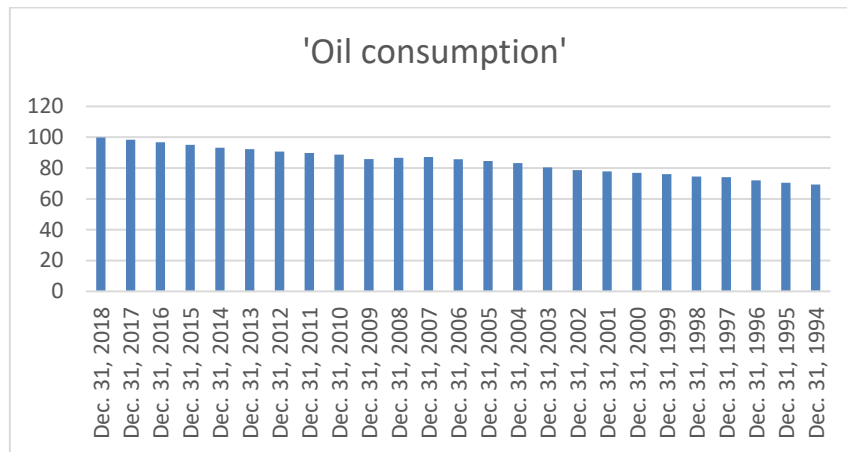
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Oil market development prospects

There is one huge market that is interesting for every country and lots of traders. So it is very important to understand how this market will develop and what is expected in the future. Firstly, let's consider data analytics. It is obvious that starting from 1994 humanity needs more oil and this trend seems to be rising. But statistics cannot demonstrate society attempts to reduce oil consumption and clear understanding of the fact how it can be reduced or increased. That is why analyzing oil demand to produce goods is required.



Almost 50% of oil is needed for gas production. That is the main product made of oil. But black gold is used to product rubber, plastic, medicine, clothes, toys, chemicals, lubricants and other industrial things. As the total number of people grows, oil will be really required even more. However, many environmentalists are concerned that petroleum products are either impossible to process or harmful substances are produced during fuel combustion. Therefore, many automakers are trying to redesign their engines to reduce emissions and increase efficiency.

	1987	2016	1987	2019
Model	Golf 2	Golf 7	Corolla	Corolla
Consumption	9,5	5	8,1	3,4

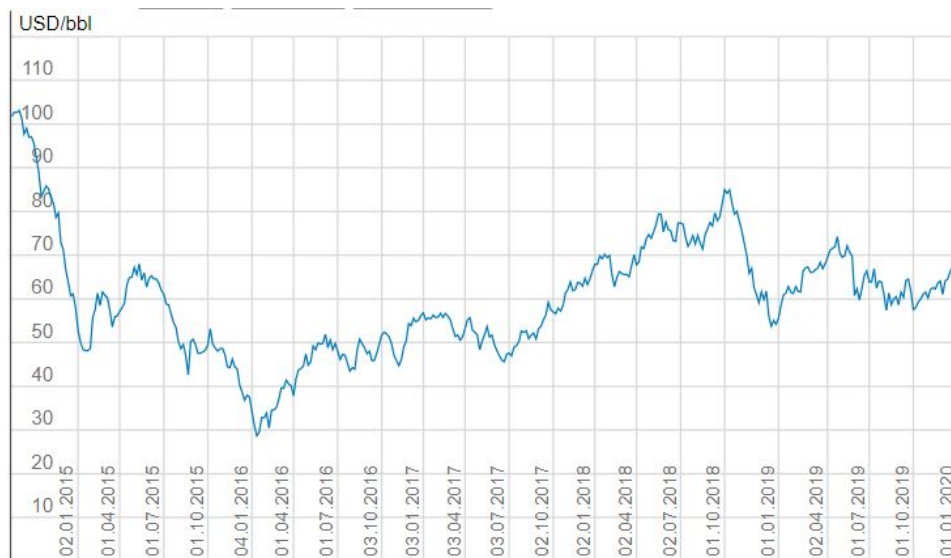
In addition, electric vehicles entered the vehicle market. Cars with batteries and electric motors do not need gasoline. It is the product that occupies half the share of petroleum products. But for the production of such a car, oil is still needed. Plastic parts, rubber products, and tires - all this in the same amount will be needed to produce new cars. Also, to produce more electricity, more lubricants are needed to service the power generation stations.

In the next 10 years, there is little chance that trucks will switch to electric motors due to the large mass of batteries and the relatively low energy consumption of diesel fuel. Businessmen are engaged in transportation, and the efficiency of each car and the ability to carry more cargo in one trip is very important for them. Switching to an electric motor can reduce cargo weight by almost 12%. This is a very big difference, which definitely leaves internal combustion engines in the field of transportation.

For the same reasons, electric motors are not yet capable of displacing engines in aviation. Weight is an extremely important indicator for providing air flights. And this means that another consumer of petroleum products remains unchanged. Although, aircraft markets, in particular, small aircrafts are also developing rapidly.

Also, large consumers of oil products are ships. Their number is growing every year. Let's consider such items as tankers for transportation or cruise liners. To operate such a heavy vehicle, unfortunately, modern electric motors are not so capable and batteries are not perfect to be used in such a case.

Experts believe that large corporations will again try to reduce costs through cheaper labor. The transfer of production is expected in Africa. The development of African countries will mean an increase in local demand for cars and motorcycles. And since they do not have a developed infrastructure for electric cars, their cars will probably consume gasoline or diesel. This is sure to result in increasing oil demand. But at the same time, there is a large and strong movement of eco-activists, which may require investors to develop precisely the electro-infrastructure.



Oil consumption is also affected by its price. When oil rises in price, many companies invest more actively in research for the invention of alternative materials, moving away from dependence on oil. The state also affects oil consumption. Restrictions on the production and sale of plastic bags also led to lower oil consumption. Promoting a healthy lifestyle and rejecting synthetic tissues reduces consumption.

It is difficult to make accurate prediction in terms of oil volume required for the future and it cannot be unequivocally stated that more or less oil will be needed.

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American employee motivation system and its implementation in Ukraine

The development of a personnel motivation system at an enterprise is a priority task for modern managers who seek to organize the most efficient work process of their company.

In Ukraine, the concept of “labour motivation” appeared relatively recently as a result of economic reform. Labour motivation is the central task of developing strategic of personnel management. The lack of a theoretical basis for conducting this process causes uncertainty and prompts appeal to world leaders.

Three strongest schools are known in the world management practice: the American school, the Japanese school, and the European one.

The American model is built on promoting entrepreneurial activity and rewarding the most active part of the population. The model is based on the socio-cultural characteristics of the nation - a mass orientation towards achieving personal success for everyone as well as the high level of economic well-being.

To determine the correspondence of the employees’ work efficiency and the size of their salary, the Pay for Performance (PFP) system is used. Remuneration depends on individual and group differences in the performance of activities [4].

Five widely used types of flexible payment systems are shown below (Fig. 1).

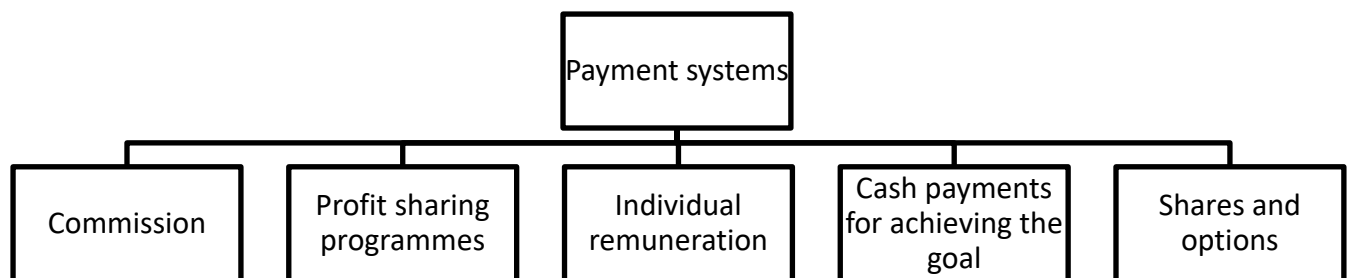


Figure 1. Flexible payment system types

Commission is the simplest and at the same time the oldest PFP scheme: the employees receive a certain percentage of the amount of customers’ pay.

Cash payments for achieving the goals is the most common type of PFP plan (used by approximately 61% of companies that use PFP). Such bonuses are generally awarded when the employee meets certain predetermined criteria.

Special individual remuneration in recognition of the value of an employees implies special bonuses paid to employees.

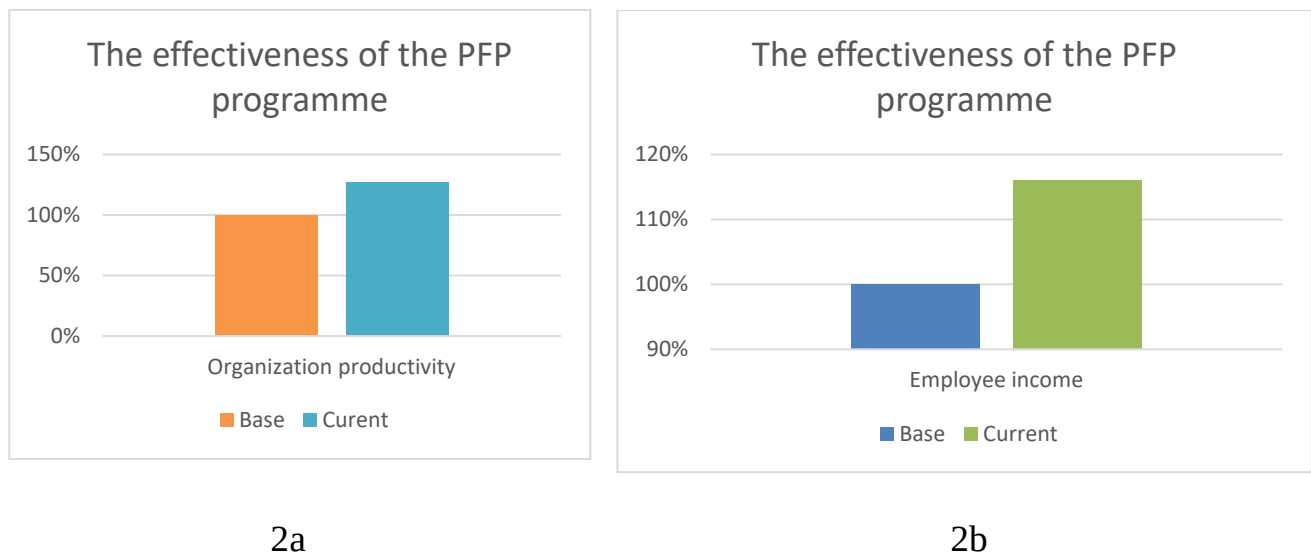
With the profit sharing programmes employees receive a certain percentage of the company's profit.

For shares and options payment system the board of directors of the company make a decision on granting the employees a certain number of shares free of charge, or simply on granting them the right to acquire a package of shares of the agreed size.

To effectively apply this method, the following should be considered:

- assessment of organizational culture using PFP;
- analysis of the market situation: in addition to compulsory knowledge of the average market salary of specialists, the company should separately encourage employees who have the skills that are urgently needed at the moment;
- efficiency of action (without delay in payments; regular analysis existing PFP plans);
- awareness of the long-term nature of implemented programmes. PFP is not a one-time way to increase motivation, but a long-term investment in human resources.

Figures 2a and 2b illustrate the effectiveness of the PFP programme. According to some reports, a typical PFP programme increases organizational productivity by 5–49%, and employee income by 3–29%. Employees get the opportunity to earn more money provided that they have a good job. The company receives motivated employees: people try to do more.



Figures 2a, 2b. The effectiveness of the PFP programme

There are points that are criticized by PFP. However, the majority of this criticism is directed not at the system, but at unsuccessful methods of its application.

Non-financial rewards are all non-payment methods that companies use to reward their employees [5].

The following systems are the most common:

- schedule benefits: providing the employee with a flexible work schedule, the system of "bank of non-working days";
- payment of employee non-working hours: holidays and vacation, period of temporary disability;
- material non-financial rewards: gifts as a symbol of the employee's importance for the company, payment of medical insurance and discounts on the purchase of company products.

Some examples of effective application of American motivation system are presented below:

1. Interesting titles for posts. Creative staff motivation was used by Steve Jobs. He changed the title of office consultant to "genius".
2. "Animal" work. Airbnb, an online rental company, allows employees to bring pets to the office. The management considers this staff motivation to be effective, as workers worry about pets when they are not nearby, and this distracts them from work.
3. 20% of the time for third-party projects. Until 2012, Google had a rule that allowed each employee to spend up to 20% of their work time on any tasks that were interesting to them and were not related to their work responsibilities. Some of these hobbies subsequently turned into the largest divisions of Google, for example, the Gmail email service or the AdSense contextual advertising service.

The methods described are implemented in Ukraine, for example, company events, the material non-financial rewards. Remuneration system in Ukraine needs to be improved. Being on the sidelines of incentive schemes leads to the lack of interest in the dynamic development of the company. In order to obtain the greatest result, it is preferable to apply various methods of staff motivation, rationally introducing them into work process, and the effectiveness of the functioning of the motivation system will be determined not only by the impact on employees of organizations, but also by its relevance and viability for the long term.

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Factors for improving the dynamics and volumes of FDI in Ukraine

Any kind of investments as well as foreign and internal investors play an important role in the formation of the economies of the world. Independently of the level of economic development, any state seeks to attract foreign capital, receiving direct and indirect effects from investment deposits. We can not agree with the statement that economic growth stipulates in some way significant volumes of investments. The confirmation of this statement is the rapid economic raise of Japan in the postwar period and economies of China in the end of the XX - XXI century. Foreign investments have become an effective lever structural reorganization for a number of post-socialist countries. For Ukraine the influence of investment policy can be manifested both in accelerating the reproduction of the rate of economic development of the country, and in stimulating industrial production, ensuring conditions for sustainable and rapid economic growth and increasing the level of social prosperity .

For Ukraine, foreign direct investment (FDI) is a rather profitable form, since this form is most in demand for developing countries, as it allows: realizing large and important projects; introducing new rules of corporate governance; receiving the latest technology (for example, when creating industries); creating new jobs; increasing export indicators; improving skills of local labor force; transferring modern methods and management skills; increasing foreign currency inflow; increasing region competitiveness etc. The volumes of FDI in Ukraine during the period of 2007-2019 are presented in Fig. 1

The analysis of the dynamics of FDI in Ukraine in 2007 - 2013 shows us annual foreign direct investments in the amount of 4.5 - 5 million USD. In 2014 - 2016 there was a significant decline in the volume of these investments. In particular, by the end of 2016, the aggregate volume of FDI grew by only \$ 37.3 billion, due to a significant outflow of investments in 2014 and 2015, as well as an unfavorable exchange rate (in 2014 depreciation from UAH 8 per USD 1 to UAH 15, and in 2015 from UAH 15.5 to UAH 22 per USD 1).

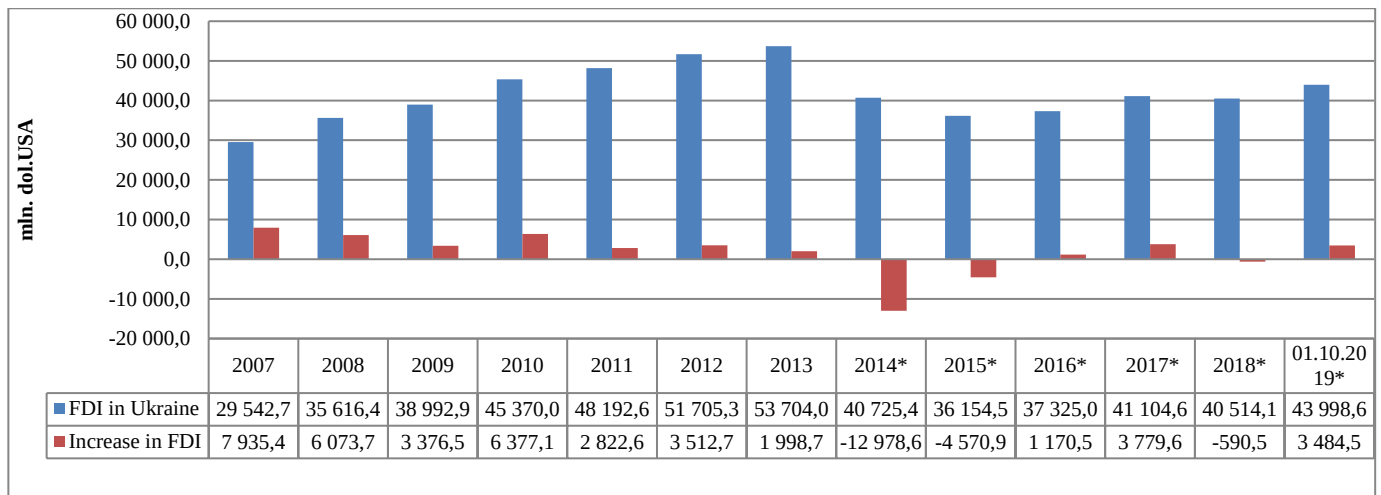


Fig. 1 Volumes of foreign direct investment in Ukraine

* - without the hail of the temporarily occupied territory of the Autonomous Republic of Crimea and the city of Sevastopol and part of the area of the anti-terrorist operation.

There are a number of macroeconomic factors that can promote attracting direct foreign investments. Such factors should be allocated as the following: GDP per capital; income level; employment and unemployment of population; volumes of industrial production; volume of export; import of goods and services ; taxation of enterprises; stabilization of the national currency rate; the scale of corruption and the lack of trust for judicial power; the presence of hostilities . But in Ukraine investors are directly paying more attention to indices of unemployment of the population (since it more determines the general state of the economy than the GDP of the state); hryvnia rate relative to US dollar ; high level of corruption in the country and so on . Even the military conflict taking place in the East of Ukraine has a lesser effect on foreign investment than the above-mentioned problems .

In our opinion the main negative factors in Ukraine are the lack of steel strategy and action plan in relation to FDI; complicated tax system; ineffective capacity of the market to ensure the rights and freedom protection of investors; a low level of corporate governance at the legislative level (for example: there is no right of the shareholder for disagreement in a case of a decision to merge the company, which threatens the emergence of conflicts and resistance with the involvement of power agencies, blocking the activity of enterprises, and exacerbating social tensions); the limited potential of attraction of foreign direct investments to Ukraine through the introduction of state enterprises; negative image of Ukraine on the international level that arose as a result of the absence of "successful" investment projects that would serve as a means of advertising the investment climate and thus it would attract capital to the country; obsolete infrastructure, etc.

Thanks to FDI, structural changes can be realized and reflected : in the reform of the economy, the production of consumer goods, the modernization of production, and the overcoming of the state's dependence on imports. Therefore, in our opinion,

in order to attract foreign investors to Ukraine, it is necessary to carry out a series of consecutive actions that require many years of systematic work. To do this, it needs to create: a favorable investment climate, favorable conditions for conduct of business, stabilization of the banking system, overcoming large-scale corruption, engaging insurance companies, ensuring economic and political stability, stopping the outflow of Ukrainian capital abroad, and so on.

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Problems of development of small business in Ukraine

World experience shows that the efficiency of any country's economy depends largely on the optimal combination of small, medium and large businesses. In the face of gigantisms, extremely poor economic relations and a crisis economy, small business in general is one of the means of solving many socio-economic problems. It contributes to the weakening of monopolistic tendencies by developing intra-industry competition in the national economy.

The particular role of small businesses is to support and develop certain industries, such as trade, services and catering.

The tendency of development of small business in Ukraine is directly influenced by the negative dynamics of the main macroeconomic indicators. In particular, the decline in GDP led to a decrease in the state's internal financial resources, working capital from business entities, a decrease in the purchasing power of the population and so on. In its activities small domestic entrepreneurship encounters various macro and microeconomic obstacles. The first group includes the following:

1) **Tax policy.** It mostly determines the conditions of operation of small enterprises in Ukraine as it directly affects their financial results and investment opportunities. According to statistical surveys, taxation ranks development problem as the first issue for small business. The most unfavorable factor, however, is the complexity of the tax system and the instability of reporting requirements, followed by high tax burden.

2) **Administrative barriers.** The following obstacles include: registration problems; imperfection of the licensing system; a significant number of supervisory authorities and duplication of functions; bureaucratic actions of state executive bodies. In addition, the amount of fees for state registration is set at the tax-free minimum incomes of citizens and also depending on the sphere of business activity.

3) **Limited domestic demand and domestic crisis.** As a result of widespread unemployment, rising wage and pension arrears, recent inflationary spikes, citizens' incomes are diminishing, and small businesses are losing major consumers of their products.

4) **Insufficient government support.** To date, an effective system of state support and protection for small businesses has not emerged in Ukraine yet. There is a weak mechanism of financing and crediting followed by inadequate information and consulting support as well as an imperfect system of training and retraining of personnel for business activities.

5) **Low investment activity.** Lack of sufficient start-up capital for highly profitable investments and leaching working capital through inflation, reduce

opportunities for accumulating investment resources and explain the low investment activity of small businesses.

6) **Undeveloped infrastructure.** Despite the large number of infrastructure, their role in small business development is still very small.

7) **Limited financial market.** Not only due to high cost, but also because of the risky financial condition of the company and lack of credit policy, it is not possible to obtain a loan. Under such conditions, everything depends on the entrepreneurial ingenuity of the firm.

8) **Shadow economy.** Small business is increasingly using the practice of non-contractual work, outsourcing and trying to translate its operations into cash to minimize taxation.

9) **The underdevelopment of leasing and franchising** significantly narrows the range of business financing. Due to the high cost of leasing payments, small businesses in Ukraine are unable to lease equipment. Therefore, it is necessary to create conditions for the emergence and formation of leasing companies, as well as to encourage banks and other financial institutions to participate in leasing relations.

Among the microeconomic factors that most influence the development of small business are the following: the way and time of the company; ownership; financial capabilities of the enterprise; the range of products, their quality and demand; imperfect organizational and production structures of enterprises; not sufficiently high level of product competitiveness; irrational use of production resources; personnel policy.

In an unstable economic situation, domestic small businesses need the protectorate of the state. Unfortunately, an effective mechanism to support and stimulate business development in Ukraine has not been established yet. The adopted programs, laws, regulations are mostly declarative.

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Marketing innovation

Marketing is an activity aimed at achieving the goals of enterprises, institutions, organizations by forming demand and maximizing customer satisfaction. In a broad sense, the purpose of marketing is to "identify and meet human and social needs." Firstly, let us take a look at mobile marketing, which begins to develop in marketplaces. The amount of content consumed by smartphones is increasing day by day. According to statistics, people use their gadgets more than three hours a day: read news, make purchases, order food. About 85% of personal correspondence on social networks is via telephone. And in 2019, this trend will be gaining momentum. Therefore, for aspiring companies, they are setting up mobile applications and other consumer-friendly gadgets that are currently available and understandable.

Live video is also worth noting, as now people need a bright picture that is easy to see and understand. The trend towards simplification is also observed in marketing. Instead of the usual photos and text material, the audience prefers watching videos on the pages of their favorite brands. Experts believe that the greatest effect is given to videos. They retain the viewer's interest for the required amount of time, without requiring significant financial costs.

Continuing, we would like to talk about chatbots. Chatbots are a popular topic that are being actively promoted in the business field. Bots are always in touch and ready to respond to the customer's first request. Of course, if the issue does not go beyond the standards. Even the users themselves claim that it is better for them to communicate with the bot than to contact technical support.

Another important marketing innovation is interactive content. Close seller-buyer interaction is a guarantee of a successful deal in 2019. Various variants can be used as interactive content: tests, questionnaires, quizzes. For example, over the past years, Crispin Porter has increased its turnover by creating a virtual reality app where a potential buyer could ride on a selected car in real time.

And finally, social networks: it is impossible to imagine modern life without social networks. Every day, any user visits dozens of resources: Twitter, Telegram, Facebook, Instagram. In 2018, the number of social network visitors has increased to 3 billion. Social networks are no longer a place for leisure and socializing with friends. Today, Instagram has become a great marketplace for sale / purchase, and a large number of businesses have their own sites where fresh news is published. Many marketers today work in freelance mode.

So, at the moment, social networking is a tool for successful business promotion. If a company is to be competitive, be competitive in the market, then it must necessarily communicate with consumers online.

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Issues and Genesis of Behavioral Economics

Undoubtedly, many scientific works written by “classics of economics” during the last century are still considered relevant and widely used in the 21st century's studies. On the other hand, over the last several decades, the achievements of the classics in some areas can not be applied. The challenges of the new economic system and new empirical researches have led to the development of new theories. Expanding the competencies of psychology as a science, and its rapid entrance into other scientific fields, was a beginning of behavioral economics as an independent theory. Over the last fifty years, this theory has gained more and more supporters and economical schools.

It should be noted that in modern scientific literature, such a research field as behavioral economics is still insufficiently covered due to its rapid development. Insufficient attention is paid to the history and genesis of this area development, including more detailed and systematic analysis. The article purpose is to study the genesis of behavioral economics and to analyze the scientific and methodological background that preceded the development of research in this area, as well as to outline the problems (issues) faced by scientists at a particular stage.

While working on the article, the definition of C. W. Lin was taken as a basis: “Behavioral Economics is the science that studies the influence of psychological, cognitive, emotional, cultural and social factors on the economic decisions of individuals and institutions and how those decisions differ from those implied by classical theory” [1].

A historical approach was used to specify the stages of the Genesis of Behavioral Economics. These stages should be considered as equal to the steps of the genesis of behavioral economics. Thus, the following stages can be distinguished.

Zero (propaedeutic) stage

While studying the scientific literature on the topic of Behavioral Economics, it was decided to highlight the preparatory "zero" stage of its genesis. The zero stage (propaedeutic) (from 1940 to 1955) is connected with the development of economic psychology. The first elements of economic psychology can be found in publications of A. Smith ("The Theory of Moral Sentiments " [2]) and J. Bentham ("Utility Theory" [3]). However, when the concept of "economic man" [4, p. 50-53] was developed in the neoclassical Economics, these preconditions were lost. During this period, the problems (issues) of choice are actively investigated in conditions of uncertainty, motivation, and consideration of limited human capabilities (the restriction concerns information and intellectual abilities of a person).

Stage one

The first full-fledged stage began with works published by G. Tarde [5] and L. Garai [6, p. 29–41.] (on the topic of group consciousness), and paper developed by G. Katona [7] (on the index of consumer preferences). Then the decision-making concepts in the conditions of insufficient information or uncertainty were developed by M. Allais [8] and D. Ellsberg [9, p. 643–669.], who became the pioneers of this period, blowing up the usual foundations of "classical" approach. The paradoxes discovered at this stage in the Genesis of Behavioral Economics were named after these scientists. Based on the models of "midtemporal utility" [10] and "expected utility", many differences and unusual facts were revealed in the economic behavior of people that could not be explained by the "classical" approach.

Stage two (institutional emergence of Behavioral Economics)

From 1955 to 1974 the Behavior Economics was closely associated with "dynamic theory of personality" [11], and particularly with the idea of "level of claims". Another feature of the period is the deliberate refusal of scientists to continue to rely on the classical approach and the formation of new own "modern" schools: the school of Carnegie Mellon University (studying the market behavior of companies [12]) and Michigan school (studied the market behavior of consumers). In the same period, a number of classic papers of the new science were published: "A Behavioral Theory of the Firm" [13] published in 1963 by R. Cyert and J. March (followers of the school of Carnegie Mellon University). Another significant work is Leibenstein's X-efficiency theory [14]. Among famous followers of the Michigan school, G. Katona should be distinguished due to his papers on the division of consumer spending and savings into necessary and optional [15].

Stage three (development of scientific formation)

The period from 1974 to 1990 in the Genesis of Behavioral Economics is the best example of how psychology penetrates into other sciences. During this period, the Cognitive Psychology became closely related to Economics and Mathematical Psychology. The most significant authors of this period are D. Kahneman, A. Tversky; their paper "Perspective Theory: Analysis of Decision at Risk" (published in 1979) explained the existing differences in the expected behavior of individuals in the decision-making processes [16]. Their theoretical views formed an independent scientific field of research, which was called Behavioral Economics.

Stage four (development of practical application)

From 1990 to 2000 there was a period of rapid development of Behavioral Economics as a practical tool. This time was known for game theory development and creation of many related theories, mathematical and statistical methods and additional tools that were used in game theory (including Economics). This refers, in particular, to the strategic interaction of economic agents. These agents could interact in different ways with each other and with the business environment, and all situations exist in different unique conditions. But they are always guided by the search for the best solution. The following papers have been developed and published for simplification:

- Analysis of equilibrium in the theory of non-cooperative games by J. Nash;
- Shapley value – a vector distribution of optimality of winning by L. Shapley;
- A procedure of tracing by J. Harsanyi and R. Selten.

These tools described the real participants' behavior and allow to predict the effects and specific results of the steps taken. One of the most important and controversial issues in the behavioral game theory is the topic of "social preferences and fair distribution".

Stage five (currently widespread use: neuroeconomics, neuromarketing, neuromanagement, etc.)

2001st was the first year of modern stage of Behavioral Economics' Genesis. This is a period of rapid expansion. Now, not only psychology has deeply penetrated into behavioral economics, but psychophysiology, neurophysiology, and neurobiology penetrated as well. Behavioral economics is a widely used practical business tool. That is why it now has many branches, for example, neuroeconomics. Researches in the field of neuroeconomics help to understand consumer's and seller's behavior in competitive and emerging markets (within companies, between partners, etc). In neuroeconomics, the main theory is based on the model of "making perceptual decisions" (authors: M. Chadlen and W. Newsome [17]). This model's development became possible thanks to research of primates' behavior. Consequently, the study of hormones' impact on social and economic interaction was checked by P. Zak in 2001 [18, p. 224–227]; the function of emotions in decision-making processes (by A. Beshar and A. Damasio) was also studied [19, p. 1293– 1295.]. In parallel, scientists are researching the encoding of the personal value of choice. These studies led to the development of a new economical vector of the business approach known as "neuromarketing" [20]. Research using MRI technology and computed tomography of various mental actions led to the emergence of a new direction in management, known as "neuro-management" [21]. Internal marketing of enterprises and the human resources sector also became the areas for widespread use of Behavioral Economics tools. The problem of science is still quite broad, and modern scientists are working on it. The list of current issues includes the following questions:

- the history of life in social and humanitarian studies (the studies of such scientists: A. L. Shestakov and A.V. Keller);
- a search for new mechanisms to increase labor productivity (the issue is being studied by such scientists: I. P. Savelyeva, I. V. Rezanovich, E. A. Rezanovich, and I. M. Tsalo);
- determination of sexual features influence on human labor behavior (the issue is being studied by such scientists: V. E. Tseylikman, O. B. Tseylikman, M. S. Lapshin);
- new mathematical modules for trade union cooperation (the issue is being studied by such scientists: A. V. Keller, I. V. Rezanovich), etc.

Thus, Behavioral Economics studies a number of behavioral models of consumers, companies, and human labor, leading to many phenomena that have no place in a "classical" economy. The use of new behavioral models in business helps

businesses to be more sustainable and mobile, and human resource management becomes more efficient.

It is worth noting that there are important non- economical things that we can learn from Behavioral Economics. This science teaches us not only to know about the characteristics of other people's behavior, but also about actions that can influence other people's behaviour (not only knowledge about the behavior of other people, but also their results can affect people's behavior). On a large scale, this can have a strong social impact. For example, after several clinics in Germany violated the rules and procedure for the fair distribution of human organs to patients in 2010, several relatives of potential donors withdrew their consent to donate potential donor organs, and at the public level, the number of donated organs was constantly decreasing. The number of organ donations declined by about a third comparing to the initial amount of 1,296 organs donated in 2010 to 864 organs donated in 2014, according to the German Organ Transplant Foundation (Deutsche Stiftung Organ Transplantation) [22]. This case shows the importance of incomprehensible mathematical models as well as the relevance and comprehensiveness of the Behavioral Economics.

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The problem of investing Ukrainian startups

It has been possible to observe the active development of startups recently. Moreover, their number is increasing every year. In 2019, Ukraine ranked 43rd place in terms of new projects. Now, there are about 263 of them in the country, and they are all very diverse, including toys, inventory, latest technology, online applications, robotics, medicine etc. Similarly, in Ukraine, the project of a completely functional house has been developed thanks to solar panels.

Environmental startups are gaining popularity. Among them one can mention Nuka's "One Notebook for Life", Effa's "Brush at a Time". The projects become an integral part of our lives, as well as help solve some problems and simplify our lives. There are also Ukrainian startups that are part of the unicorns. Startup unicorns are fast-growing companies with a capitalization of \$ 1 billion and more, while other companies can raise \$ 100-200 million for 10-20 years, development of science-intensive industries, which affects the development of the digital economy of the country, and will increase the state budget.

Foreign investors are increasingly attracting attention to new ideas, proposals, projects offered by Ukrainian startups. Most startups target foreign investment funds: Kite Ventures, ABRT Venture Fund, Elbus Capital, Intel Capital, Admitad.com, Google Ventures, and more. Sometimes, even with startups being invested by a Ukrainian investor, manufacturing and development itself is outside the country. The number of Ukrainian startups that are collaborating or fully developed in the US exceed those ones developed in Ukraine. In 2019, it attracted about \$ 336.9 million in foreign venture investment, which neither affected the country's economic development nor created new jobs.

Financing is a major problem in the development of Ukrainian startups. There are several ways to raise funds for startup development. Often startups try to find financial support from funds or large investors. There is also a system such as crowdfunding, which becomes more popular in the US and some other countries. In addition, financial support is available from Business Angels and Business Incubators. But despite the fact that Ukraine provides an opportunity for young researchers to develop, still most projects are invested by foreign funds. So, in 2019, foreign funds, ventures, accelerators concluded about 25 public deals, while Ukrainian funds and investors made fewer than 10 public deals.

The reason is that government support does not provide much opportunity for start-ups, and most large investors are very meticulous and do not always consider investing in some projects. There are also business angels in Ukraine, but such investors sometimes do not realize what they are and what they need to invest their money in, and they do not agree to invest a certain amount of money in the project at

an early stage. More attractive to investors, especially investment funds, is the development of new technologies. The most successful startups are IT technology projects, while others require more expensive resources and, being more risky, rarely attract attention of investors.

One of the problems is finding financial support for startups in Ukraine, because only in 2018 the Ukrainian startup fund was registered in the country, and only a year later it started its work. The state is still not helping to find sources of funding, and therefore is not able to influence the development of innovative technologies, and is not using non-budgetary funds, which is also very important. Many new offerings and discoveries go unnoticed, and young start-ups are little aware of their financial support by future investors. Of course, the most interesting projects and developments will be able to enter the international investment market, but the state should help in this, and not give their future profits to other countries. This lack of interest in the state leads to the fact that startups are initially oriented to foreign countries, and are trying to attract their attention, and more and more Ukrainian startups are being bought up by foreign countries, especially the United States. The question is how to remedy this situation and improve the position of Ukrainian startups in the international market.

There are no problems with the lack of ideas in Ukraine, but there is a problem of financial support for the implementation of these ideas. One of the areas of decision for young start-ups is crowdfunding. Developing new platforms or an online platform to look for small investors can help many startups, such as the unit-linked platform. With the help of this method of finding financing in the fall of 2018, Japanese startup platform Kampfire, Ukrainian startup Hushme was able to raise about \$ 9 thousand.

Such projects may not be very expensive or promising, but they will provide the foundation for the further development of a more stable position of new startups in the country, because in order to finance large-scale projects, the state does not provide the opportunity to attract investments from many small investors.

It is very important to create a strong startup ecosystem that is influenced by the state. It is now known that the government has registered bill № 2615, which should create tax support for new startups, and last year launched its Ukrainian Startup Fund as well as a competition for the best projects to receive a \$ 50 000 or \$ 25000 grant. the bill is still being finalized and is not effective. It is important at the legislative level to allow start-up businesses, create government institutions that can help attract investment, and properly inform young scientists and enable them to develop agricultural, social, environmental startups in the Ukrainian market. It is also an important task to attract funds from Ukrainian funds to support innovative startups, as most of them are now foreign. Venture or other start-ups are focused on financing larger start-ups, and in order to give birth to less developed projects, business incubators need to be improved, which directly affect the development of start-ups that help to find investors and attract funding.

State support and involvement of business incubators is required for the development of Ukrainian startups. It is also important that the country and the

investors support not only the development of the projects themselves, but also the centers that talk about opportunities and help new start-ups.

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Valuation of Intellectual Property

Today, there are many amazing inventions, such as artificial intelligence or Mercedes ' first electric VISION AVTR without pedals and steering mechanisms, that were once a dream from the Dream of the cinematic universes of DS or Marvel. These inventions are only a small part of what humanity has created, and they are all integrated into the concept of "intellectual property" [1].

The Civil Code of Ukraine (Article 418) treats intellectual property rights as "the right of a person to the result of intellectual, creative activity or other object of intellectual property rights defined by this Code and other law" [2].

There is a large number of studies on the valuation of intellectual property rights, both foreign and domestic authors, whose work was aimed at studying problems and evaluating business (Table 1).

Table 1

Valuation of intellectual property rights

No	Author	Name of work	Author's opinion
1	E. Kant	Droit moral	He saw copyright as "a simple form of property that protects an economic or material value, and an extension of the author's identity, the value to which he is entitled."
2	O. Pilenko	The inventor's right	In the twentieth century, it was argued that an invention "has a purely abstract everyday meaning and is identified with its essential substrate only in an insufficiently developed mind", while "the essence of the invention is not limited to the material things in which it is embodied, since the object of patent law is always insignificant" [3]..
3	G. Shershenevich	Civil Law Course	In his textbook, he highlighted the provision on exclusive rights, noting: "Our legislation, guided by the ruling theory in the past, recognizes all such legal relations not as independent, but standing next to property rights as two types, considering them like a special kind of law. property ... This view may be unacceptable "[4, 332].

According to many researchers, the processes of commercialization of innovation results allow us to consider intellectual property as a commodity (as an intangible asset), and as capital (costs of education and investment in intangible assets) [5].

An important point is to evaluate the value of rights to a specific intellectual property object, so there are three generally recognized approaches to the valuation of

intellectual property rights: cost approach, comparative (market) approach, income approach, which are shown in Table 2 [6].

Table 2

Analysis of existing techniques for intellectual property valuation

№	Method	A brief description of the method	Benefits	Disadvantages
1.	Cost approach	Using the direct playback and replacement methods, the residual replacement cost (playback) is determined.	- reliable; - allows you to take into account when evaluating the uniqueness of each object..	- difficulty of obtaining information for calculations; - complexity of the calculation, which may affect the accuracy of the result
2.	Comparative (market) approach	The analysis of prices of sale and supply of similar property is used with appropriate adjustment of differences between the objects of comparison and the object of valuation.	- reflects the real supply-demand ratio; - takes into account the uniqueness of each object.	- dependence on market stability; - difficulties in gathering the necessary information.
3.	Income approach	The value of an item is defined as the present value of the expected revenue from the most effective use of the item, including its revenue of possible reselling.	- versatility; - takes into account future expectations	- difficulty of obtaining information for calculations; - high risk; - complexity of forecasting.

Therefore, in order to improve the intellectual property valuation system, it is necessary to develop guidelines for accurately estimating the value of objects individually for each type, taking into account possible disadvantages and risks, and to train qualified valuers.

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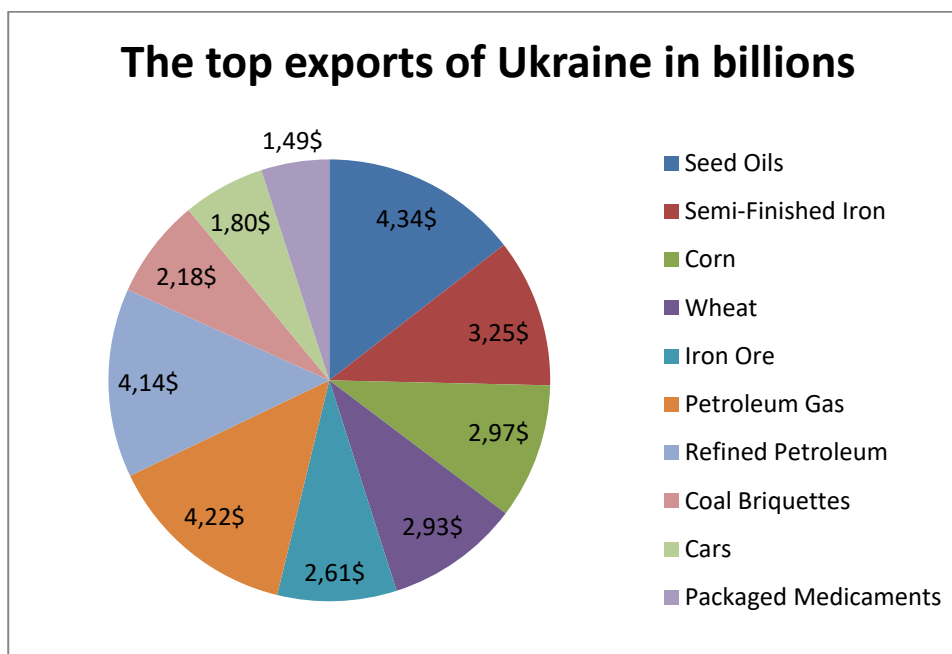
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Why is it profitable for Ukraine to export value-added goods rather than raw materials?

Everyone buys and uses different goods made in China, and this is not surprising because China is one of the largest exporters of finished products. So why has Ukraine developed the reputation of the breadbasket of the world and does not increase the export of finished food products instead?

As you know, value-added goods are more profitable to export to other countries, because the profit from them is in foreign currency and much higher than from raw materials. At the same time, Ukrainian food products are quite popular abroad, because they have good quality and favorable price. It cannot be said that Ukraine is not developing in this way: the share of finished food products amounted to 20% of the total export, and this is 5% more than last year. But the profit from the export of agricultural products (mainly cereals) has been growing for the last 4 year in our country.

Ukraine has various enterprises supplying products abroad. As you can see from the trend, these are not monopoly giants and not state-owned companies, but mainly medium-sized businesses such as: TB Fruit (a producer of juice), Terra Food (a producer of milk and dairy products), ViOil (produces sunflower, rapeseed and soybean oil, vegetable fats, meal, fatty acids), "Yarych" (produces cookies and crackers). These and other companies have conquered the markets of the EU, CIS and other countries and they are making good profits.



What are the main barriers to exporting goods to other countries? The largest of these is the lack of funding and the insurance risk. Now new legislation is struggling with this problem, creating support for medium and small businesses. A new organization, the Export Credit Agency of Ukraine, has also appeared. The government tried to create such an agency twice in the history of Ukraine and only for the third time it was successful. The task of this organization is to minimize the losses of profit for the supplier and protect the buyer.

Also, the inability to adapt products to the taste of consumers can be attributed to the obstacles. To prevent this, our manufacturers need to develop marketing skills. Because, a bright product is important for a buyer, and a memorable advertisement is the main factor in competition with other products.

The difference between the Ukrainian manufacturers and the foreign ones is that our producers do not want to spend their budget on advertising. Only in the USA manufactures spend \$567 on an advertising campaign per buyer, and in Ukraine only \$3. If they pay more, technology and advertising will be more developed. The coverage of buyers by advertising on the Internet plays an important role, in different countries: in Ukraine - 37.5%, in Germany and the USA - 87%, in the UK - 90% and the highest rates are in Canada and South Korea - 93% and 91%, respectively.

Statistics about potential buyers plays an important role in the promotion of goods. For this, manufacturers must collect information about preferences and tastes of their customers. After all, the more you know about the buyer, the less you pay for advertising, because you know how to interest your potential clients.

So, in the near future, Ukraine is expected to supply more finished goods abroad. On the one hand, Ukraine has various valuable resources such as a strategic geographical position at the crossroads of Europe and Asia, fertile agricultural land, educated workers. On the other hand, as our country is developing at the moment, the government will have to revise its export policy, because in any case, Ukraine will get more benefit from the promotion of value-added goods.

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Impact of investment climate on an innovative process

Globalization makes the successful operation of the enterprise impossible, without introducing changes that will help the produced products correspond to consumer requests. In this environment, innovative activity is one of the most important components of the development of Ukrainian enterprises. Now, the country has not effective economic structure, which has the extensive development of extractive industries. Most of the production in industry accounted for raw materials and energy resources. As for the innovative inputs, only 15% of the enterprises invest money in innovation, with the share of innovative products of only 2-4% [1].

Industrial development of Ukraine is not satisfactory, which was the reason technical and technological retardation, also takes place high level of wear of fixed assets. Thus, most enterprises in Ukraine needed investment for depreciation of fixed assets, so that it can be able to create innovative products.

Figure 1 shows the dynamics of Ukraine's GDP and capital investment. The normative value of capital investments as a percentage of GDP is 25% [2], and in 2018 this figure was 16.3%. Thus, there is a deficit of capital investment that prevents enterprises from updating the fixed assets and, in the future, to implement innovative solutions.

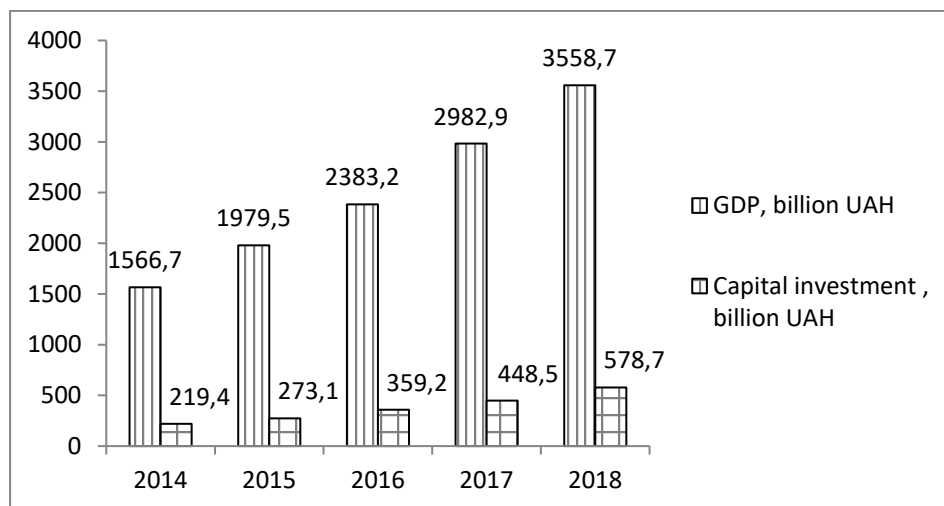


Fig. 1 Dynamics GDP of Ukraine and capital investment during 2014-2018

Sources of financing capital investments in 2018 are presented in Figure 2. The main source is own money of enterprises, as for the funds of foreign investors, in 2018, financing amounted to only 0.3% of the total amount of invested funds. It speaks about unfavorable investment climate in Ukraine. Foreign investments are very important for the introduction of innovations, because they have a strategic

nature that would help Ukraine to reduce the gap with industrially developed countries.

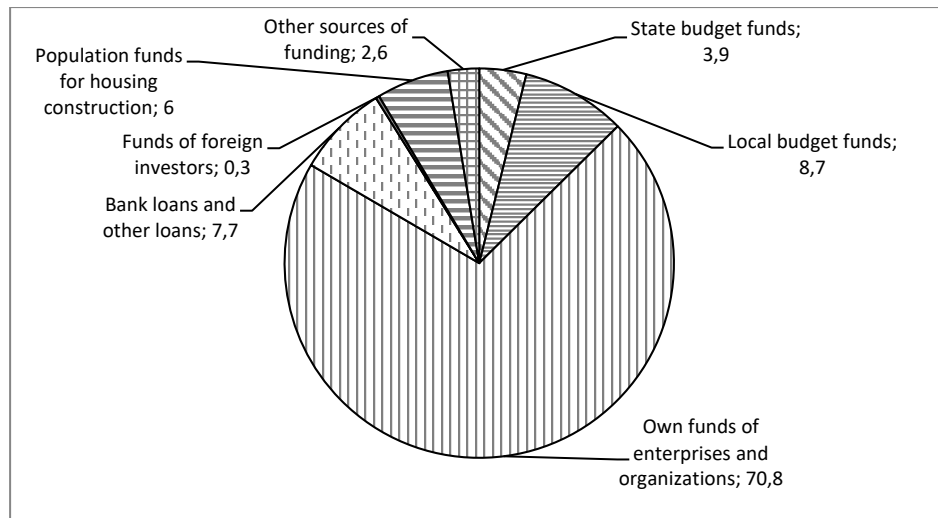


Fig. 2 Capital investments on funding sources in 2018 (% of total)

The non-attractiveness of domestic enterprises is caused by a group of factors such as the military conflict in the east of Ukraine, the instability of the national currency, corruption, imperfect legal system, shadow economy, insufficiently developed process of innovations implementation, etc.

In Ukraine, not configured investment process is traced. Capital investments are delivered to enterprises in insufficient amounts, limiting renewal of fixed assets and introducing innovations. Insufficient investment of enterprises leads to the loss of competitiveness of not only a particular enterprise, but also of the national economy as a whole. Also, there will be the decline of basic capital, fade in production, increase of the production cost, which causes reduction of investment activity. Thus, an expansion of investment opportunities of business entities is necessary for Ukraine. This extension should be undertaken by improving the financial system in general. It is necessary to increase the impact of financial and credit leverage in order to change the governance model of the state and enterprises – from consumer to investment. Such changes will help stabilize economic development and will be able to increase competitiveness of the country's enterprises in the world market.

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Technologies of 21st Century and their Influence on Accounting

The accounting profession is rapidly transforming in the 21st century by optimizing performance with new technologies. Today's accountant is no longer loaded with projects focused on the goals. Instead, thanks to changes in dynamic accounting technologies, accounting software programs are becoming more automated, and the role of an accountant is changing to that of a business adviser. Changing the role of a modern accountant as a business consultant requires new skills, including professional skepticism, judgment, and critical thinking.

Accounting technologies have always played a role in simplifying the accountant's work. As the progress of technology is increasing, the ability of the accountant to analyze statistical values is growing too. Technological progress has created new roles for the modern accountant and effective and efficient data interpretation.

There are **five main ways** that transform the functions and tasks of an accountant in the 21st century.

1. Artificial Intelligence & Robotics – are about automating complex and repetitive tasks and processes with extraordinary precision, reducing operating costs and increasing efficiency. These are some of the new technologies that highlight the transition role of today's accountant to a more critical role of thinking.

2. Cloud Computing is a type of online computing that provides publicly available computing resources and data to computers and other devices on demand. This allows the accountant to perform accounting tasks from anywhere, as well as the ability to deliver financial information and reports via the cloud. This opens up a new way for an accountant to work with their clients. Now there is more time to communicate with the client and focus on the business strategy, rather than being burdened with detailed processes.

In addition, thanks to cloud computing, it has become possible for an accountant to provide freelance services to many companies. This allows an accountant to perform accounting tasks from anywhere in the world, which provides an excellent financial and favorable environment for an accountant than being an employee of a single company. Jeff Drew wrote in his article "Technology and CPA": "The ability to work from almost anywhere has destroyed the walls of the office – at least in a virtual sense. And the Internet has broken down virtual borders, providing access to clients all over the world for an accountant that was previously unavailable due to backward technology" [1].

3. Innovation in tax software. Modern tax software has helped improve accuracy while reducing the errors that companies want to get in order to avoid tax

penalties and prevent problems with stakeholders. Better tax software also helps optimize the work of a modern accountant, making them more efficient and effective.

4. Mobile Accounting. An accountant is increasingly dependent on mobile devices to access data. Mobile communication also connects the accountant and his clients. Companies such as Xero support the launch of the mobile accounting era. Their mobile apps help accounting firms manage their business. Firms can check, send invoices, add receipts, and create expense claims from smartphones or tablets. Bill Price writes in "Accounting today", "Mobile accounting can mean different things to different people and companies, so the first step to successfully rolling out is determining what it means for you and your company. For example, think about who the accountant user will be and why they will use it. Think about the different functions of a modern accountant that you would like to use in your company's mobile accounting program" [2]

5. Social Media. Social media has become an important tool for accounting firms that want to interact with their current and potential clients, expanding the scope of their brand. Gary Boomer, CEO of Boomer Consulting Inc. and Jim Burke, partner responsible for internal technology at accounting firm WithumSmith + Brown, consider social media as a tool that will continue to evolve and provide accountants with a valuable sales and marketing platform that can instantly connect firms with current and potential customers. Most accountants understand the importance of integrating traditional marketing into overall business development plans, but many firms may not realize the power of integrating social media marketing into their long-term marketing strategies. Social media should be part of the firm's overall business development strategy, and if done consistently, contribute to the effectiveness of all other marketing efforts regarding business development [3].

Accountants must take into account new roles and tasks, if they want to remain relevant in the field of accounting, as there is a rapid development of technology in the world. This includes following current technological trends, optimizing and adapting current accounting software to meet their company's needs, and being open to introducing and learning new technologies to develop advanced software in the modern innovative 21st century.

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Economic and mathematical analysis of the influence of foreign investment in Ukraine for economic development

In modern world economic theory states that foreign direct investment can influence economic growth of the country through technology transfers, international trade development, direct increase in tangible assets and contributing new managerial practices. All these factors may lead to higher economic growth of the country. Over the last years the major FDI flows have been directed to the developing counties' economies.

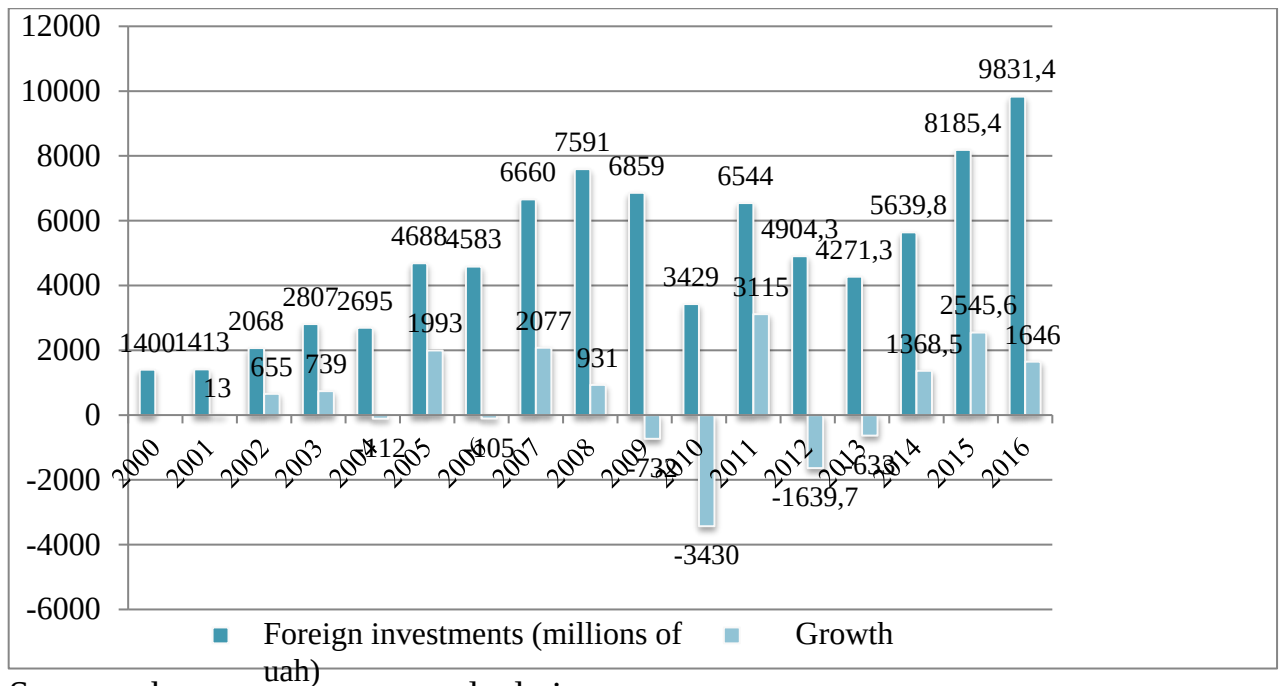
Foreign investment is largely seen as a catalyst for economic growth in the future. Foreign investments can be made by individuals, but are most often endeavors pursued by companies and corporations with substantial assets looking to expand their reach. As globalization increases, more and more companies have branches in countries around the world. For some companies, opening new manufacturing and production plants in a different country is attractive because of the opportunities for cheaper production, labor and lower or fewer taxes.

Foreign direct investments can be made in a variety of ways, including the opening of a subsidiary or associate company in a foreign country, acquiring a controlling interest in an existing foreign company, or by means of a merger or joint venture with a foreign company.

The threshold for a foreign direct investment that establishes a controlling interest, per guidelines established by the Organization of Economic Co-operation and Development (OECD), is a minimum 10% ownership stake in a foreign-based company. However, that definition is flexible, as there are instances where effective controlling interest in a firm can be established with less than 10% of the company's voting shares.

Ukraine is still faced with a very tense macroeconomic and financial situation; even though some signs of stabilization have emerged recently, like the (still fragile) stabilization of the exchange rate after a massive depreciation in the beginning of the year. Reforms to achieve external stabilization, which is crucial under current conditions, are well underway, even though they proceed with different speeds.

In the public discussion, it is undisputed that Foreign Direct Investment (FDI) is an important factor in stimulating economic growth in Ukraine. At the same time, there is much less understanding of the actual role of FDI in the economy of Ukraine.



Source: ukrstat.gov.ua, own calculations

Figure 1. Foreign capital investment in Ukraine 2000-2016

Let's start with the analysis of capital foreign investment influence on economic growth, namely on GDP. Gross Domestic Product is the main indicator on the basis of which the level and rates of economic development of the country are determined.

To establish communication and further analysis, the following data are used: volumes of gross domestic product at real prices and volumes of foreign investments in fixed assets in the period from 2000 to 2016 correspondingly.

We made the necessary calculations using correlation analysis and got the regression equation in the form given below:

$$GDP = 216.81FCI - 102316, 22.$$

The regression coefficient being equal to 216 is the sum in hryvnia, which is assumed to increase (assuming) GDP of the country with an increase in foreign investment in fixed assets for one hryvnia.

So, now we come to next part of our research. Let's assume that the volume of foreign capital investment in the coming years will increase by 18.78%, as the average growth rate for the entire period under study. On the basis of this assumption and the resulting linear equation, we make a forecast of the change in the gross domestic product.

Table 1: Forecast GDP based on linear trend

Year	Predicted GDP (UAH million)	Assumed volumes of capital and foreign investments (UAH million)
2017	2427930,557	11669,8718
2018	2901086,705	13852,13783
2019	3462723,052	16442,4876

2020	4129385,397	19517,23278
2021	4920713,599	23166,95531

Let's analyze the results. The projected GDP in 2017 is 1.78% higher in comparison with last year. From 2018, the forecast gross domestic product will grow by an average of 19.3% each year. It is a very good result because in our research only one factor that influences GDP - capital investment - will increase.

It is evident that Ukraine's economic, financial and security crisis has also negative implications for the inflows and the stock of foreign direct investment being poorly performed in 2014. This is problematic for several reasons, as so stable capital flows usually support the external balance of the country, which is still rather shaky, and add to the country's overall investment levels, that are also under severe pressure.

Based on that, it can be concluded that dependence between GDP and foreign capital investment does exist and it is very high. Moreover, an increase in the volume of attracted investments can significantly affect the country's economic growth. That is why the attraction of new foreign investment in fixed assets is an important aspect of the development of the national economy and one of the main tasks of the country's political leadership. Thus, respective reforms, which are underway in Ukraine, will undoubtedly have positive impact on FDI decisions, and additionally stimulate respective inflows in the future.

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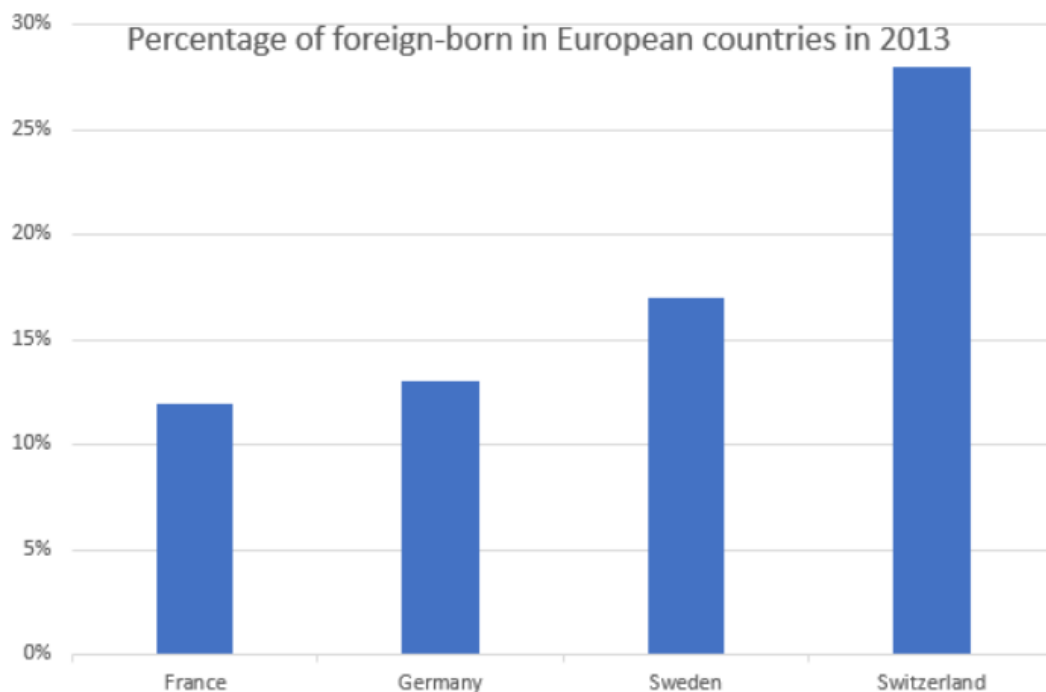
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Factors that affect economic assimilation of immigrants

In recent years, many first-world countries have faced tense situation with immigrants. Total percentage of incomers is relatively high in European countries that have restricted immigration policy (Sweden, Switzerland, France, Germany) compared to traditional immigrant countries like USA, Canada or Australia. For example, in 2013 migrants made up 28% of the population in Switzerland, 17% in Sweden, 13% in Germany and about 12% in France.



Specifically, the immigration issue in Germany has been extremely challenging since 2015 when Germany accepted over a million immigrants. It was challenging both in social science research as well as for the government. The problem is that immigrants are constantly facing different kinds of difficulties in the labor market. Their unemployment rates are high, and they earn way less than natives. It leads to extremely weak economic, political and social integration, which can cause substantial issues for the destination country.

The main question is how to solve this problem for both sides. Hence, figuring out how to increase economic assimilation is crucial for understanding the whole situation.

So, what economic assimilation of immigrants depends on? The international literature lists a number of factors that affect the economic assimilation of immigrants: the individual's educational level, work experience, language skills, time

since immigration, access to ethnic or native networks, the degree of discrimination, host country immigration policy.

Those criteria can be combined into two main groups: first one is immigrants' model of self-selection, which aggregates first three factors listed above. And the second one is the legislation of a country of choice.

Immigrants' self-selection model consists of observed (measured by education level, work experience and language skills of a person) and unobserved factors (for example, motivation and risk taking). A positive self-selection model on both observed and unobserved features increases immigrants' ability to gain successful economic assimilation in their country of choice.

The first person to use self-selection model regarding immigrants was George J. Borjas in 1987. He claimed that every immigrant is not a random person from population of birth country but rather a part of a group of people who are united by the same circumstances. Specifically by the risk immigrants are willing to take in order to improve their economical situation.

The second group that affects immigrants' economic assimilation is the destination country's legislation. The immigration regime consists of rules and norms that give immigrants' opportunities to become citizens, to acquire residence and work permission, and to participate in economic, cultural and political life.

Clearly immigration policy of the host country has a direct impact on the types of immigrants who make a decision to arrive to certain country and hence their self-selection model of choice. Therefore, it can be argued that all of the criteria of economic assimilation have an impact on each other and can't exist without each other.

Although self-selection model and the destination country's immigration regime are playing an important role in economic assimilation, every immigrant is facing economic and social discomfort in the labor market of the host country during certain time after arrival. They have limited access to the sources of information, no social bonds; in most cases they haven't master the language yet; their professional skills might not be transferred into different economical system. And when competing with native-born, they have to agree for the low-status job with way smaller salary.

With a passage of time though labor market position of immigrants (especially those with high level of human capital) becomes more leveled. The payment gaps with local population are narrowing and economic mobility is increasing.

But even high-skilled migrants don't have equally successful economic assimilation. There are various reasons for that but the main one is the feature of the occupational labor market. Some skills needed for a particular market are highly transferable and don't have much difference from country to country. For example, craftsmen, scientists, technicians have roughly the same standards worldwide. It means that for them it would be easier to get a job in the destination country and with time to be promoted and catch up with native-born workers.

At the same time there are careers that require deep knowledge of rules and law of the host country (e.g. accountants, attorneys, doctors) or in some cases even licensing permits (such as medical stuff).

Keeping that in mind, there is also one more factor which success of a migrant on labor market depends on. And that is saturation of certain profession on the market. There are occupations in high demand in almost every country (such as nurses) and some of the career paths are already highly popular in the country, so there's no need for more specialists.

It is a great challenge for every immigrant to consider all the factors and as a result people with advanced professional skills are likely to choose a country where they expect to realize their potential as much as possible and to get the highest reward they can receive. It also works other way round. Developed countries are fighting for the high-skilled migrants from other developed countries in order to get trained professionals without the need to provide them with education i.e. without spending any money on them. The second advantage for the host country is the fact that usually highly skilled immigrants tend to become productive sooner after their arrival so that destination country can get economical profit in much shorter time. Hence, there're many advantages in attraction highly skilled specialists from developed countries.

Granting citizenship considered the most important policy to foster immigrant assimilation. Germany introduced its first explicit residency requirements in 1991 and after that there was one reform in 2000. According to that policy access to citizenship was attached to the age of an immigrant. Older immigrants (arrival age 15 and up) have to wait 15 years before they can apply for citizenship. Younger immigrants (arrival ages between 8 and 14) in turn can apply for citizenship after only eight years of living in Germany. Child immigrants (arriving before the age of 8) in turn could naturalize when they turned 16.

Different kinds of restrictions are applied to a wide range of occupations for immigrants. Getting citizenship eliminates all restrictions on career mobility that many immigrants faced before. Citizenship enables immigrants to take any job, at any time and place, which improves chances of immigrant-workers to get a job in a particular firm. To the extent that these jobs and new career options offer better salary and working conditions than jobs available to the average immigrant and naturalization improves the labor market prospects of immigrants.

It should be concluded that balanced combination of immigrants' model of self-selection and more liberal citizenship policy can regulate economic assimilation of immigrants - mostly because immigrants make different choices in terms of human capital investment and labor supply. While it is difficult to make any predictions about the integration of the recent refugees, it is obvious that clever legislation in the destination country can contribute a lot to the economic prosperity of immigrants.

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Ecological business as an example of a new type of business

Today the business in the whole world is developed as never before. Lots of usual spheres in our daily life become a foundation for business. For example, raising a food became part of business; only 200 years ago almost each person had a farm and a place to grow up vegetables and fruits, or some kind of animals for meat and milk. But today most of the people in Europe make purchases of food in stores. So today people do not have a need to rise up some food, because they can buy it. The same thing is with other areas of our life: making clothes, producing medicines, cooking, beauty service, babysitting etc. Business grows up so fast and spreads to lots of the areas in our life.

Today the definition of the enterprise totally changes. If just 20-30 years ago, huge factories were operating only to earn money, to create a business, to make a high-quality production, but today it is more than just producing. As competition grows up, many enterprises start creating a special mission of organization that makes it unique. They want to create their own specific brand, with some special meaning and idea that corporations want to share with. For example, Adidas Company producing sport clothes and equipment created a new slogan "Just do it". As you can see, they have a new idea, a new meaning of the brand, so wearing Adidas clothes is not already just about looking good, it is about performance and becoming better. Lots of the companies in the world change their policy to more high-moral, they try to take part in charities and some volunteer projects, and propose a lot of ecological ideas. And considering the current ecological situation, lots of companies change their political to be more source-saving.

Lots of spheres of business start using source-saving equipment and the sphere of tourism is not an exception as well. According to the search of Polish professor Radoslaw Dzuba [1], the sphere of tourism is developing very fast. The professor describes a kind of ecological hotel and gives it as an example of a new kind of business to operate in many European countries.

Ecological hotel is a hotel which has special kind of source-saving equipment and keeps limits of using such sources as water, electricity etc. Factually, getting such a position (of ecological clean establishment) is not so easy as there should be special certificates giving the status of being ecologically safe. Such documents are not free to get, the cost can vary depending on the size of the hotel and includes staff training, analyzing conditions of the hotel and experts' statement. In Poland it is the certificate "Czysta turystyka" granted to hotels in case of saving natural resources. The most common thing to save some valuable resources as water and electricity is buying a special kind of equipment (it can be water dispensers) that limit using of the water, power saving lamps, energy generators etc.

The main advantages of spreading ecological hotels are:

- growing up the level of awareness in terms of user-friendly attitude to the environment
- showing a good example for other areas of business
- finance saving with natural sources efficiency (less water, less energy, using windmills)
- greater attractiveness for tourists
- overcoming other hotels.

So, taking into consideration all the listed information, it is obvious that applying saving equipment in domestic areas is rather profitable thing but in relation to business sphere it becomes much more profitable. Such innovations can help not only to reduce producing expenses but also to increase productivity, and, as a result, more production in shorter period, and lower constant (fixed) costs. Furthermore, the quality of production can become better, especially in modern conditions while the meaning of quality changes all the time. For example, not many years ago (starting from 1910) [2] when the plastic dishes were invented, it was very popular and modern decision of fighting with unsanitary conditions. So, disposable cups replaced metal. Till that time plastic dishes had been started using at schools, canteens, fast-food restaurants, clinics. But as the world changes, today significant part of people prefers to use paper dish and not to use plastic at all, but to use metal or ceramic instead.

Moreover, keeping ecological standards can raise up the rating of the company, lots of consumers are very conscious about choosing the product and many of them would follow the idea of green planet. Furthermore, such policy can attract the attention of international investors.

As it is known, ecological problems are very common today and there are lots of new better ways to fix them, but still some kind of businessmen do not pay much attention to that. Considering the results of making an interview among entities of business, it was found out that significant part of them don't agree about the profitability of saving technologies. According to their opinion, new equipment is just a marketing step and it is more expensive than profitable. Based on such feedback, we can make conclusions that modern society is not well-informed about the benefits of ecological changes. In 2017 in Ukraine there was the most profitable rate on solar – battery energy in Europe [3], but because of not sufficient level of informing, such technologies were not used in whole perspective. Not only big enterprises but also private businessmen could invest in green electricity. It is important to emphasize that producing and selling green electricity to the government is full of benefits.

To raise the level of economy and get people more aware in terms of such crucial issue the following steps should be done:

- The government should encourage businessman to provide reforms according to the new standards (reducing taxes, providing long-term loans, controlling economical sector);
- To express the opinion of different types of products as a consumer;

- To be a good example for other people and share the idea of a green planet.

Based on all presented information, we can make conclusions that ecological situation in the whole world is now much more important as never before. The business sphere should also be involved in mitigating environmental pollution. Such changes would not be only financially more profitable, but would also promote attracting additional clients and business partners. Starting to apply new save technologies would be profitable not only for big factories, but also for single entrepreneurs. Improving economic and ecological situations in Ukraine requires greater government stimulation and wider information spread.

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Python in Economics

The use of programming languages has become increasingly necessary in many of the tasks that we economist do, either because the theoretic models we develop lack analytic solutions, or because the new econometric estimator we wish to use is not yet available in a program with a graphical user interface (GUI, where we could just click with a mouse), or just because it is not efficient to analyze huge datasets with spreadsheets. Despite the fact that Python is not yet as popular as MATLAB among economists, its popularity has certainly skyrocketed in recent years. Python is a versatile and easy-to-learn language—in fact it is used extensively in America’s best universities to teach introductory programming courses. Its syntax is very clear, which makes developing and maintaining code easy. Because it is one of the most popular languages among computer programmers, there are abundant resources to learn it (books, Internet pages). Thanks to packages such as Numpy and Scipy), data management (pandas), visualization (Matplotlib) and econometric modeling (Statsmodels) it is easy to use Python. Another advantage of using Python is that, unlike proprietary programs, Python and many of these complementary packages are completely free.

The purpose of this note is to illustrate some of the common tasks that economists can perform using Python. First, we use numerical techniques to solve two Cournot competition models presented by Miranda and Fackler (2002) using the “CompEcon-python” package ², which is freely available at Github³. Second, it illustrates how to automate the collection of Internet data and its presentation in tables and graphs. Third, some examples of econometric models estimated with Python are shown.

Now I want to show a few examples how easy we can work with Python.

In first example we need to calculate the cost of the loan, i.e it is necessary to calculate how much you will have to pay per month on the loan and how much to give to the bank for the whole period. And we can easily use the Python to solve this task. So here is my code:

```
s=float(input('Enter loan amount'))
p=float(input('Enter the percentage of the bank'))
n=float(input('Enter the number of years'))
m=float((s*(p/100)*(1+p/100)**n)/(12*((1+p/100)**n-1)))
summ = float(m*12*n)
summ = round(summ,2)
m= round(m,2)
print('The total for the whole period - ' + str(summ))
print('The amount of the monthly payment - ' + str(m))
```

In the second example I want to present you another python function. Such as working with text. In this task I need to

- 1) Enter Last and first name, number of repetitions and the group code,
- 2) Concatenation of strings (Surname, First name, Last name + "Student group" + group code),
- 3) Search for a substring in a row,
- 4) Repeat merged rows a specified number of times from a new row;
- 5) Print the symbol "*" the specified number of times in the form:

Here is my code:

```
name = str(input('Enter your name and last name '))
name1 = int(input('Enter group code'))
n= int(input('Enter the number of repetitions '))
a=(name + ' ' + name1)
f=input('Which string do you want to find?')
index=a.find(f)
if index>0:
    print('Your search string begins with a number', index+1)
else:
    print ('There is no such string!')
print((a+ ' ') * n)
i=0
k=n+1
while i<=n:
    print(' '*k + '* '*i )
    k=k-1
    i=i+1
input()
```

As shown above Python is very useful and powerful tool for solving economic tasks.

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Actual problems of economy and management of sustainable development of the country

The basic economic problem is the scarcity of resources. People want more than can be met with their available resources. The effort to overcome the relative lack of goods, in other words to solve the economic problem is the basis of the economic activity of people. If the satisfaction of a need does not have a shortage of the appropriate resource, the action for the acquisition of this instrument is not classified as economic. The effort, for example, for inhalation of air lacks is not an economic action because the air is in abundance. The economic goods, of course, are not created on their own. It is the result of people's effort that use whatever is available to them, to create resources that meet the needs i.e. the goods. The problem of scarcity of resources has as a result the allocation of resources.

Moreover, the scarcity of resources means that the production of a particular product has costs in the form of other goods and services that could be produced in its place with the same resources spent for its production. For example, the working time and the machines that are used for car production cannot be used placed for the construction of schools. So, the society avoids producing useless products that nobody wants to consume or produce useful products but with more resources than those that it could use if it combined them better. An economy is effective when it does not waste its limited resources by producing useless products when it maximizes the produced goods by ensuring their full use and their excellent combination.

Generally, in capitalist societies, it is possible to have a relation of reverse ratio between the objectives of economic efficiency and social justice. That is because when the employees and other social classes and strata achieve redistribution of income to their benefit, then it is possible that the profit rate may fall, and as a consequence capital reduces the amount of investment and the rate of product slows down. So, the efficiency of the economy may be reduced as a result of the redistribution of income, although the latter contributes to achieving social justice.

It can be said that social welfare that is based on the satisfaction of social needs through consumption depends on :

- the harmonization of social preferences for product consumption with the allocation of social resources in their production,
- the effective use of resources in goods production
- the fair distribution of income and the fair distribution of wealth, which ensure that social welfare is distributed equitably among all members of society.

The economic problem is a permanent problem for human societies. In the immediate future there is neither a limitation of the needs nor a substantial increase in the resources to satisfy needs. On the contrary, indeed, as the pessimistic scholars support the economic problem will become more intense.

But along with such bleak prospects there is the evolution of technology and the possibility to find new energy sources that tend to dampen the intensity of the economic problem. However, to the degree that developments can be predicted, the basic economic problem seems to be permanent.

In addition there are some problems of a market economy: "what is done?", "How is it created?" and "who are they producing for?" The ever-present problems facing each manufacturer and demonstrating economic freedom.

Consider the first question - what is important? You can see outstretched entrepreneurs from their manufacturers. It needs to understand what it looks like and may be offered to be known and looking for companies. In a market economy, the answer to this question is the market itself. If the need for any goods grows sharply, then the production of this product will expand. The answer and description of responses to resources is important. On the other hand, there will be a situation, and for certain reasons, try to lower the product. The "vote" of the crop will orient the production so that the production of this product is reduced, and the resources stored in other products for other products.

The second problem is how to create? It is the real production, its technology. Market competition between manufacturers is a protesting factor. Competitive products that are forced to use higher quality goods, and also - to improve production, to use new technologies, are themselves to maintain competitiveness. When changing products on resources, the company often proves the production and production of production, so as not to raise the price of their goods.

The third problem - who is it important for? They are being considered for what is achievable, and perhaps the user is buying a product. Significant blows are also played by goods for goods and buyers' taste. We offer certain goods, and while buyers also forget about big products in the production of products and other products, they are ready to receive products that are sold for their own goods. In terms of the number of products of a particular type at a given time, this is limited and consumers remain competitive. Consumer competition can lead to different things.

Stages to form the strategy of the country sustainable development:

- Identifying the problem on the path to sustainable development and they are affected
- Formation of goals and objectives that stand develop
- Defining options in the work structure for achievement of goals and objectives
- Identification of individual factors for achieving goals objectives
- Determination of baseline values of individuals and setting their target values
- Conducting the Committee and comparing achievements benchmarks based on benchmarking

One of the most frequent problems is that economic decisions can have external effects on other people not involved in the transaction. For example, if you produce power from coal, the pollution affects people all over the world (acid rain,

global warming). This is a particular problem because we cannot rely on the free market to provide the most efficient outcome. If everyone maximises their utility, it doesn't lead to the most efficient outcome – but gridlock and wasted resources.

Monopoly was an economic problem that Adam Smith was concerned about in his influential book of economics “A Wealth of Nations.” For various reasons firms can gain monopoly power – and therefore the ability to set high prices to consumers. Given a lack of alternatives, monopolies can make high profits at the expense of consumers, causing inequality within society.

How to deal with the problem of monopoly? – A government may seek to encourage competition, e.g. rail franchising, or price regulation to prevent excessive prices.

Inequality is considered a problem because of normative opinions such as – it is an unfair distribution of resources. Also, you could argue there is a diminishing marginal utility of wealth. If all wealth is owned by a small percentage of the population, this reduces net welfare. Redistributing the money to the very poor would enable a greater net utility to society.

Inequality is a problem. However, it is also a problem to know how much we should seek to reduce poverty. Many will agree on the necessity of reducing absolute poverty – but how far should we take it? Another issue with reducing poverty is that measures to reduce poverty may cause unintended consequences. Giving benefits to the low paid may reduce incentives to work.

Unemployment has been a major economic problem in advanced economies. One of the principal causes of unemployment is swings in the business cycle. A fall in demand for goods during a recession, causes people to be laid off. Because of the depressed state of the economy, there is an imbalance between demand and supply of workers.

Unemployment can also be caused by rapid changes in labour markets, for examples, unskilled workers unable to gain employment in a high tech economy. Unemployment is a problem because it is a waste of resources, but more importantly, it leads to very high personal costs, such as stress, alienation, low income and feelings of failure.

A recession is a period of negative economic growth – a decline in the size of the economy. It exacerbates problems of inequality and unemployment. A problem of recession is that it can create a negative spiral. When demand falls, firms lay off workers. The unemployed have less money to spend causing further falls in demand. In the great depression, unemployment rose to over 20% – the unemployed also had little support and relied on soup kitchens.

High inflation can be a serious problem if prices rise faster than wages and nominal interest rates. In periods of rapidly rising prices, people with savings will see a decline in their real wealth. If prices rise faster than wages, then people's spending power will decline. Also, rapidly rising prices creates confusion and uncertainty and can cause firms to cut back on investment and spending.

Countries which have experienced hyperinflation, have seen it as a very traumatic period because all the economic certainty is washed away, leaving people

without any certainty. Hyperinflation can cause not just economic turmoil but political turmoil as people lose confidence in the economic situation of the economy. Some developing economies may be stuck in a poverty trap. Low growth and low saving ratios lead to low levels of investment and therefore low economic growth. This low growth and poverty cause the low savings and investment to be continued. Developing economies face similar economic problems, but any issue is magnified by low GDP and high levels of poverty. For example, unemployment in a developing economy is more serious because there is unlikely to be any government insurance to give a minimum standard of living.

So, we have called the current economic problems and how they can be solved. One of the social reasons exacerbation of global problems was ill-considered regional policy of states, lack of economic sovereignty of the republics, national ownership of their natural resources, means of production.

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Material and technical supply as a factor in improving the economic efficiency of organizations

Under the current conditions of economic development, the improvement of material and technical supply (MTS) as one of the areas of commodity circulation is one of the most important factors in improving the economic efficiency of organizations.

Material and technical supply is a form of commodity circulation in the field of material production, which is the process of providing enterprises with raw materials, semi-finished products, ready-made products etc.

Logistic processes occupy an important place in the activities of any enterprise. Effective operation of the whole chain of MTS is the formation of orders, procurement of material resources, their delivery, distribution and storage. It depends on the efficiency of the enterprise as a whole and the successful implementation of its production plans. In the cost structure of the enterprise, the costs associated with the movement of material flows, reach 50%. Successful management of these items of expenditure is one of the main levers of influence on the value of the final product for the company.

The material and technical supply must ensure coordination between the production and consumption of products in interrelated sectors of the national economy. This coordination is one of the important conditions for a high rate of economic development. In turn, the planned organization of the circulation of means of production has a large influence on the efficiency of social production and on the results of the economic activity of enterprises. The steady production of output, growth in labour productivity, and better use of the fixed and circulating assets of enterprises depend on a timely and complete supply of material resources

Thus, the MTS system has a number of functions according to which it supports the productivity and efficiency of production [1]. They are shown in the diagram:

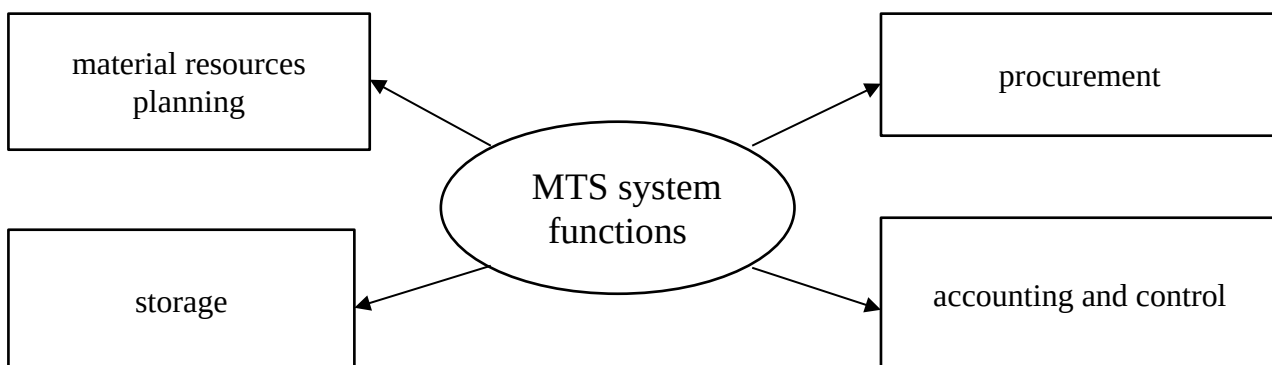


Fig.1 MTS system functions

Planning necessary material resources means that MTS, on the basis of available data on such indicators of production as returns on assets, determines the optimum amount of resources necessary for the implementation of a single production cycle and the production of a specific batch of goods and services.

MTS conducts operational and procurement operations according to the plans of the needs, controls the process of concluding contracts, processes all "errors" of production. The MTS system develops guidelines, principles, standards and instructions, according to which the storage and use of stocks should be carried out. MTS system controls materials and raw materials for production.

The issues related to the optimization of the logistics system have been studied by researchers and practitioners [2]. The analysis of the results of investigations show that the updating of material and technical resources of enterprises can be carried out using different methods including application of innovative technologies in production.

Planning of material and technical supply, which is the basis for making a decision on procurement of resources, occupies an important place in the procurement activity. MTS planning is a complex of planned calculations, on the basis of which the resources requirements, the sources of their coverage and the amount of expenses for the implementation of the procurement process are determined. Selecting the optimal form of supply when large volumes of materials are consumed, the most efficient form is transit supply; the materials are delivered directly to users from the manufacturing enterprises bypassing intermediate bases. The warehouse form of supply is preferable where small amounts of output are consumed. In this case products move through the bases and warehouses of supply and marketing bodies ensuring optimal maneuvering of material resources [3]. The use of warehouses raises the problem of optimal siting of material stocks.

One of the main trends in improving management of the supply process is developing economically expedient, direct, long-term economic links between enterprises. Such links create more flexible conditions for supply and marketing, ensure the required timing for deliveries of products, increase production efficiency and labour productivity, improve the use of production assets by consuming enterprises, and at the same time help give the suppliers regular portfolios of orders. For the effective functioning of industrial enterprises, the improvement of the supply of goods should be based on strategic management, one of the components of which is the logistical supply process.

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Forecast calculations for transport enterprise

In today's economy, small business is of great importance. It determines the rate of economic growth, quality, and the structure of the gross national product, creates competition, due to which there is a rapid saturation of the market with the best quality goods, the creation of new jobs and so on. Small business is such a profitable link in the economic structure that the state supports it wholeheartedly. It would seem that having your own business is a very attractive and rewarding idea, but it must always be remembered that there are now enough entrepreneurs in every field who can create strong competition for any new project - be it a start-up venture, or a large corporation.

For the company to be profitable and competitive, it is necessary to conduct a regular analysis of the flow of profits and expenses, keep an eye on customer growth and ensure optimal product turnover. In order to maintain the best work of the company, there is a number of methods aimed at analyzing and optimizing the activity of the company depending on its profile.

This article describes a forecast for the number of passengers for a private transport company with irregular transportation in 2020. The private enterprise (PE) accepts orders from companies and factories that require the transportation of their workers at the beginning and at the end of the business day, accepts orders for passengers' transportation to a festive event, excursion and more. During the summer season, the company is engaged in passenger transportation to Kyrylivka, Berdyansk, and Prymorsk. As of 2020, the company fleet has 8 buses for irregular transportation (in 2017 - 7, 2019 - 8).

To carry out the work, we obtained the data on the number of passengers over the last three full years of operation of the enterprise per months. Information was collected on the last day of each month. Therefore, due to the time series obtained, it was possible to draw conclusions about the trend and seasonality of the indicators. The visualization of the enterprise passenger turnover dynamics is presented in the graph below (Fig. 1). According to the received schedule, there is a noticeably positive trend in the growth of passenger turnover at the enterprise.

Therefore, to obtain a passenger forecast, it is necessary to build a Holt-Winters model, since the data structure has a clear seasonality and an increasing trend. First, the linear trend equation was analytically obtained and an approximation error was calculated, which is 10%. The data obtained indicate that the equation is acceptable as a trend.

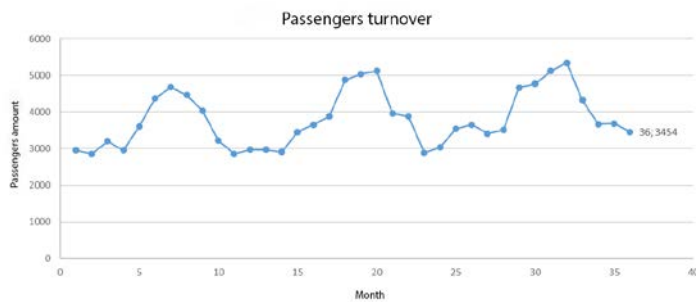


Fig. 1 Passenger traffic dynamics on the PE

Next, it is necessary to calculate the seasonality factor, which will be taken into account in the forecast model. After calculating the deviation of the actual values from the trend values and the average deviation for each month, it is determined that for the given time series the total seasonality index is 0.994. The next step was to calculate the seasonal coefficients, separated from the trend, for each month separately. The final step is the calculation of the forecast, which depends on the seasonality for each month and the estimated future trend. The results are presented in the second graph (Fig. 2); here the solid line identifies the factual values, the dotted line - the predicted ones. Looking at the last chart, it is quite obvious that the forecast repeats seasonal fluctuations and has the same upward trend as the previous data.

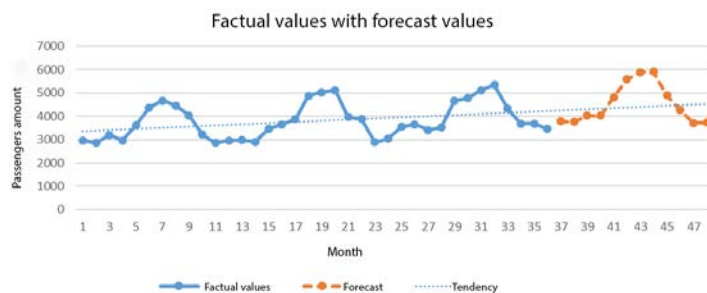


Fig 2. Actual indicators with forecast and trend line

Before making any conclusions, it is important to check the forecast accuracy. Any prediction has a possible error, so it is always necessary to determine the deviations of the predicted values from their real future values. Calculating the average absolute percentage error, we obtained $MAPE = 8\%$, that is error rate is $<10\%$, the forecast can be considered very accurate. Next, a Tail coefficient was calculated, $KH = 0.26$, which indicates high adequacy of the forecast, because indicator is in the range from 0 to 1 [1].

To sum up, this company has a positive trend of growth in passenger turnover, which, according to forecasts, will continue in the upcoming year. Also, analyzing the data received, a noticeable influx of customers is expected in the summer.

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Marketing research

Now we live in the world of data. How we use data and how we integrate them into the data that we need requires a completely different level of skills and thinking compared to what traditional market researchers do. Digital marketing platforms (DMPs) are in use today. Their development is the future of market research.

As technology advances, marketers have a new ability to scale and personalize their programmes through artificial intelligence. In fact, 79% of customers are willing to share data in exchange for contextual interaction, and 88% will do this for personalized offers [1].

Personalization of interaction focuses on “how” to interact with users. Marketers usually rely on user’s certain actions or their behaviour. For example, if a customer buys a product in a mobile application, the seller may send them a gratitude via email, thereby encouraging to the next action. If the user adds the product to her cart and then refuses it, the seller can send a coupon for this product to stimulate the next purchase.

Besides, 82% of marketing leaders believe that personalization is a serious incentive to protect the interests of customers, and 92% say about the same impact on brand formation. The ability of marketing teams to personalize the customer’s path has become a marker of success. Marketers with high rates are 9.7 times more likely than weak ones to be fully satisfied with their ability to personalize multi-channel experiences [2].

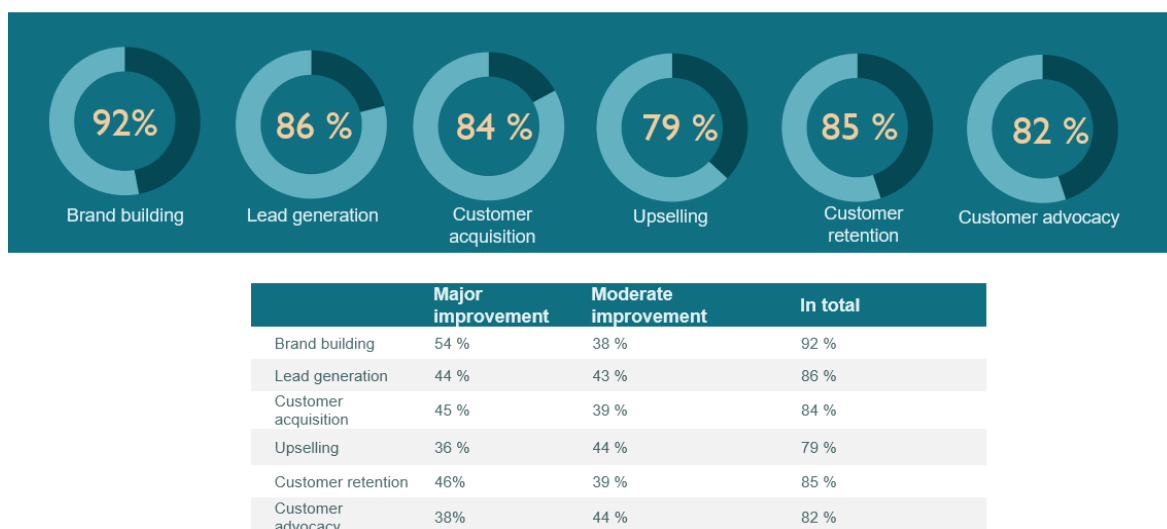


Fig.1. Improving brand performance through personalization

While big data technologies help with capturing accurately loads of data, there is still no machine or computer replacement for human cognition. As such, market researchers are excited to use tools and software that connect them more directly with consumers. Mobile applications are the best sample. It includes video analysis tools, geolocation, social listening, automation tools, and more. Market researchers are excited to use these tools to create a better data story that more accurately describes consumer preferences and behaviours.

Forty-four percent of marketers use connected devices (up from 29% who used them extensively in 2017), including 32% with voice-activated personal assistants like Alexa and Siri. Twenty-four percent use virtual reality, such as applications, which allow customers to calculate mortgage costs by pointing their phone at home or “trying on” the shade of makeup without going to the store [3].

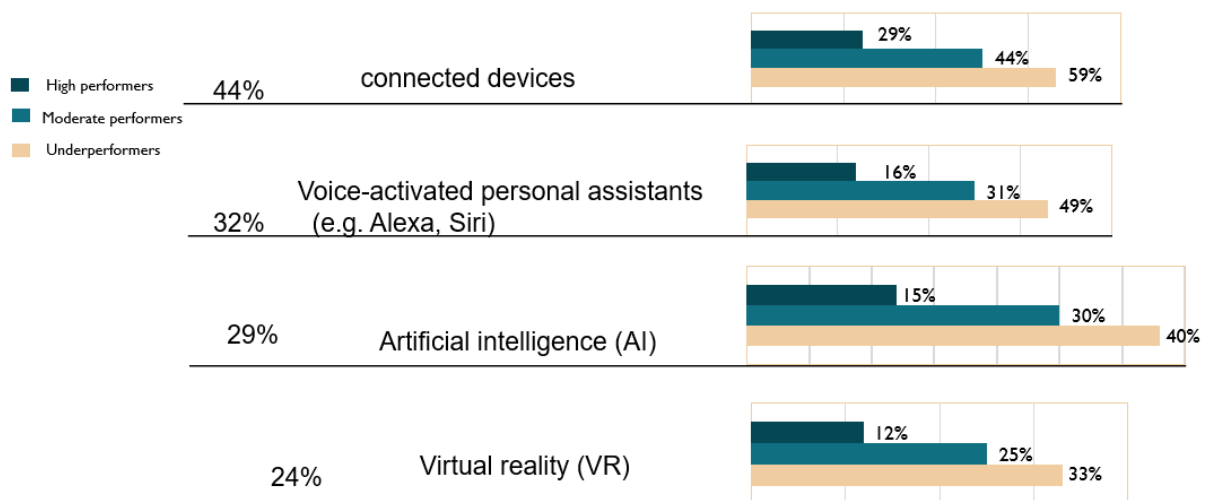


Fig.2. Percentage of Marketing Organizations Using Different Technologies

The most common way companies receive customer feedback is through surveys sent via email. At the turn of the century, the email survey was a fine solution. Inboxes were not flooded, and online surveys were far more effective than telephone surveys. However, 20 years later, emails have earned a very different reputation. Nearly 75 percent of consumers are overloaded with email. More than 244 billion emails are sent daily, but only 23 percent of company emails are read. Many are ideally suited to their inboxes with one primary goal: to delete emails and spam before it takes over. The spreadsheet of Daily Email Traffic shows a decline in growth rate, despite the increase in the numbers of users [4].

Daily Email Traffic	2018	2019	2020	2021	2022
Total Worldwide Emails (billions)	281.1	293.6	306.4	319.6	333.2
% Growth		4.4%	4.4%	% 4.3%	% 4.3%
Worldwide Email Users	3,823	3,930	4,037	4,147	4,258
% Growth		3%	3%	3%	3%

Fig.3. Daily Email Traffic

As mailboxes got more loaded, more people began to use mobile applications and messaging platforms to chat with their friends and family. Currently, the leading messaging platforms are Telegram, Instagram, Facebook Messenger and Viber Messenger. Messaging is also becoming a very common way to communicate with customers. According to research, consumers feel more confident about the brands they can get through messaging. In addition, favourite brands always have time to remind themselves by sending a notice of discount on goods or new collection.

If we adequately consider personalization, we can say that it simplifies the life of both customers and companies. Indeed, in this way, consumers have a wide selection of assortments right at hand and even, it would seem, without voicing their desires.

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Ukraine`s Trade Politics in the Context of International Trade Development

In the modern world, issues of globalization of economic activity for most countries is an acute question. It is relevant both from a theoretical and a practical points of view. Studies are being conducted to search promising areas and forms of foreign economic ties. For countries moving from closed national economies to an open-type economy facing the outside world, in particular for Ukraine, such studies are especially relevant.

In the context of economic reforms, the country's transition to the efficiency of a market economy is a difficult task. Despite the fact that Ukraine was able to achieve significant achievements in the political and regulatory sectors and steps were taken towards European integration, the problem of enterprise development and stimulation of competition remains, the results of which are much more modest. That is why the question of formation of an effective trade policy of Ukraine is of great importance.

Scientists such as: Porter M, Obsfeld M, Galchinsky tried to solve the problem of ineffective conducting of trade policy. But as we can see, the problem has not been completely and comprehensively solved.

At present, the economic condition of the economy is unsatisfactory, last year the negative balance amounted to more than \$ 5.8 billion. Based on the results of the first eight months, we can see that Ukraine has increased its imports and exports, but at the same time goods from abroad are imported far more than they are sold. This is evidenced by data from the State Statistics Service, which indicate \$ 38 billion 873.1 million, which is the amount of imports of goods in January-August, which is 8.2% more than in the same period last year. This year's export value is 33 billion 30.4 million dollars, which increased by 6.9%. [1]

Accordingly, the negative balance amounted to \$ 5 billion 842.7 million. The annual negative balance for January - August was less - \$ 5 billion 6.4 million. Analyzing these figures, we can say that the import export coverage ratio was 0.85, which was 0.86 last year.

In August 2019 compared to July 2019 seasonally adjusted export volumes decreased by 2.4 percent, imports - by 4.2 percent. Seasonally adjusted foreign trade balance in August 2019 was negative and amounted to 847.2 million US dollars. In July 2019 is also negative - 964.8 million US dollars.

But this data is just the tip of the iceberg. If we analyze the state of exports and imports of Ukraine since 2005, we can see that all exports are either equal to or less than imports. In fairness, a steady increase in exports can be noted (except for 2009, where exports declined during the global crisis). The data on the foreign trade balance of Ukraine, starting from 2005, are presented in table 1 and figure 1 [2].

Table 1

Foreign trade balance of Ukraine

<i>Year</i>	<i>Nominal GDP per year</i>	<i>Export of goods and services</i>	<i>Import of goods and services</i>	<i>Balance</i>
2005	441452	227252	-223555	+3697
2006	544153	253707	-269200	-15493
2007	720731	323205	-364373	-41168
2008	948056	444859	-520588	-75729
2009	913345	423564	-438860	-15296
2010	1082569	549365	-580944	-31579
2011	1316600	707953	-779028	-71075
2012	1408889	717347	-835394	-118047
2013	1454931	681899	-805662	-123763
2014	1566728	770121	-834133	-64012
2015	1979458	1044541	-1084016	-39475
2016	2383182	1174625	-1323127	-148502
2017	2982920	1430230	-1618749	-188519
2018	3558706	1608890	-1914893	-306003

Obviously, along with the increase in the volume of export-import operations, imports to Ukraine have been chronically ahead of exports in recent years, with a difference reaching at times 8% of GDP.

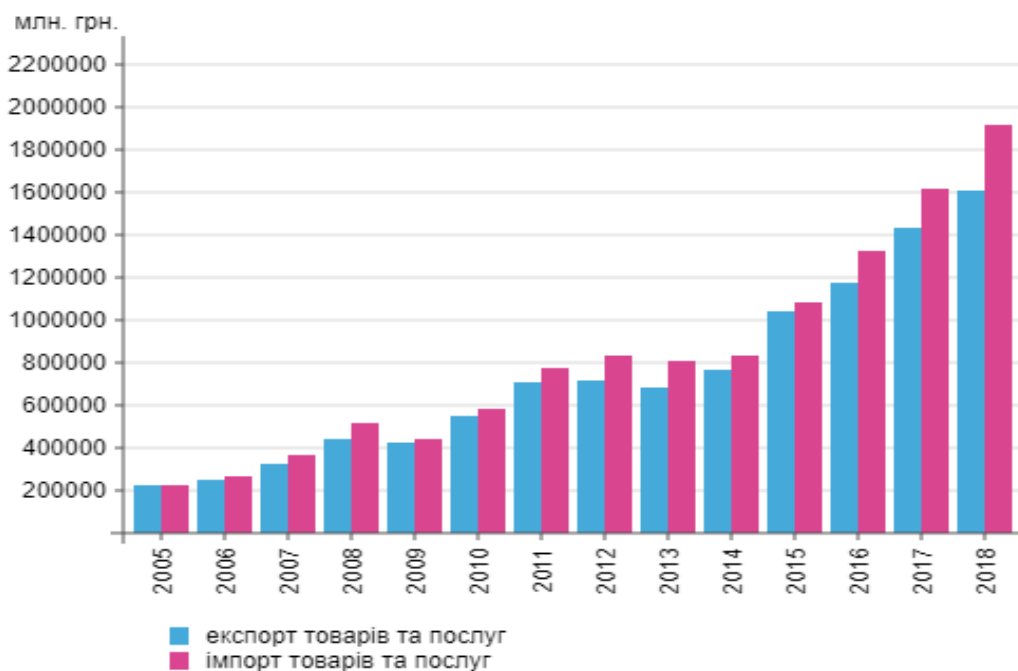


Figure 1. Ukraine's foreign trade balance.

Despite the rather encouraging forecasts of experts, which indicate a GDP growth in 2020 from 3.2 - 3.3% to 4%, the Ukrainian economy needs to develop a new strategy for conducting foreign economic policy, because the export structure of Ukraine has a low-quality character. In particular, the export of raw materials and semi-finished products (these include the product groups "Products of animal origin", "Products of crop production", "Fats and oils", "Mineral products", "Products of the chemical industry", "Skins", "Wood and products from it", "Cellulose", "Materials of precious stones, gypsum, cement", "Metallurgical products and articles made of it ") amounted to \$ 18.7 billion in the first half of the year. This represents more than three quarters of Ukrainian exports - 76.4%. Little has changed over time. Over the last 15 years, raw materials exports were below 70% of total exports in 2009, 2010 and 2017 only.

The aim of the paper is to present indicators of import and export, to identify the main directions of development of foreign trade and to develop proposals for improving foreign economic policy.

That is, we can conclude that Ukraine needs to reduce the amount of imports. In our opinion, the best solution will be non-tariff means, which will include increased quality control of products imported into the territory of Ukraine, and also possible quotas for products that can be replaced by domestic counterparts.

Despite Ukraine's introduction of export support, it made the tariff quota for exports equal to 0%, but this is not enough, it is necessary to stimulate domestic business, which in the future may lead to the development of a quality, competitive product that will be demanded in foreign markets.

It is also necessary to increase investment in research, to minimize technological backwardness from more developed countries, to increase the level of education, which will also bear fruit in the form of more qualified specialists. It is also necessary to determine the further path of Ukraine, whether it is a country with advanced metallurgy, or vice versa to bet on the agrarian sector. It should be noted that at the moment, exports of plant products come to the metallurgical sector, even at such a difficult time for industry.

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Modern payment tools: trends and perspectives

Payment systems are one of the key parts of modern monetary systems. They are a substitute for cash implementation when you make domestic and international payments [1]. Today payment systems are developing very quickly and creating the most of existing digital technologies. People do not need to bring cash with them every day, because they can use Apple Pay, Google Pay or other apps in their phones. They can also have an online wallet and use the Swift system for international money transfers. Unfortunately, not all people know how to use modern payment tools and do not estimate the necessity of them although they can simplify their everyday life greatly.

The goal of the presented research is to consider different tools of modern payment, to show the trends and perspectives of developing technologies in order to make people more familiar with new technologies in finance.

The most concise, simple and common payment tool for everyone is cash (banknotes and coins). Each country has its own currency, issued and controlled by the National Bank. However, cash is not always convenient, for example, if you need to pay remotely. There is also a hygiene problem, because banknotes or coins are usually passed from hand to hand many times. Statistics from National Bank of Ukraine show that of July 1, 2019, UAH 393.8 billion were in cash circulation in Ukraine. In Ukraine, the largest number of banknotes with a value of UAH 200 and coins with a value of 10 kopecks (23% and 29%, respectively) are in cash circulation, and in the Eurozone there are banknotes with a value of 50 euro and coins of 1 euro cent (46% and 29%, respectively) [2]. It should be mentioned that the National Bank should spend a lot of time and resources to serve the cash turnover. Another problem occurred with the cash turnover is the difficulties in control of money flowing to the hidden market and financing the shadow economy.

The second tool of payment is a bankcard. A bankcard is a plastic card, issued by a bank to its clients, that performs one or more of a number of services that are related to giving the client access to bank account [3]. Bankcard simplifies the purchase process because you do not spend time counting cash. It is much more convenient to carry one or two bankcards with you than a full wallet of banknotes and coins. Using a bankcard, you know exactly that it exists only in your hands, unlike banknotes, which pass from owner to owner. A bankcard allows you to make a purchase or withdraw cash in any country of the world, while cash is limited to the country that issued it. Using the tech-apps from your bank, you can monitor your spending, make deposits without visiting the bank branch, work with your loan account and pay for different services online.

According to statistics [4] three the most popular payment systems are UnionPay, MasterCard and Visa. UnionPay is an international and the most popular (debit and credit cards) payment system in the world, developed in China. Mastercard Incorporated and Visa Incorporated are American multinational financial services corporations. Throughout the world, their principal business is to process payments between the banks of merchants and the card issuing banks. They provide financial institutions payment products that they then use to offer credit, debit, prepaid and cash-access programs to their customers [5, 6]. The base currency of the MasterCard is the euro, while Visa uses the dollar. It means that in the Eurozone it is better to use a MasterCard, and in America a Visa. It is very convenient to pay not just with a card, but also through a contactless payment. Contactless payment is a new method of payment with use of phone or watch. It means that you do not need any physical contact between the card and the terminal. You can just enter the data of your card into your phone wallet and pay in 5 seconds. You should not worry about security, because everything is protected with your passwords.

There is also a digital wallet, which allows you to make online transactions. Digital wallet is a software product, not a bank in the usual sense for us. You can create an electronic wallet without leaving home; store electronic money; quickly and without fees conduct online payment for goods; make wallet replenishment operations in terminals. There is no need to add your bankcards or share payment card information on the website.

If you need to transfer funds abroad from your account to the account of an individual or legal entity abroad, you can use special standard money transfers. The benefits are as follows: transfer without opening an account or from account to account; access to operations with euro or US dollars worldwide where this system operates; the term of crediting is no more than one banking day. SWIFT is one of the best international interbank information transfer and payment systems. Payments are ideal for paying for purchases made abroad, booking hotel rooms, paying for tuition, leisure or medical treatment, as well as for money transfers to relatives and friends.

So, it should be noted that modern technologies are fundamentally changing all aspects of life, including the financial sector and especially payment instruments. This direction will develop every year faster and faster, making people's lives easier. People need to learn new technologies and not be afraid to use them.

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Neobanks: new opportunities and challenges

Quickly developing financial market is a nowadays reality and digitalization process is unstoppable. Financial technologies (FinTech) and technologies in finance (TechFin) are dramatically changing the rules and rhythm of financial operations. Under these conditions totally new institutions in the field of alternative finance appear. One of the biggest challenges for traditional financial market is neobanks. A neobank is a type of direct bank that is 100% digital and reaches customers on mobile apps and personal computer platforms only [1].

The goal of the presented research is to define the peculiarities of the neobank as a financial institution and to check the opportunities and threats of using such institutions.

The first neobank, Cashplus, started working in 2005. But the term will be mentioned only after 12 years, in 2017. That year is also a year when this neobank got its banking license. We can argue that neobanks began to be recognized in the world only 3 years ago.

Nevertheless, today a lot of developed countries have their own neobanks. Chinese financial unicorn WeBank is considered the most popular one. It started its work in 2015 and by September 2019 had collected 900 million active users of its app called WeChat pay. It described itself as «affordable, accessible, appropriate and sustainable» bank for customers and business. During the 21st century around the world there appeared such neobanks as: Tinkoff bank (2008, Russia), Simple (2009, USA), Chime (2013, USA), bunq (2013, Netherlands) [2], Monobank (2017, Ukraine).

Users of such banks do not need to leave their houses to receive answers to their questions or to make an unusual operation. Or, conversely, they can manage their personal account from the phone application anywhere in the world.

You always get faster support from neobanks than from traditional ones, what is more, they work 24\7, which also differs them from the usual ones.

While neobanks are still a relatively recent phenomenon, they are fueled by impressive growth. As of August 2019, they cumulatively amass over 30 million customers – and this figure excludes highly populated markets like China and India. Some estimates predict that UK-based challenger banks will grow threefold within 12 months, hitting the 35 million users mark. This growth is vastly fueled by aggressive investments in neobanks, with several "unicorn" funding rounds and a combined \$2.5B investment in 2019 to date.

According to some banking industry analysis, traditional banks spend 70% of their IT budget on maintaining legacy systems. On the contrary, by not having to rely

on these legacy systems, Neobanks experience servicing costs that can be up to 70% lower than those of incumbents.

Neobanks' IT approach is then to rely on micro-services and standardized APIs for the back-end, while leveraging open-source front-end frameworks like React Native and Ionic to develop modern web and mobile apps. [3]

Talking about Ukraine we need to mention Monobank, because it's the first neobank in Ukraine. Monobank is a retail product from Universal Bank JSC, which resulted from a collaboration with FinTech Band. Monobank issues customer credit cards, provides depositing options and other services, and the best mobile app will make controlling finances as convenient as possible. Monobank works only on mobile devices. As Iryna Starominska, chairperson of the board at Universal Bank SC said, "Our new project has allowed us to provide the customers with a progressive tool of personal banking which is extremely convenient and competitive on the lending market." [4] In Monobank app you can make various banking services, including money transfer, comfortable way of paying utility bills, receiving a cash-back from your purchases and the ability to take part in the bank's special offers. Communication with consumers happens with the help of social media like Viber, Facebook Messenger, Telegram or on the phone. They develop lending to the Ukrainian people. The services they provide will have the best impact on the people's spending capacity, which in its turn will help to develop small and medium enterprises in Ukraine.

Summarizing all this information, we can surely say that neobanks are the future of banking system. They are more comfortable, safer, faster and you can do everything by yourself. Neobanks are bringing a new force to the banking sector. They challenge traditional banks by delivering highly engaging digital banking experiences and are quickly amassing users across the globe. [3]

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Top challenges faced by logistics management today in Ukraine

In the modern version of the Ukrainian economic policy, logistics plays the most important role in the implementation of trade on the market and, accordingly, in the completion of market transactions. But if you do not take this fact into account, evolving consumer requirements, rather simple business models, this is just a small number from the huge list of main factors that can provide problems for improving logistics regulation.

Due to problems arising from the recent negative events in the socioeconomic system of the country, logistics in Ukraine is not in the best position. Moreover, a fairly large number of experts on the market say that logistics in Ukraine has great potential and will soon be able to show decent results after the economic situation recovers. The survey was conducted with indicators collected from all cities of Ukraine.

Therefore, to obtain rational results, there are priority tasks that today should be in the forefront among managers of logistics:

Moderate use of transportation costs

Taking a strategic approach to preventing or reducing short positions will likely play a major role in improving networks, and will typically reduce transportation costs. Therefore, in order to implement these strategies, managers of logistics must possess sufficiently reliable information about current and subsequent orders. The use of computer technology in the field of visibility is likely to provide a significant simplification of the goals.

Analysis of a large amount of information

Due to the specifics of their work, the logistics manager has to devote a lot of time every day to process a huge amount of numbers and information, not taking into account the fact that it is also necessary to exercise control over the solution of delegated tasks. The process area includes ensuring the safety of the fleet and personnel, loading the fleet, cross-checking route maps, authorizing fuel bills, etc.

Offer segmented, individual services

With increasing customer intentions, small and fairly rated shipping companies are trying to achieve record customer support. The most important word for a successful plan in such an idea is plasticity. Logistics managers should talk about their own experiences for a specific sample of customers. Reproduction of programs for controlling logistics processes, which should help automate the design of various services for any customers, most likely will not only help reduce the working time and strengthen positions at the level of management and control, but most likely will increase the accuracy of data generation and comparison.

Employee control

Exercising control over employees is a rather difficult duty to manage. You must follow a humane approach to your employees, and you must adhere to the concept of your organization. In potential cases, this is a difficult task in all management structures, but this is the most important rule in management in the logistics sphere, because drivers and employees are in many cases in different places to reproduce the quality of the supply chain. The distribution of responsibility through the appointment of logistics managers in the main moments with the help of the necessary solutions for exercising control over the work order will become the key to more efficient management.

Compliance with the rules

Transportation rules, norms and safety standards will vary depending on the location (from city to city, from state to state and, of course, from country to country). If your company and your employees provide services to a mass client, in this case, you are sure to apply constantly changing rules and regulations and constantly familiarize your employees with these rules, rather undesirable problems will appear. Working with more efficient examination software is more likely to help prevent these problems and increase regulatory compliance, the results of the examination and create a better and more modern audit, and thereby eliminate problems for you that may be associated with incorrect laws and regulations.

Ukraine has at its disposal highly profitable geographical and geopolitical locations, because Ukraine is located at the intersection of the most significant directions in the world trade market and shortened transport routes in Eurasian territory. Ukraine has a sufficient number of major international transport corridors with a total number of more than 5,000 km.

But we can also observe a cycle of decline in the dynamics of freight traffic in recent years. This is due to some points described below:

- economic crisis;
- undermining the political situation;
- reduction of domestic and foreign markets.

Since the transport market of Ukraine does not have sufficient development to guarantee uninterrupted work on issues of European integration in the current situation of its trend potential, we intend to talk about the proximity and features of this market. For the Ukrainian transport market, certain periods of formation of this industry are very different. If we make a selection from the main one, then the logistics industry in the service market observes both ups and downs with a frequency of 3-5 years. However, if the employees of the logistics companies non-stop fulfill global goals and create competition for European potential companies, enterprises in our country will be able to period of stagnation for a long period. Therefore, in order to create a strong position in a competitive environment, logistics managers must follow the internal reserves that are characteristic not only of the transport segment, but also of the entire socioeconomic system of Ukraine.

Over the past 10 years, the rate of domestic investment in the transport segment has decreased by 2 times to 7% of the total indicator of investment in the economy. It

is only exceptional that the financing of road transport remained with the same indicators, that is, 0.5–0.7% (1,400.00–1,600.00 million UAH) of the total investment in the economy.

If you follow the official statistics, the capital of the transport segment in Ukraine has depleted by more than 90%. But it is also said that in the case of road transport, the figure is only 60%. Nevertheless, it should be pointed out that the updated fleet of only 40% is not a sufficient indicator for cars to enter the international market; this shows the reason for the absence of even the smallest competition. The highest rates of domestic investment in road transport are seen in Kiev (20%), Dnipro (15%) and Poltava (12%) regions.

Unfortunately, the distinguishing features of the current state of Ukrainian rail transport are at the crucial financial level, and rolling stocks as well as material and technical bases are completely worn-out (about 90%). The largest amount of traction rolling stock of railways in Ukraine was made by adhering to obsolete techniques, so the standard service life was almost exhausted. The settlement plan showed that investments in the amount of 3 billion UAH are required. And it should be believed that this money would not be spent only on improving passenger traffic. In the regional formations, two main railways can be distinguished: the Dnipro Railway (31%) and the Donetsk Railway (39%), but with all this, due to the general downward trend, as well as structural changes in the territorial division after 2013, huge rates of decline in traffic are observed.

On May 24, 2019, Odessa hosted a significant conference for the entire logistics industry in Ukraine, in which the Minister of Infrastructure of Ukraine Omelyan V. and the Director General for Mobility and Transport of the European Commission Henrik Hololei took part. In the end, important decisions were made about the trend in the development of the transport system of Ukraine and its compliance with European standards.

That conference was followed by the event "International Trade and Transport Week" where the topic of logistics industry development was also raised. Such key issues as the provision of new opportunities for multimodal transportation in the Europe-Asia-Europe connection, opportunities for trade facilitation, the introduction and development of digital technologies, as well as the development of port infrastructure were paid much attention.

It should be concluded that our world is constantly changing and the pace of these changes is constantly increasing and this can also be applied to business operations resulting in significant changes arising in subsequent tasks. Logistic managers should be aware of these changes and be able to quickly take steps to resolve these problems, which is the hallmark of a successful manager. At the same time, resolving problematic issues in the logistics sector is not an unattainable task. If you select only 3 main resources from the total mass, namely data, processes and technologies, then with a higher probability you will be able to solve any conflict situation related to your transaction.

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Main problems of online management

Online management is the process of demonstrating and locating a movement of its own and qualifying online brand. This stage combines web design and creation, demonstration of blogs, search optimization, one-click payment, reputation support, directory listing, social networks, online networking and other benefits to realize long-term positive participation for a person, enterprise or product, and on the whole on the Internet.

The management of online learning differs from the management of the Internet in that the former, as a rule, acts as a discipline of marketing and networking, and the latter - the academic discipline of “Risk Management and Compliance” (GRC).

Due to the constant changes in the basics of using the Internet, the use of one web resource is a rather weak version for improving brand recognition and perfection. In order to constantly be visible on the Internet and become a recognizable brand, employees, managers and organizations must combine several online resources and social networks. The most commonly used are Google Maps, Facebook, Twitter, Flickr, YouTube, and Pinterest. It is also strongly recommended to promote brands through the creation of mobile applications, attracting IT - companies and also affect other databases.

The development of coordinating the existence of the Internet arises from the setting of goals that will contribute to the development of online strategies. After completing the creation of the strategy and its introduction in the current work, a continuous and continuous assessment and specification are also necessary to guarantee participation on the Internet to achieve the established goals.

The strategy of coordinating participation on the Internet is a task, divided into several solutions to certain issues. In most cases, they consist of basing on search engines (ensuring that the brand is among the first search results), tracking online conversations and researching the brand’s single participation on the Internet.

The basics of online management:

- WEB Portfolio Guide
- quality blog content
- search engine optimization (SEO);
- promotion on the Internet
- control over building an unwavering reputation
- coordination of social networks
- marketing in the field of media

Mastering the right business skills on the Internet probably represents a great amount of opportunities and a relative advantage to other existing methods, such as avoiding the overhead associated with working in a regular offline store and avoiding

the need to make huge daily runs to get in touch with suppliers, customers and other people involved in this business. It also affects the flexibility of managing a business of your choice. Indeed, only in spite of all the advantages of creating a business on the Internet, it is quite possible that a number of some problems arise.

Difficulty in conducting computer expertise

An online business manager, as well as owners and companions, are required to have additional education, despite an adequate amount of basic knowledge on how to organize a business on the Internet. Important techniques should include an understanding of how to create a proficient website to run a successful business and how to promote your business in the online world. If you do not have enough defined skills in this area, you will most likely need to contact the special companies involved in creating an online business and you will lose a substantial amount of money.

Difficulty in building strong relationships

Meanwhile, as the creation of online business is facilitated by the opening of markets around the world, there are apparently some obstacles to develop current business relationships. If your business is located in Ukraine, you are most unlikely to meet in person with a client who lives in China or Asia. Even with developed technologies, such as video conferencing, which give us the opportunity to conduct a conversation through a computer screen, in reality, the client may still feel the lack of a personal meeting with the seller.

Privacy and security

Despite the fact that you take all precautions, such as the implementation of secure web pages to pay for purchases by your customers, you are certain committed to get to scammers who can easily hack your system and steal important and detailed information from your customers. This is most likely to be used to steal money from bank accounts or steal their identity. Obviously, you will not be able to make transactions with expected customers who do not want to make purchases on web sites.

Copyright Issues

Due to the strong world of the Internet, difficulties such as copyright infringement become difficult to control. The Internet unites the whole world with all countries and continents and therefore the implementation of a coherent and international copyright law is virtually impossible. If you have created a successful online business, it is obviously to be difficult for you to prevent other people from copying your business model and applying it for their own purposes.

Restriction of freedom in choosing an online business

Certain types of business will not be suitable for an online store. To a greater extent, this is palpable if their products imply the use of feelings. Suppose if your product is particularly unique in a pleasant aroma, you will most likely encounter difficult circumstances when selling it online. And besides, all people are different, and someone would like when making a purchase, a car, be sure to inspect the product in person.

When conducting a business on the Internet, like any other, it is advisable to monitor your capital - what expenses are incurred from, what sources they come from

and where to go. Excellent coordination of cash flow is necessary for any business, especially for a developing one.

As a developing business co-operator, you need to be extremely careful about your budget. You are not able to repay unnecessary tools for your business and hope that all applied methods and purchased devices will help you to be a successful entrepreneur.

And also, you should not spend your capital on various adaptation methods if you do not know exactly how to properly organize your campaigns and create targeting for the desired audience, which is more likely to convert.

Being involved in a particular online business, one can constantly watch how most decent firms are failing due to improper money management. I have no idea why entrepreneurs often lose control and start spending their budget on personal items. Cars, yachts, holidays - these are just a few things from a huge list that simply deprive the company of successful development and achievement of the status of a great company.

The best use of capital should definitely be at the top of your business plan list. Using scarce resources, you will need to apply some methods and make choices about investing in something that does not exhaust your fixed capital by concept.

Each component of your budget must be carefully monitored in order to achieve the highest investments and of course have a democratic cash flow. Proper credit money management and sound monitoring of past due debt are also of sufficient value. Proper control and efficient supply chain management will also mean paramount in the successful development of your online business.

It should be concluded that the profile of the company can be positive or negative, but with the best fulfillment of advantages, it is much more than with shortcomings. Our world is becoming online, and novice entrepreneurs should unconditionally accept this fact and always be aware of the latest marketing technologies. If you are only promoting your business offline, take a leap and you can discover a whole new world awaiting your company's research.

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Financial aspects of investment policy in Ukraine

The complicated process of transformational changes in Ukraine from the administrative-centralized economy to market affected the loss of the country part of its economic potential, which failed to restore to the present. Problems of transition to another type of economy and problems of the present time are the cause problems in the country to introduce innovation, and create an attractive investment climate.

One of the most important factors of economic development in modern conditions of management is innovation activity, which is basis for competitiveness. The innovation activity of enterprises depends on the condition of investment market of Ukraine. It is necessary to analyze the condition of investment policy and investment activity, in order to explore the investment market of Ukraine. In table 1 provided economic investment indicators in Ukraine. According to the table, the nominal GDP of Ukraine for the studied period had a growing character, after decreasing in 2014, as well as capital investments.

Speaking of interrelation capital investments to GDP, which is an indicator of economic security of the country, the reduction of this indicator was observed in 2013 and 2014 by 3.2% and 0.2%, respectively. Further the indicator was increased, so in 2018 capital investments in interrelation to GDP amounted to 16.3%. A recognized normative value of this index is 25% [2]. Thus, Ukraine has a shortage of investment resources and weakening of the country's investment activity.

Table 1

Indicators of economy investment in Ukraine in 2013-2018 years [1]

Year	GDP, billion UAH	GDP, billion USD	Capital investments, billion UAH	Capital investments (% of GDP)	Change in capital investments (%)
2013	1454.9	179.572	249.9	17.2	-
2014	1566.7	132.343	219.4	14.0	-3.2
2015	1979.5	90.939	273.1	13.8	-0.2
2016	2383.2	93.263	359.2	15.1	1.3
2017	2982.9	112.154	448.5	15.0	-0.1
2018	3558.7	130.86	578.7	16.3	1.3

According to the State statistics service of Ukraine [1] direct foreign investments in the economy of Ukraine in 2019 amounted to 3,1 billion USD. Dynamics of this indicator for 2013-2019 pp. shown in figure 1.

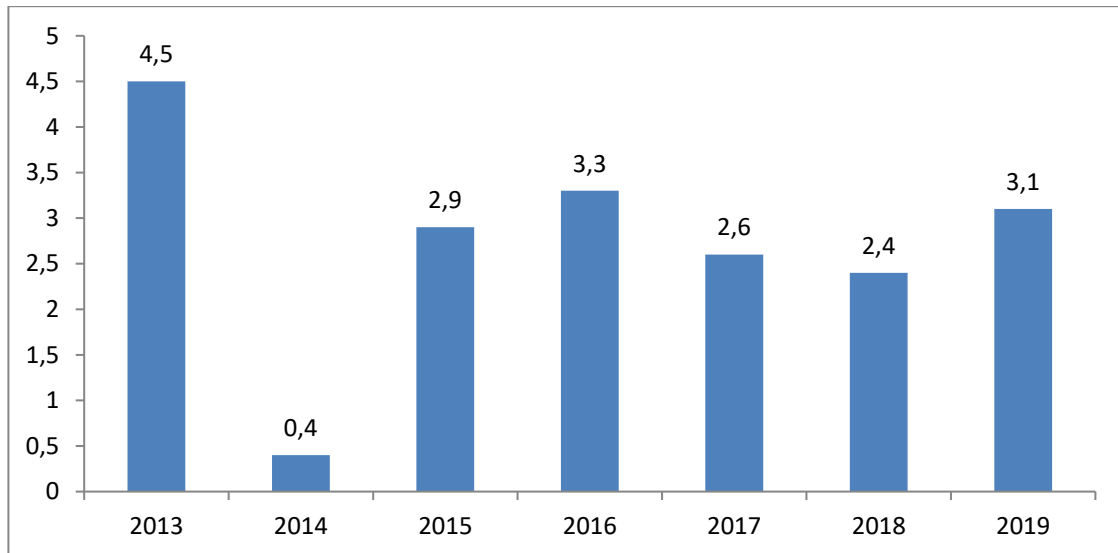


Fig. 1 The dynamics of direct foreign investment in 2013-2019(in billion USD) [1]

In 2014, foreign direct investments significantly decreased, which is associated with the military conflict in the east of Ukraine, the annexation of the Autonomous Republic of the Crimea in conjunction with the growth of production costs, due to devaluation of the national currency. It means that investment climate of Ukraine has decreased significantly, but further increase in foreign direct investment to the country proves that Ukraine is attractive to investment, and integrated into the world economy.

The analysis of investors according to the geographic component showed that in 2019 the greatest investment was received from Cyprus, the Netherlands and the Russian Federation. Investments were directed in spheres that are already economically developed, so most of foreign direct investments were submitted to the institutions that carry out financial and insurance activity – 36.1% and enterprises of industry – 23.9%. Thus, the largest part of the invested funds in Ukraine invest in the financial sector and mining industry, while professional, scientific and technical activities receive only 6.2% of the attracted resources (fig. 2).

According to World Bank rating "Doing Business 2018" [3] Ukraine takes the 71st place with 190, on the indicator of favorable business conditions and investment climate. Ukraine was recognized as a country that achieved the best result in the improving regulatory environment among all countries of the world in 2012-2013.

Despite some improvements in the investment climate of Ukraine, there are a number of problems requiring urgent solution to increase investments to the country and, at the expense of the involved resources, the implementation of measures for the development of innovation sector and scientific activity. Currently, the topical issues are:

- stabilization of the economic and political situation in the country;

- reorganization of the legal and organizational base to increase the efficiency of mechanisms providing favorable investment climate;
- increasing competitiveness of domestic economy;
- organization of an active fight against corruption;
- introducing measures to de-shadowing the economy;
- development and implementation of innovations, etc.

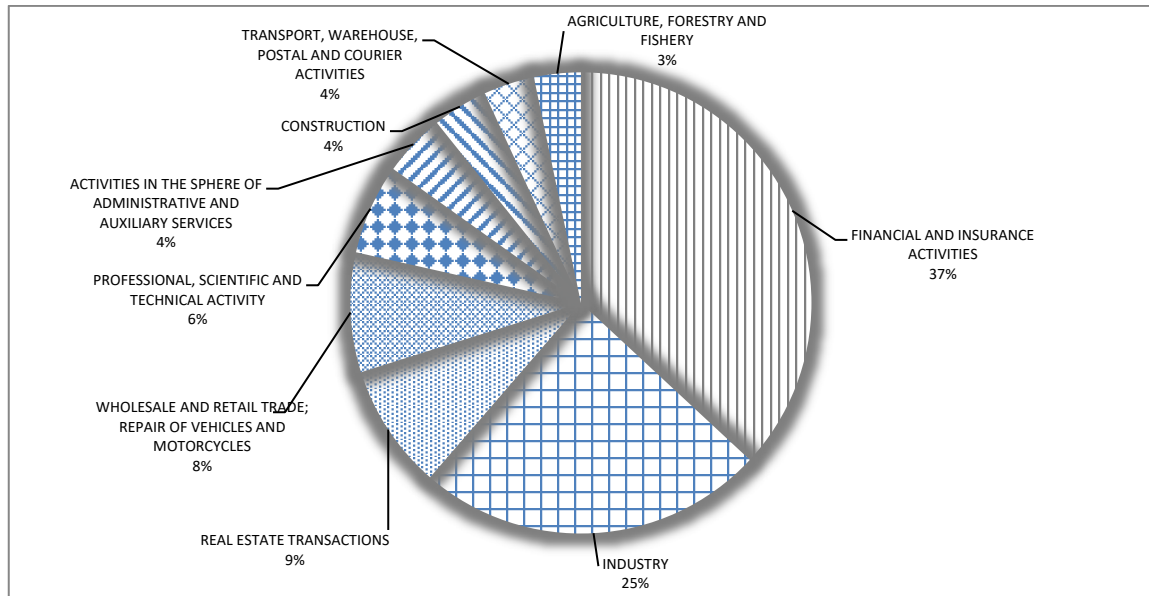


Fig. 2 The structure of direct investments in the economy of Ukraine according to the types of economic activity in 2019 [1]

Active investment strategy and effective activity of the investment market will help Ukraine attract as many resources as possible, which will help to overcome the crisis stage of the cycle, develop the scientific and technical activity, and also implement innovations that will help to develop on an upward trend.

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Remote work: how to protect yourself

The issue of securing a deal between an employer and a freelancer is widely considered to be the most important and extremely actual. It is well known that in the modern world, remote work is increasingly gaining popularity. This topic has received a lot of attention over the last 10 years. Since 2010 there has been a rapid rise in the use of secure transaction services. Fraud has become a critical issue for both an employer and a contractor. In the next few years, secure transaction service will become an irreplaceable tool for preventing any criminal activity and ensuring safe transactional settlement [2].

Previous experience had only been based on conditional agreements, which did not always provide fair fulfillment of conditions. The main problem of securing transactions on the part of a freelancer consists in untimely labour payments, incomplete payments or no payments at all. Thus, the employer may receive poorly completed tasks or in fact unfinished work. Current solutions based on contingent agreements are ineffective. Major difficulties in choosing a service are represented by three factors:

- pricing transparency;
- withdrawal methods;
- reasonable charge.

This paper outlines the relevance of the method, its features as well as pitfalls. The aim of our work is to identify the best secure transaction service on the market. In this study, the most common services are considered and compared.

The term "Safe Deal" is generally meant to be an online employer and freelancer protection service [3]. Secure transaction guarantees a 100% prepayment, which is stored on the account of the intermediary, until freelancers fulfill all their obligations and employers receive the result of services provided. Initially, the transaction protection service was used in real estate transactions. In the United Kingdom and the United States, the practice of transferring funds to lawyers was widespread until both parties could satisfy all conditions agreed [4].

The principle of the secure transaction service is rather simple. First of all, you are to select the appropriate escrow-service (Fig. 1). We place a vacancy or a CV on the chosen website. After an employer and a contractor have found each other, the terms of the transaction are discussed between the parties. All the nuances are filled into a special online form, and necessary amount is transferred to the intermediary's account. As soon as the employer has convinced that the work is of a high quality and meets all previously agreed requirements and confirms this fact, the money will be transferred to the contractor. The transaction with the contractor is completed in the same way: you will receive money after completing your task in accordance with the fixed conditions.

All secure transaction services operate according to a similar principle, regardless of a type of transaction. Nowadays, there is a countless number of them [1]. We have

chosen the ones most commonly used in the former CIS countries for the study (Table 1).

Place	Charge (per transaction, %)	Who pays	Additional charge (for input / output, %)	Budget constraints, \$	Withdrawal methods
Freelansim [5]	11	employer	no	from 45	bank card
fl.ru [6]	15,9-19,9	employer	13 off freelancer	from 15	bank card or Yandex.Money
freelance [7]	6	freelancer	no	from 8 to 450	bank card
freelancehunt [8]	9-10	at choice	0-5 off freelancer	from 3	bank card online wallet to mobile account Vkontakte
Kwork [9]	5-20	freelancer	no	from 8	Qiwi Webmoney bank card
Weblancer [10]	5	at choice	1-5 off freelancer and 1 off employer	no	Yandex.Money Webmoney card by PrivatBank

Table 1 Secure transaction services compared

The comparative table shows the main parameters for choosing a safe transaction service: amount of charge, additional fees, dynamics, payers and withdrawal methods. Based on these parameters, we can conclude that Freelance.ru is the most suitable platform for freelancers, and Kwork for employers (Table 1). When choosing the best service, each of the parties will be satisfied (Fig. 1, Fig. 2).



Fig. 1 Benefits of the service for an employer

When making a transaction using the service, the employer will receive a guarantee for a refund, will be able to work with a resident of any country and will be able to confidentially receive author's rights if requested (Fig. 1).

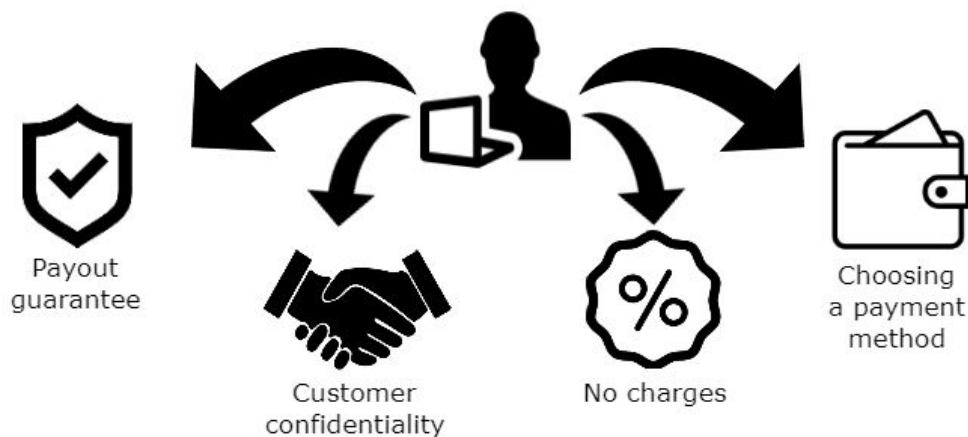


Fig. 2 Utility of the service for a freelancer

When making a transaction using the service, the freelancer will receive a guaranteed payment, will not pay any charges and will be able to choose a payment method (Fig. 2).

The recommended ways of protecting for freelancers and employers from scammers and conducting a truly secure transaction are:

- conduct transactions only within platforms;
- never transfer collateral, only an employer pays;
- pay for services only after receiving a guarantee of terms and conditions. Use services that ensure support for conflicting disputes;
- test your customers and freelancers with Google. Often, active scammers quickly receive negative reviews and are criticized on portals and forums;

Safe transaction mechanism is designed in such a way that it becomes impossible to conduct a payment settlement, if all the conditions of the contract are not met. Whatever cunning scammer's plan is, it will not outsmart a safe deal [4].

Thus, this study proves that the application of secure transaction services is the best option for remote work proponents, as it can ensure the safety of funds and the quality of the work performed.

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International Financial Reporting Standards for Small and Medium-sized Enterprises

In 2014, Ukraine signed an Association Agreement with the European Union, which obliged our state to take on a number of obligations, including the harmonization of legislation regulating business activities. The agreement provides for the reform of accounting and auditing with the transition to international standards. The process of harmonization of financial statements is carried out by implementing International financial reporting standards (hereinafter – IFRS) for companies participating in the securities market and other enterprises of public importance.

Public joint-stock companies, banks, insurers, as well as enterprises engaged in economic activities in a number of areas specified by the Cabinet of Ministers of Ukraine can use IFRS for preparing and submitting reports.

The relevance of the adoption and application of IFRS by small and medium-sized enterprises (hereinafter referred to as IFRS for SMEs) opens up prospects for them to enter foreign markets before possible competitors, as well as attracting capital from foreign investors.

IFRS for SMEs are a special set of documents. It establishes the rules for generating financial statements that external users need when implementing any economic decision that concerns the company.

Here is what Paul Thompson, the director of the European Federation of Accountants and Auditors of small and medium – sized enterprises (EFAA) says about the transition to IFRS for SMEs: ‘...The problem of transition to IFRS for SMEs depends on which accounting system they are switching from and how easily they can access expert advice on IFRS for SMEs. If SMEs use the full set of IFRS, then the transition will be relatively easy, since IFRS for SMEs is essentially a simplification of full IFRS. Changing the accounting structure is not only a matter of getting acquainted with the technical content of the new accounting framework, but also a matter of managing the process of changes. First of all, this requires that all interested parties understand why the change is necessary and what the benefits of IFRS for SMEs are...’ [1].

Summarizing all the above, we can highlight the following advantages of implementing the IFRS concept at the enterprises:

- This makes it possible to provide regulatory authorities, partners, investors and other persons with the most objective information about the financial side of the company's activities.
- The accountant will be able to interpret available data more freely to optimize management accounting.

- Accounting will be organized according to the principle that the entire developed world is gradually moving to.

The negative consequences of implementing IFRS include:

- The relatively high level of complexity of such a transition and restoring the transparency of credentials.
- The need to train accountants and managers to work in a new conceptual accounting scheme.
- Lack of a sufficient number of qualified specialists trained in reporting according to International standards.
- The need to reconfigure the reporting software within the new concept [2].

The key differences between IFRS and National Standards of Accounting (hereinafter referred to as P(C) BU:

- The transition to IFRS is a voluntary decision for many domestic enterprises, while the requirements of P(C) BU are mandatory.
- Some accounting items are reflected in IFRS more freely than in the P(C) BU. For example, in the P(C) BU, you cannot minimize the profit and loss from the difference in exchange rates. They have to be included in the items "other income" and "other expenses", which leads to "inflating" indicators. IFRS does not have such a ban.
- IFRS and P(C) BU contain various requirements for accounting of fixed assets, exchange rate differences, stocks, accounting of financial liabilities and assets, and a number of other indicators [3].

IFRS provide a common interpretation of financial reporting indicators prepared by companies in different countries. In addition, IFRS has a significant advantage due to the availability of tools for updating the accounting value of assets and liabilities. This allows users to evaluate information in accordance with market conditions.

For many businesses, IFRS of SMEs are a way to get high-quality reporting with a little effort. Global standards also increase consistency in audit quality. The auditors who will confirm statements prepared in accordance with IFRS of SMEs should refer to its compliance with these standards in the conclusion.

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Google's corporate culture

Nowadays corporate social responsibility (CSR) has a huge impact on companies, competitiveness and profit thus creating their image. Corporate culture has a significant impact on it. Each company, especially large corporations, is considered a small society that is why they need to build and develop their own unique culture.

The American model of corporate business responsibility is the most developed, since this country was the first to take care not only of profit, but of the environment as well. The key point of this model is the orientation towards the development of a person and his potential within the company and society.

Google is in the top 3 most expensive companies in the world (new official name Alphabet), and their culture is an example for other organizations. They always innovate to find the best way to help personnel be effective. If you want to engage talented individuals, you must focus on building exemplary working environment. And Google does it.

People are the foundation of any company. Moreover, the organization must make their work exciting. A famous American writer once said: “Work and play are words used to describe the same thing under differing conditions” (Mark Twain). Google follows this expression and pursues an open door policy, where everyone can express his or her idea or opinion.

The advantage of their system is that it is based on factors that are shown in Fig. 1.

Fig. 1 The main components of Google's corporate culture



In a globalizing world economy, the competitive environment among enterprises, corporate culture has the following objectives:

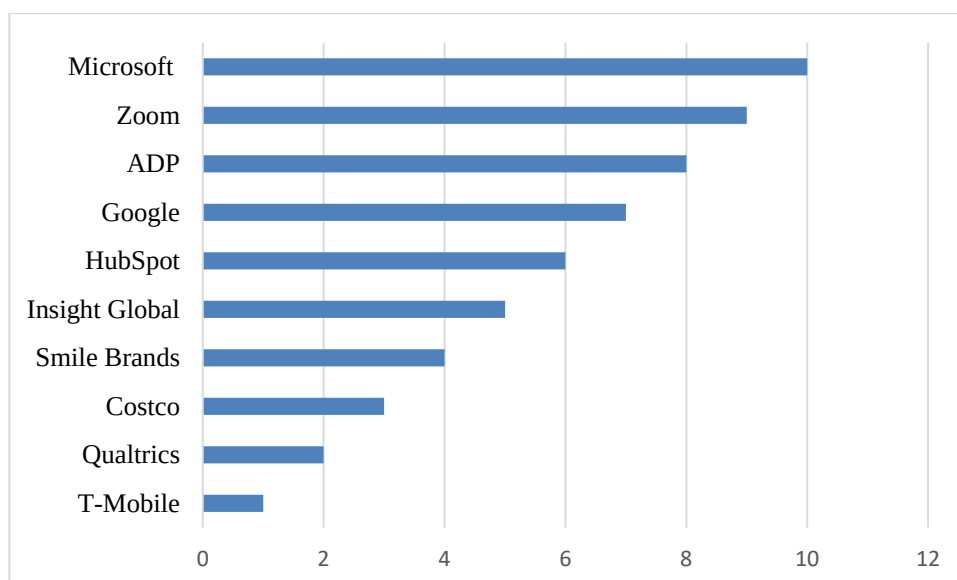
- developing employee's potential, his professionalism and erudition;
- creating a single corporate spirit, taking into account national, religious, sociocultural characteristics of the corporation members;
- increasing professional mobility in various areas of the corporation;
- maintaining the harmony of internal corporate relations based on the values of "common destiny" and "complicity";
- making focus on social partnership and responsibility of a modern corporation.

These objectives give employees the freedom to make decisions, solve problems and apply all required resources to reach the goals. By demonstrating their appreciation of employees' capabilities and evaluating their contribution in a proper way, an employer promotes increasing productivity and continuous success.

Google uses various tools to motivate employees, for example: salary level, payment of premiums by Google shares, special incentive programs (payment for realized ideas, payments to children, subsidies, payment for parties, maternity leave, etc.), free meals and services. Some large companies are inspired by Google's ideas and transform them into their own.

Comparably.com conducted research of the best corporate cultures in 2019. The data was based on fifty indicators and questions (compensation, benefits, leadership, professional development and work-life balance). The organizations that received the best results are presented in Fig. 2.

Fig.2 Top 10 corporate culture



Consequently, corporate culture has already become an integral part of success. If corporate culture is used correctly, an enterprise is sure to reach success

and vice versa it results in failure. This process must be constantly observed, improved and adapted to modern economic conditions.

Such company is in great demand among the potential employees, obtains mutual respect among colleagues, motivates for reaching positive results, and promotes creating new leaders and excellent teams. Google develops and supports its own culture, so that employees do their work efficiently and focus on permanent company's development.

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Commodity policy: the essence and directions of its implementation

Beyond the standard theory, trading is based on production, division, and relative economic separation. The development of specialized goods production directly determinates the corresponding development of trade. One of the most important mechanisms of ensuring the competitiveness of the enterprise is its commodity policy, which is capable to provide the enterprise with a stable market position, economic stability and strategic development.

The issues of forming a system of effective management of the commodity portfolio and development of marketing commodity policy are not new to the economic science as a whole. Some issues of commodity policy of the enterprise formation are considered in the works of many domestic and foreign scientists: G. Russell, E. Dikhtl, F. Kotler, V.Ya Kardash, I.V. Zablodsky, S.Yu Haminich, A.N. Belenov and others.

The activity of any enterprise is carried out in a constantly changing market situation. Depending on the industry, the market, the degree of state regulation of the economy, the enterprise is in the conditions of a market model. In the market economy, the role of commodity policy is increasing due to:

- competition for the markets of goods;
- increase of consumers' attention to quality of goods, their brands, service, packaging;
- increase in the rate of growth of new goods;
- promotion and advertising.

After choosing a market for its activities, the enterprise determines a set of marketing means for influencing consumers. The most important component of the complex is the product.

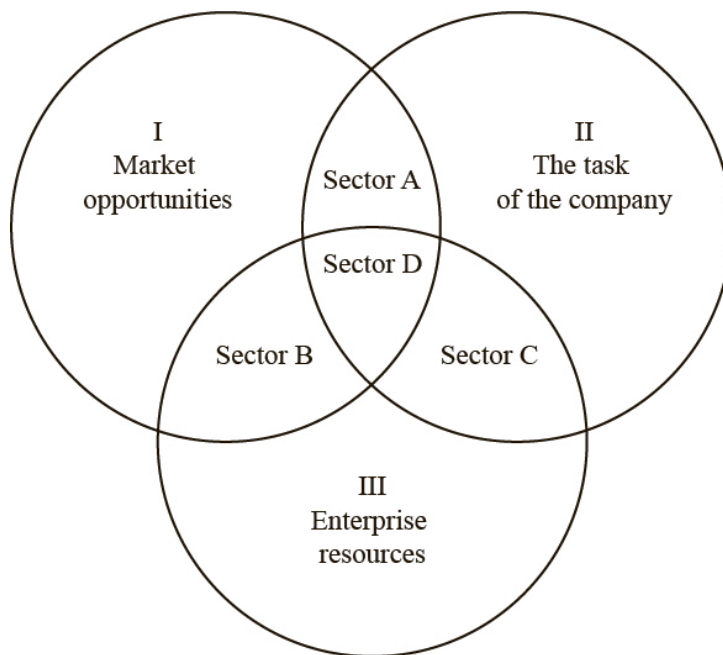
Goods are a product of labor or a certain benefit capable of satisfying certain human needs and intended for exchange (purchase and sale). In the economic literature of countries with a developed market, the concept of "goods" has several definitions. Famous American economists G.S. Slouen and A. J. Zurich in the Dictionary of Economics, published 1970 p., Interpret it so. Commercial (goods) - any object of commerce or trade. This term is used instead of the term "goods" in the singular, since the term "good" has a different social meaning (first, good, benefit, second, in the plural - goods, products, thirdly, cargo, luggage). In addition, this term is another specialized meaning in the economy, when used as "economic good".

Economic good is something external to a person, has utility properties, can be appropriated and is relatively scarce. This term is used in contrast to the term "*free good*". Economic goods can be material or intangible. Consequently, the services of a teacher or lawyer are quite logically considered as an economic commodity, as well

as the books they use. Such a definition is more voluminous than the term “*wealth*”, since the authors of the specified dictionary restrict the latter to tangible economic goods.

Policy is a system of activities carried out by an enterprise or other people aimed at regulating economic processes. The policy includes setting objectives and identifying ways and means of achieving them [1]. Product policy is a specific activity of a firm, corresponding marketing strategy aimed at studying ways to increase the competitiveness of products, primarily their quality characteristics, creation of new products, formation of assortment, searching market segments, development and implementation of a strategy of packing, etc. [2].

The decisions taken in the framework of the product policy should include: nomenclature of manufactured goods, the width of the assortment groups; range of volumes of each product; product quality; modification production of new goods; standardization; the planned aging of former types of goods in order to attract the attention of buyers to new products; etc. The model for the implementation of these decisions can be defined as the final result of the interaction of three variables: the tasks of the enterprise; resources at his disposal; market opportunities (figure).



In our opinion, commodity policy implies a certain set of actions or pre-thought-out methods and principles of activity, which ensure continuity and purposefulness of measures for the formation and management of an assortment of goods. The absence of such a set of actions leads to instability of the assortment of the enterprise, failures, exposure of the assortment to the excessive influence of random or transient market factors. The current management decisions in such cases are often half-hearted, poorly substantiated, based on intuition rather than calculation. So, the main objectives of commodity policy are:

- Revenue generation;

- Increase of trade turnover;
- Increase of the market share on which the enterprise operates;
- Lower production and marketing costs;
- Image improvement.

The main objectives of the commodity policy are achieved through a strategic decision in such areas of creation and promotion of goods as innovations, variations, differentiation, elimination, installation and choice of brand, packaging, form and type of goods, and the like.

Commodity policy objectives:

- Searching for new products;
- Development of new products;
- Introduction of new products to the market;
- Justification of the form of goods;
- Regulation of the quality of goods;

The commodity policy is designed to ensure continuity of decisions and measures to:

- formation of the assortment and its management;
- maintaining competitiveness of goods at the required level;
- finding optimal product segments for products;
- developing and implementation packaging, labeling, and product maintenance strategy.

The implementation of commodity policies requires the following conditions:

- Production, marketing and export objectives for the future;
- The presence of a strategy of production and distribution activity of the enterprise;
- Good knowledge of the market and the nature of its requirements.

The commodity policy cannot be separated from the real conditions of the manufacturer's activity, the specifics of its profile. At the same time, industrial enterprises, which are in approximately the same difficult conditions of the current market and economic environment in Ukraine, solve their commodity problems differently, some show complete inability and helplessness, and others, following the principles and methods of marketing, find promising ways [3].

So, a strategic approach is needed to solve the tasks of commodity policy at any economic level. This means that any decision in this area should be made not only from the point of view of current interests, but also considering how it works for the ultimate goals.

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Sharing economy as an alternative way of developing modern management and economy

Millenials and zoomers radically different from previous generations because of different factors. There are the rapid pace of scientific and technological progress, the advent of the Internet era, consequently the emergence of wide opportunities for the dissemination of information, free access to it, focusing on issues of protecting human rights, active globalization and integration of national economies. Under the influence of these factors, they formed another worldview, the other understanding of a happy family, a successful career, comfort and quality of life. The consumption culture has also changed; now access to things is valued more than possession of them. Nowadays, George W. Bush's statement "The more ownership there is in America, the more vitality there is in America" is rapidly losing its relevance [1]. Young people no longer tend to store a large number of things, increasingly preferring this to co-consumption. This term describes the economic model of "sharing economy" (SE). It is based on the collective using of material goods and services, rent and barter. Things that the owner does not need are transferred for permanent or temporary use to another person who needs them.

A similar practice has always existed in society, although it has been applied much less frequently. It allows people to satisfy their needs, while not having enough resources to acquire a particular item. An example of a sharing economy in the early stages of its development is libraries that accumulate information in various fields and industries. Thanks to public libraries, books are used more efficiently than in private libraries, and benefit a huge number of people.

The co-consumption trend was further spread due to changes in the consumption culture, which was formed under the influence of a number of factors already mentioned. The availability of the Internet and the ability to get easy in touch with other people stimulates the exchange of goods and services within the framework of a peer-to-peer economy (i.e. economic relations between equal participants in horizontal networks). However, the main impetus, after which the development of the sharing economy has become more intense, is the global economic crisis. At this time, online services appeared, which subsequently became vivid examples of the economy of joint consumption. These are giants such as BlaBlaCar, Airbnb and Uber. In their activities, they give priority to customer safety and the reliability of the offered services. After all, it is on trust that the entire philosophy of SE is based, it is the currency of the future. This is the role of trust, according to Rachel Botsman and Ru Rogers, who described the concept of sharing economy in their book "What's mine is yours: the rise of collaborative consumption".

This economic model is more focused on meeting the needs of members of modern society than the well-established traditional models, in which individual consumption of goods and services predominates. For millennials, it is important not to acquire any product, but to gain experience during its operation, and for this they can simply rent what they need. They also like it when service workers interact directly with customers. This approach helps build trust and brings them more satisfaction. For example, when RelayRides, a car-sharing startup, installed a gizmo in tenants' cars that allowed them to unlock it without meeting up to hand over the keys, satisfaction went down nearly 40% and complaints shot up fivefold. When they met in person, tenants kept their cars cleaner and returned them on time way more often [2].

Sharing economy acts as a good alternative to traditional models, expanding its segment at a fast pace, increasingly introducing itself into new sectors of the economy. It should be noted that joint consumption is actively practiced in logistics, where such trends as the joint use of warehouses and transport are gaining great popularity. It is one of the SE principles: if you do not use it, you lose it [3]. Inefficient use of logistic capacities negatively affects the cost and speed of product delivery. Therefore, currently unavailable places in warehouses and trucks are leased. There are platforms such as Flexe (provides rental of warehouse space that is not used), Saloodo, Freightos, Huochebang (optimize the use of vehicles). Thus, assets are used rationally. This allows you to reduce the cost of transportation and storage of products, as a result – the consumer receives goods of the same quality, but at a lower price. The practice of joint consumption is now often found when using expensive assets. This applies, for instance, to handling equipment, which is handed over to retailers to prevent downtime.

In the prospects for further development of the sharing economy, the need for intermediaries will disappear, companies everywhere will be able to exchange resources directly using special platforms that greatly simplify the interaction between entities and make it reliable. This trend already exists and continues to gain popularity rapidly. Thanks to it, subjects of economic activity become more open to each other, an exchange of experience occurs - logistics providers advise everyone, based on their own experience in the storage and transportation of goods.

Dynamic changes in the culture of consumption, the increasing role of the collective use of goods – these factors has an impact on managerial thought. Management thought is a set of views on the management system in accordance with the objective conditions and needs of the economy [4]. In the context of popularization of the sharing economy, managers are forced to revise some views on management, as economic entities increasingly prefer collective consumption to individual. According to multinational consulting company PricewaterhouseCoopers, over the next decade, the SE segment will increase by 35% annually [3]. Two aspects can be distinguished, ignoring which will be inappropriate in the process of organizing the activities of the company.

Nowadays more and more attention is paid to the efficient use of assets, the downtime of which creates additional costs. Benefits from unused resources give a

competitive advantage over companies that do not follow the trend of joint consumption, as it is an additional way to reduce the cost of production. Therefore, the first aspect is the increasing need for cooperation with other companies. The purpose of this is to reduce the cost of servicing products during transportation.

The second aspect relates directly to consumer preferences. As already mentioned, representatives of new generations (millennials and buzzers) give increasing preference to the lease of goods (bicycles, cars, camping equipment, animals and even bouquets of flowers). Given this, the company can find new sources of revenue, as BMW did. The company created DriveNow together with Sixt: using the application, people can find cars and temporarily use them for a fee [5].

The wide distribution of the sharing economy model is logically justified by the convenience of its use in modern conditions. People have a huge number of needs that most of them cannot satisfy by purchasing the necessary goods for lack of sufficient financial resources. This problem found a solution in co-consumption. Things that are unnecessary to one person are not thrown away, but transferred to another person, for additional benefit. Items that are not currently in operation are leased. At the same time, the owner receives material benefits, and the tenant gets the opportunity to satisfy his/her need for a relatively small amount (since the cost and maintenance of any product significantly exceeds the cost of rent). As for the role of SE for companies, it is much more profitable for them to collaborate and share expensive assets, thereby using them more efficiently. Under the influence of changes in consumer preferences and the nature of the interaction between different companies, approaches to enterprise management also require a revision, a greater focus on the rapidly developing trend of joint consumption

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Influencer marketing in 2020: how to establish cooperation with bloggers

Influencer marketing is increasingly becoming a wide-spread tool in the field of promotion. Although this term is relatively new, such kind of advertising is known for a long time. Brands have been involving famous people, such as politicians, actors, singers, sportsmen and so on, for dozens of years. Now, while the popularity of social networks is growing with an incredible velocity, bloggers are gaining more and more interest, that makes them real influencers.

This promotion channel is especially active on Instagram, that takes the 3rd place in the list of the most popular social networks among Ukrainian users.

According to some recent researches, the number of regular Internet users in Ukraine is about 21 million (63% of the country's inhabitants). Despite the fact Instagram is still less popular than Facebook and YouTube, its audience runs up to astonishing 11 million, which is more than 52% of regular Internet users.

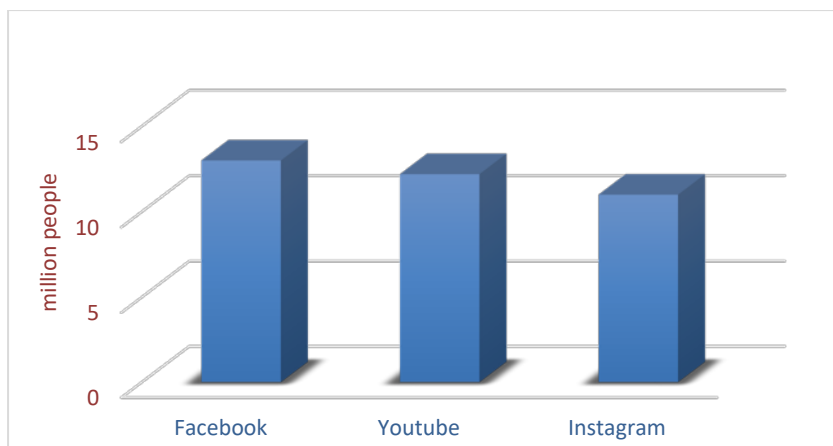


Figure 1 Number of users on Top-3 social networks in Ukraine

The histogram (Fig. 1) compares the data on the number of users on top-3 social networks in Ukraine: Facebook, YouTube and Instagram.

Bloggers make native advertisement, which looks like a part of the editorial flow of the page. Editorial content is defined to mean anything published in print or on the Internet that is designed to inform, educate or entertain and is not created to attempt to sell something. It is considered to be the opposite of commercial content or advertising copy and that is why it faces much less advertisement fatigue.

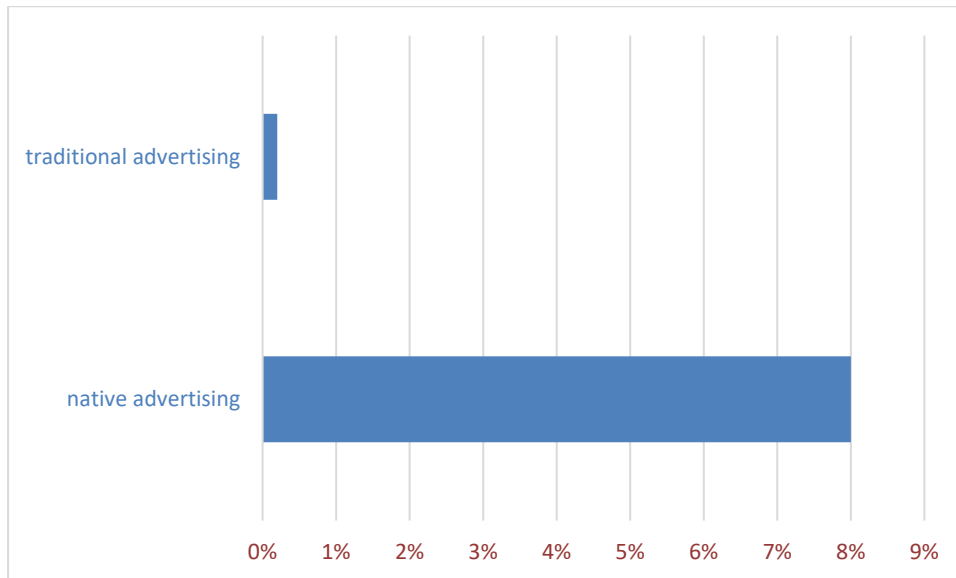


Figure 2 Click-through-rate of traditional and native advertising

The graph above (Fig.2) illustrates the comparison of click-through rate (the percentage of people who click on a specific link) of traditional and native advertising.

As it is shown in the graph below (Fig. 3), influencer marketing is one of the most developing spheres of promotion. No doubt, we should take all its advantages just now.

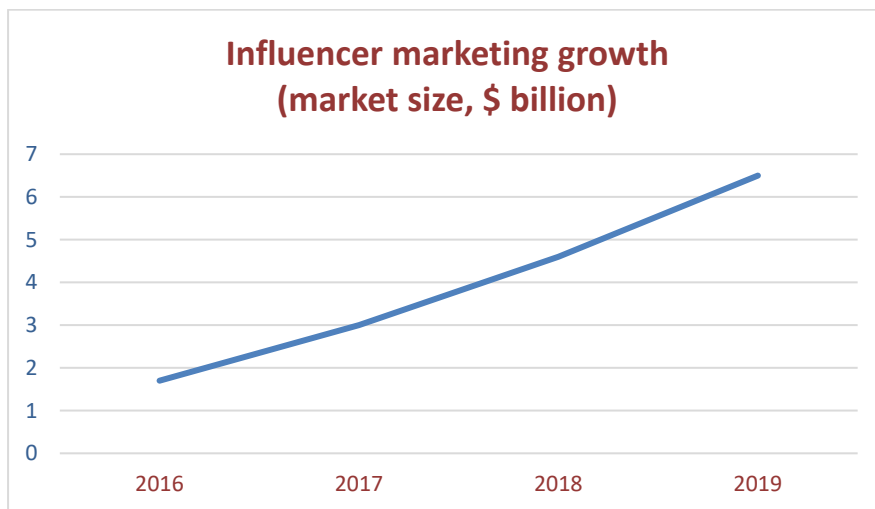


Figure 3 The development of influencer marketing

We have worked out some keys for successful collaboration with Instagram bloggers.

The first and the most important step is preparing the product. It plays vital role in advertising on social networks, as it is understandably useless to spend money on such kind of promotion in case your product is not packed, content is raw and Instagram page/website is still not designed.

If you are sure your product is ready, start looking for the appropriate bloggers.

In search for them the list of the people your readers follow must be looked through. Subscribe bloggers from it and Instagram will suggest you resembling pages. You can also use some specially created websites, such as “22 floor”, a telegram channel @top_bloggers_ua or an Instagram account with the same nickname.

After finding the blogger a small check-up should be done.

In the initial stage of it assess his/her profile and audience. Answer the questions: “Does the blogger correspond to your brand’s values?”, “How your product matches his/her account?”, “Are his followers similar to your target audience?”

If all the answers are “yes”, look, when the account was created and how many times it has changed nickname. In case the page is new and it boasts a large sum of followers, there are some reasons to suspect a blogger in cheating, if the username was changed several times during a small period, it might be a fraud.

During the second phase of this check-up we suggest using a service of account autoverifying. Among the most wide-spread are LiveDune, inBlogs, where you can easily analyse the page you are interested in. There are also Picalitycs and Minter, which supply with deeper analysis. However, LiveDune or inBlog will definitely be enough for getting all the necessary information. Check these indexes:

- Engagement rate. Normally it is not less than 2-3%. The bigger account is, the lower engagement rate it has.

The number of likes should be ~5-7% of followers, it should be different from post to post. The number of comments should be from 1-2 per thousand of followers for small accounts to 0,5-1 per thousand for big ones. If the blogger takes part in activity chats, comments are general and look quite alike.

- Likes growth dynamics. The smoother it is, the more likely likes are natural.



Figure 4 Likes growth due to cheating

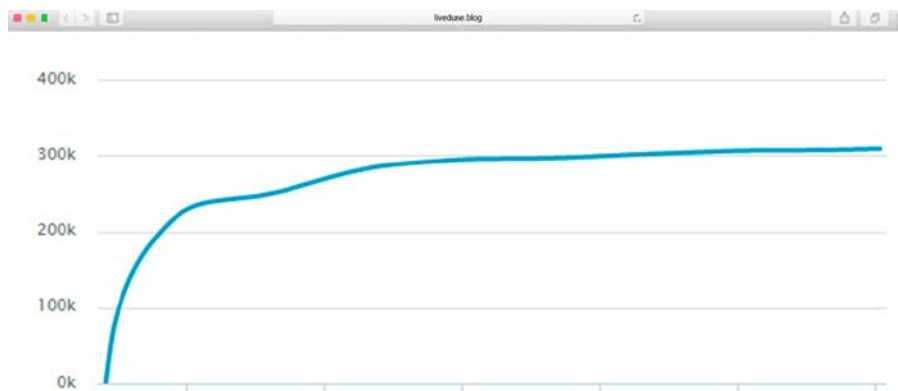


Figure 5 Natural likes growth

Fig.4 illustrates, how the sum of likes got due to cheating increases, while Fig.5 presents the natural dynamic. The key moments:

1. The main part of likes comes during the first 24 hours after posting.
2. They are got more slowly at night.
3. After 24 hours the number of likes still extends, but visibly not so fast.

Last but not the least, it is always helpful to follow bloggers' account. Look, if he/she has been advertising a similar product during the last time. If he/she has, another one advertisement post on the same topic is not likely to attract blogger's audience. However, you can observe the way influencer presents the product and decide, if it matches your goals. If yes, you can apply to the blogger later.

We advise you collaborating with microinfluencers (bloggers, who have 5-25 thousand of followers). It is easier for them to keep readers' interest. Moreover, they usually ask for lower fees, which minimizes your risks.

Every cooperation with a blogger is built on an exact technical requirement, which lists all the expectations from the advertisement publication. There should be specific details on the colour spectrum and camera angle, the number of product mentioning and phrases in the text, etc.

You should not neglect naming different details for every single blogger. If the technical requirement is always the same, photographs and texts look nearly identical. It definitely would not inspire trust of your target audience. Pattern_expressions which bloggers pose as their own experience and resembling photos are more likely to antagonize, than to show the advertised item's most attracting sides.

Summing all the information up, the technical requirement should include:

1. The description of the visual part. State, if it has to be video or photo, how light it is expected to be, how it should be edited, how many preliminary versions the blogger must send, which props there have to be.
2. The description of the textual part. Name, which phrases, situations, hashtags, geolocation should be used.
3. Creative aspect. We suggest you allow the blogger take the initiative. Ask him/her about him/her own ideas. Bloggers are more familiar to their audience and they surely know, what can attract their followers easier: a funny IGTV video, a long live or a short story.

Statistic data show that a stable result comes only after 6-8 touches. That is why we cannot help noting, that one of the biggest 2020 trends is building long-term relationships with opinion leaders. Analyse audience reaction and choose bloggers for lasting partnership contracts.

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Marketing mix concept as a tool for improving company's market position

The marketing mix is a set of measures that determine the positioning of a product on the market. The term itself originated in 1953, when Neil Borden, president of the American Marketing Association, united under his "marketing complex" twelve elements: commodity policy, pricing policy, branding, distribution policy, personal sales, advertising policy, promotional campaigns sales, packing, demonstration of goods, service, transport and warehouse operations, and analytical activity [4].

Later, in 1960, Jerome McCarthy divided the twelve Borden elements into 4 groups. This is exactly how the 4P (product, price, place, promotion) or marketing complex came into being [1].

Marketing concept "7P" is also known as "advanced marketing mix" [2,3]. Besides the basic elements, it includes also people (consumers, their preferences, and employees), process (the development of the right sales and after-sales service strategy), and physical evidence (the confirmation of the quality of services and goods that are provided). HR management is playing important role here, because the way we communicate with clients, considering their opinion, influences company sales.

Marketing mix concept is used for developing future marketing strategy, based on previous sales data. There are three stages of this analysis [5] :

1. Preliminary planning stage

This phase includes accumulating data about previous sales and advertisement expenditure. Companies are analyzing their Return On Marketing Investment (ROMI) [7]. This index shows the return and effectiveness of investments into the marketing strategy. It helps to distribute marketing expenses in an appropriate way, so the company would get maximum effect with minimum expenses.

$$\text{ROMI} = \frac{\text{Pr}_{\text{prom}} - \text{C}_{\text{prom}}}{\text{C}_{\text{prom}}}$$

Figure 1. Formula of ROMI

2. Planning stage

This phase is about assessment of marketing effectiveness and prognosis. Marketing mix concept is a tool for sales prognosis and conversion of advertising campaign. Also, according to the results of the study, the budget is reallocated to optimize marketing investments.

3. Tracking results stage.

This phase includes tracking the effectiveness of marketing variables: product, price, place and promotion. If that is necessary, marketing strategy can be developed.

There are two constituents of sales, according to marketing mix model.

The first one is “basic sales” that is the amount of sales occurring thanks to the popularity of company’s brand. This model does not imply any additional costs for advertising and product promotion. Sales volume depends only on the brand, under which a particular product is produced. Usually this volume is fixed.

The second element, “gradual sales”- the amount of sales which occurs thanks to the advertising policy on the TV, sales campaign, printed advertisement etc.

Ways of applying marketing analysis results:

1. Optimizing budget

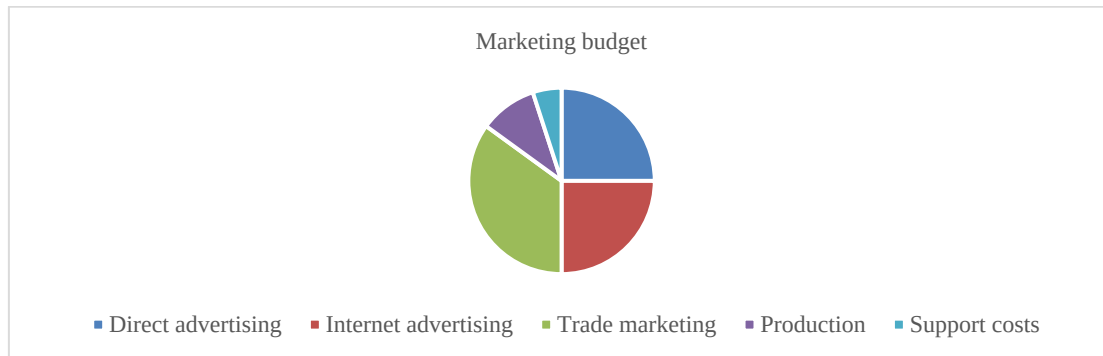


Figure 2. Effective budget reallocation

According to the pie chart, the biggest part of marketing expenditures is devoted to trade marketing, which includes conducting various promotion presentations and surveys aimed at the end consumer. Besides, trade marketing outlays include buying or producing POS (point of sales) materials: posters, flyers, displays, dispensers etc [6]. Approximately equal parts of the budget cover the cost of advertising in Internet resources (for example, creating the online store or the advertisement in the social networks), and on the TV or radio. The lowest share of expenses is devoted to support costs, for example, the production of branded trifles (pens, cups, bags with the company logo). Production includes the cost of filming a commercial, printing advertisements and paying celebrity fees.

2. Improving the advertisement performance

Analyzing the marketing mix elements provides the information about their changes. This can be used, for example, when talking about TV promotion or Internet marketing. If the information about expenditures on every element mentioned before is available, it is possible to count the ROMI index for each type of activity. According to these results, the company can determine the most and the least effective marketing activities.

The next index, influenced by marketing mix strategy, is ROI (return on investment). It considers all expenditures and revenue the company gets [9].

$$\text{ROI} = \frac{\text{Amount Gained} - \text{Amount Spent}}{\text{Amount Spent}}$$

Figure 3. Formula of ROI

Together with ROI and ROMI, index marketing strategy also includes ROAS index [8]. ROAS means return on advertising spent. This index shows the amount of

income, earned for every dollar spent on your marketing campaign. ROAS can be calculated, using data about the advertisement expenditures and revenue.

$$\text{ROAS} = \frac{\text{Amount Gained From Ads}}{\text{Amount Spent On Ads}} * 100\%$$

Figure 4. Formula of ROAS

Considering difference between ROI and ROAS, it can be described in the following way. The ROI answers the question if the company gets the profit after taking into account expenditures on products, services and advertisement. On the other hand, ROAS index answers the question whether the company gets more than it spends on advertising. In comparison with ROAS, ROI is more general, which makes its result less truthful. On the other hand, ROAS takes into account only one marketing channel, while customers interact with the company using different channels. In conclusion, it would be appropriate to mention that the marketing mix concept is a useful tool for improving the company's market position, because it helps to identify the advantages and disadvantages of the selected marketing strategy analytically.

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Development optimal strategy of inventory management of the catering

In our country, particularly in Dnipro city, the structure of catering is developing rapidly. There are many competitors in this field, with many concepts, that can reach more of the target audience. In order to be competitive, you need to know the sphere of your activity and develop your business, and attract more visitors and, of course, optimize the work of the entire establishment. The main task of any enterprise is profit maximization. To do this, it is necessary to regulate all the needs of visitors, control the inventory and optimize the work of the company [1].

The general task of inventory management is formulated as follows: to determine the optimal stock size, quantity, frequency and delivery time of the order, at which the total expenses become as small as possible. Expenses are usually determined by the cost of purchasing, shipping and storing products. An enterprise does not often spend money on storing products because the warehouse with all necessary resources is located in premises that is owned or leased by the company [2]. The purpose of this work is to increase the efficiency of the enterprise, which is a catering establishment, by the analyzing its functioning, technologies of receiving products, identifying opportunities for rational purchase of ingredients for products offered by the company, optimizing the plan of implementation of mixtures.

According to the results of the SWOT-analysis, it was possible to identify the strengths and weaknesses of the enterprise, identify those opportunities, the implementation of which will eliminate or compensate for some threats that arise during the institution functioning (Table 1).

In addition to the SWOT-analysis, the ABC-analysis was carried out, which, in turn, provided recommendations for the purchase and sale of finished products, i.e. optimization of the logistics system of the enterprise.

Table 1. SWOT-analysis of the catering

Strengths	Weaknesses
• purchasing resources at the most favorable prices in the market, getting more profit than competitors have • well-qualified staff • location of the establishment - the city center	• a big amount of partners • low staff salary • ineffective advertising • unpredictable absence of any resource in the warehouse
Opportunities	Threats
• prospective clients can learn about the company from the Internet • improving the quality of service	• strong competitors • too little amount of employees • possible increase of tariffs • late delivery of resources

The mathematical models of the three following optimization problems, which have arisen at the enterprise, are presented and implemented:

- maximizing profit in terms of implementation and over-fulfillment of the volume of sales of the company products, taking into account available resources;
- maximizing waste of high-cost and perishable ingredients;
- minimizing purchases of ingredients for the production and sale of some products (in this case, cocktails) according to the plan of the previous month.

The following notation will be used to construct the mathematical models of the problems.

N -number of mixes (cocktails) to be sold; we will connect index n with each cocktail; $n \in \{1, \dots, N\}$

M -number of ingredients used for cocktails; m is the ingredient number;

b_m -mass of the ingredient in one unit of a container, g/pc;

s_m -purchase price of one unit of ingredient container, UAH/pc;

p_m -quantity (availability) of purchases of the ingredient in the appropriate packaging, pc;

d_{mn} -is the content of m -th ingredient per 1 unit weight of n -type cocktail;

V_n –weight of one serving of n -type cocktail, g/serving;

C_n –price of one serving of n -type cocktail, UAH serving;

Markup $_n$ –markup for 1 serving of n -type cocktail, %;

ExpectedPlan $_n$ –the expected plan for the implementation of n -type cocktail, servings.

The first task is to find the number of servings of each type of cocktail, which in terms of implementation and over-fulfillment of the volume of sales of the previous month would allow having maximum profit taking into account available resources.

Let all the above values be known. Let x_n be the number of servings of the n -th cocktail that is desirable to be sold in the current month. Then, the mathematical model of the formulated problem has the following form:

$$z(x) = \sum_{n=1}^N \frac{C_n * Markup_n}{100 + Markup_n} * x_n \rightarrow \max$$

$$\sum_{n=1}^N d_{mn} * V_n x_n \leq b_m p_m, \quad m = \overline{1, M}$$

$$x_n \geq ExpectedPlan_n, \quad n = \overline{1, N}$$

$$x_n - \text{цiле}, \quad n = \overline{1, N}$$

For this task, it should be noted that resources were purchased at the beginning of the month so that they were sufficient to fulfill the Expected Plan.

Analysis of the solution results of this problem revealed the cocktails, the expediency and profitability of which are generally zero. These are cocktails with ingredients, which in turn are full cocktails. Moreover, when these products are mixed into one, the price for them is significantly reduced. Therefore, it is concluded that it is advisable to remove these mixtures from the menu and to leave only the ingredients separately.

In addition, the solution of the problem showed such cocktails, which are the most profitable. Total profit amounted to 21952 UAH, and considering the resources utilized during month, the profit amounted to 19631 UAH.

Therefore, the second task is to find a plan for offering such cocktails in the current month, in which the most perishable ingredients are used as much as possible.

Let $\sigma = \{j_1, j_2, \dots, j_s\}$ be a set of indices of such perishable and high priced ingredients.

$$R(x) = \sum_{j \in \sigma} d_{jn} * V_n * x_n \rightarrow \max$$

$$\sum_{n=1}^N d_{mn} * V_n * x_n \leq b_m p_m, \quad m = \overline{1, M}$$

$$x_n \geq 0, \quad n = \overline{1, N}$$

$$x_n - \text{цїле}, \quad n = \overline{1, N}$$

The mathematical model of the third problem is minimizing the purchases of ingredients for the production and sale of cocktails according to the plan of the previous month.

Let p_m be the amount of ingredient in the appropriate packaging that must be purchased for sales of cocktails in previous month.

Then, the problem looks like this:

$$U(p) = \sum_{m=1}^M s_m p_m \rightarrow \min$$

under conditions

$$b_m p_m \geq \sum_{n=1}^N d_{mn} V_n \text{ExpectedPlan}_n, \quad \forall m = \overline{1, M}$$

$$p_m \geq 0, \quad m = \overline{1, M}$$

$$p_m - \text{the whole}, \quad m = \overline{1, M}$$

It is easy to see that all three models are tasks of integer linear programming [3,4]. All the calculations were done using the Excel Solution Finder. As a result of the solution, the optimal amount of ingredients needed to be purchased is obtained and, thus, the profit is increased.

Therefore, the paper proposes a systematic approach to analyzing the work of a catering establishment, which is based on: 1) a thorough SWOT analysis to identify weaknesses in the functioning of the enterprise, to seek opportunities to eliminate these deficiencies and prevent external threats; 2) ABC analysis to evaluate the importance of both the product and resources, that is to identify goods that need some attention and ingredients that require regular procurement; 3) mathematical modeling, formulation and solution of optimization problems. This research methodology can be applied to any enterprise not necessarily related to catering.

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Problems of foreign investments attraction in the economy of Ukraine

Effective reform of the country's economy, renewal of the market and social infrastructure, and production modernization require significant investment.

In general, the term "investment" comes from the Latin word "invest" [1, p.48]. In the broadest interpretation, investments are investments of capital for the purpose of its subsequent increase.

Legal regulation of foreign investment in Ukraine is implemented by national legislation, which is influenced by international law.

Now attracting foreign investment in the economy is quite relevant and at the same time problematic. Rich natural resources, a well-developed agricultural sector, a high level of achievements in the development of research, relatively cheap labor and proximity to the market of the European Union-all this indicates a high investment potential of the country [2, p.141].

However, the volume of funds invested in the Ukrainian economy remains not too high, since the investment climate in Ukraine is relatively risky, given a number of negative factors that cause an unstable economic and political situation in the country.

Foreign direct investment has a number of advantages that make it attractive, such as:

- increase in production capacity and resources through the import of direct investments;
- dissemination of advanced technologies and management experience, improving the skills of the workforce;
- the emergence of new material and financial resources, but also the mobilization and more effective use of existing resources;
- development of the national research base;
- promotion of competition and related positive phenomena (lower prices and improved quality of products that replace imports, as well as outdated products of local production);
- increase the demand and quality of national products and goods;
- increase in tax revenues from international joint ventures;
- investment risk is transferred to foreign investors who independently solve the problem of self-sufficiency [2, p. 110-111].

However, there are also negative factors that reduce the positive impact of foreign direct investment on the host country's economy.

1. The state should monitor the actions of transnational corporations associated with the redemption of local businesses. A country attracting foreign investment faces a dilemma: if the legislation is too restrictive, foreign capital will not be invested; if it is too liberal, in some cases, if the economic or political situation

worsens, foreign investors will simultaneously export both profits and initial investment, which can lead to a payment crisis.

2. Another problem arises from state regulation of foreign investment: if the state seeks to tightly control them, the flow of investment will decrease; if there are no government restrictions and incentives, then foreign investors will only consider personal interests.

3. World experience shows that foreign investors are simply attracted to lower-wage regions. Foreign capital is invested in countries with higher wages, which are offset by better infrastructure, more developed economies and more efficient administration. The problem also arises with the appearance on the market of products of enterprises with foreign investments. The competitive advantages of these firms can lead to the bankruptcy of local producers, causing unemployment to rise. Of course, from an economic point of view, this is justified: more efficient manufacturers outperform weaker competitors. But in many cases there is a counteraction aimed at protecting national interests.

The main problems in attracting foreign investments today are: political and legislative instability, lack of reliable guarantees of protection against changes in the Ukrainian legislation, considerable tax and administrative pressure, high level of corruption and bureaucracy, a considerable level of inflation in the country and registration licenses.

In order to create an adequate policy for regulating the activity of foreign investors in Ukraine, it is necessary to first determine the correlation of interests of a particular investor and the country of its base with a set of interests representing the recipient country and its economic entities, and to determine the category of “fair investment”, of which these interests are balanced and agreed.

Investment projects involving foreign investments, for which investors claim additional benefits and guarantees, should be represented only by “fair” investments and belong to the priority spheres of socio-economic development established by the state strategy, namely:

- have a long-term focus on a high level of profit reinvestment;
- to assist in the creation of new jobs in investment enterprises and in the economy of Ukraine as a whole;
- provide for a high degree of raw materials use, components, equipment of Ukrainian production;
- focus on rational use of Ukraine's raw materials base and reduction of import dependence;
- promote the development of export potential;
- to promote technological and innovative development of the country, introduction of modern resource-saving and environmentally safe technologies;
- to mitigate cross-sectoral and inter-regional disparities in Ukraine's domestic markets [3].

Specific measures to stimulate foreign investment inflows should include:

- reducing the level of taxation of enterprises with foreign investments in excess of a certain size of investments, increase in employment;

- introduction of stricter regulation of the process of capital repatriation - a time delay from the entry of the company into operation until the beginning of repatriation of profits, limitation of the share allowed for repatriation, etc. ;

- developing the practice of providing guarantees for foreign loans and insurance of risks to commercial banks and their associations by creating the appropriate infrastructure for this purpose;

- development of effective mechanisms for public control over the effects of foreign investments invested on preferential terms, compliance with investment obligations. Introducing the personal responsibility of government officials for the timing and direction of the use of foreign investments for which benefits are granted, as well as making the public aware of this;

- introducing mandatory controls on the origin of investments, examining investor reliability, imposing age restrictions on the investor firm and other indicators of its reliability with respect to investments seeking preferential terms;

- continuous efforts to strengthen the country's international image, wide dissemination of information about its production, technological, resource potential and investment prospects.

The application of these conceptual provisions should facilitate the establishment of partnership relations between the Ukrainian state and foreign investors, their transformation into a mode of economic pragmatism and a conscious mutual respect of economic interests, values and priorities [3].

Measures to improve the mechanism for attracting foreign investment should take into account all levels of the economy, and only their harmonious combination will lead to an improvement in the investment climate in Ukraine.

Today, for Ukraine, attracting foreign investment should become the most important means of achieving real structural changes in the economy, improving the quality of economic performance and living standards of the population. Foreign investments are all types of property and intellectual values invested by foreign economic entities in Ukraine, resulting in a profit or social effect. Therefore, in order to regulate foreign investment effectively, it is necessary to find a balance between creating existing incentives and providing guarantees, but to do so without infringing on the rights of domestic entrepreneurs.

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Organizational culture, why is it needed?

Nowadays, organizational culture plays a very important role in the functioning of entrepreneurship. Although corporate culture rules will help many businesses increase their revenue and improve their performance, we can see that this issue is quite unexplored and unpopular in our country.

The QC issue in the company today is updated and its relevance will increase as it progresses in the new market. The formation of this issues should be accompanied by corporate ethics and corporate symbols.

Considering that, the corporate spirit and the corporate culture is the element that holds the organization together and it can even be said that the corporate culture is created from a simple organization of the whole family, which helps to improve the work efficiency of the employees of this company. Today the most successful companies have a so-called corporate culture code. [1-3]. This code has to be easy to presenting and understandable in meaning.

Some sources state that the main goal of such global companies as Zappos, Warby Parker, Southwest Airlines, Twitter, Chevron, Google, for example, is not only the impoverishment of employees to achieve the goals of the company, but also the creation of certain conditions that would make it clear to employees that they are safe and everyone can rely on each other. The same full trust should be between the employee and the leader. Such relationships will help to erase the right spirit in your company. The respect and the support there are the most important points not only in everyday life, but also in working moments.[1]

It is very important that new employees quickly join the team and are on the same wavelength with everyone, understand the ideas of the chosen company. This will help to avoid conflicts and disagreements. If everyone thinks as one organism, such thinking will help to quickly translate ideas into life, which will increase competitiveness of this company [1,2].

Also, a corporate culture is what directly affects the future work with clients. The style of communication, working with clients or with interested parties in joint work.

The main goal of organizational culture, I believe, is to make workers happy, comfort of employees. For me, this is the most important aspect of corporate culture. Because happy employees, happy clients. This is key to a successful company [2,3,5]

Today, most companies with excellent corporate culture show their results in the market. And statistics prove that such companies are much more effective in their work.

Above all, let's summarize, that corporate culture is one of the most important aspects of the organization, because it is it that creates the image of the company, the

quality of the staff, the system of holidays and meetings, the corporate style! In other words, this is what helps an organization to function.

But you need to remember that organizational culture must constantly evolve, so that the organization and its products remain relevant and keep up with the times. Therefore, it is so important to conduct various trainings, classes in various fields, for advanced training [6].

I believe that corporate culture is the “soul” of the company that opens its wings and helps to fly into the tops of ratings on the effectiveness and success of the work [4].

As the conclusion we may use the expression of Duhamel: “If people don’t have a culture in their hearts, then nowhere else can there be one.” Also, it is proved that the corporative culture has a huge influence in the situation not only in the enterprise, but in the political situation in the country in general [4, 7].

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Section 02 Environmental Problems and their Solutions

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Nanomaterials are the future of our planet

Our modern world is filled with many things that humanity has created for itself. The profession of materials scientist is to study the properties of materials and develop new materials. The main purpose of this profession is to acquire knowledge about the structure and properties of materials and to establish a connection between the composition of materials. All the knowledge that a materials scientist acquires not only helps to explore our planet, but also helps create new materials that help maximize the preservation of natural resources and not pollute the Earth.

Research methods: analysis of scientific works of famous scientists; research of materials science technologies used abroad; generalization of ideas of scientists and specialists who have directly studied this problem; creating a model for solving ecological problems at the present stage with the use of nanomaterials.

Nanomaterials in Construction.

Steels that are made based on nanotechnology, are practically not subject to corrosion effects. A vapor permeable glass was created using these same technologies, there are also energy-saving pellicle that are self-cleaning and are used for translucent structures. In addition, the study found that the service life of buildings that were built using nanotechnology exceeds 2-5 times the service life of the strongest buildings of the late 20s early 21st century.

The “lotus effect” technology, developed in Beijing, helps create non-pollutant materials. This is due to the high density of particles that do not allow water droplets or dirt to linger on it. Also, these materials are completely transparent.

Materials scientists from Shanghai have created translucent nanoclays that have the ability to accumulate solar energy, these pellicles are applied to the windows of homes and significantly reduce energy costs.

Electric trunk cables based on carbon nanotubes may appear in the near future. They will be able to conduct high voltage currents much better than copper wires, while weighing five to six times less.

Nanomaterials will reduce the cost of precious metals by 15-20 times. For example, by replacing the platinum used in automotive catalytic converters with nanomaterials, which cleanse the exhaust from harmful impurities.

Nanobots.

Robots can design any object. Modern scientists and experts argue that such robots can appear as early as 2025. It is theoretically possible that these robots will be able to construct anything from ready atoms.

It is also theoretically possible that molecular work will be able to create food by replacing farm animals and plants. For example, create milk directly from the grass. This significantly stabilizes the environment, as new types of industry will not produce waste.

Incredible possibilities can become real, such as the colonization of other planets. Nanorobots will be able to create the habitat necessary for human life on other planets.

Aerospace Engineering.

Spare parts, which can be made much easier and better with minimal or no metal [1].

Water purification using nanomaterials and nanotechnologies.

Nanomaterials are endowed with unique properties, such as high surface-to-volume ratio, high reactivity and sensitivity, self-assembly properties on substrates for film formation, high adsorption, and more. Due to these properties, nanomaterials are effective against various organic and inorganic pollutants, heavy metals, as well as against various harmful microorganisms present in contaminated water [2].

Nanostructured catalysts are widely used in the treatment of industrial waste and the purification of industrial waste gas [3].

Eco-friendly food packaging.

In the area of food packaging, an example of the use of nanotechnology is materials that come into contact with food. Nowadays, nanocomposite materials are widely used as packages or coatings, which are applied to plastic containers in order to limit gas diffusion and increase the shelf life. These packages are also used in the production of antimicrobial materials in contact with food. [4]

Conclusions. Material science is a leading science in the field of ecology, with which you can save the resources of the earth and the sustainability of ecology.

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About morphology of urinary stones of the inhabitants of Dnipropetrovsk region

The research of urinary stones is necessary for the proved appointment of therapeutic and prophylactic actions to patients. Existing Ukrainian and world standards for the diagnostics and treatment of patients with urolithiasis foresee obligatory mineralogical research of the urinary stones of each patient [1-2]. At the same time, now in Ukraine, the implementation of such work, unfortunately, has initiative and episodic character, which leads to an increase in the number of diseases and their heaviness. The research of the uroliths morphology is a necessary element in establishing the most adequate model of their ontogenesis and, therefore, is currently central scientific task.

The shape of the studied urinary stones of the inhabitants of the Dnipropetrovsk region represents various surfaces of rotation, drusy-shaped, brush-shaped and dendriform aggregates, as well as their combinations [3-4]. Very often, the surface of the samples has caverns of various shapes and sizes and is covered with numerous or singular crystals. The size of the samples ranged from 0.1 to 7.5 cm, the color from white to black, but various gradations of yellow and pink predominated.

According to the morphological features, we identified five types of urinary stones. Uroliths of the first type (Fig. 1-2) have a drusy surface, represented by numerous small crystals. In thin sections, the crystal growth is appeared from the center of the urolite to the periphery. The smallest crystals often grow on the edges and tops of large crystals, giving beginning of dendrite formation; less frequently, crystal intergrowth with the formation of twins is observed. Some small crystals located in the gaps between larger crystals bear traces of dissolution (rounded tops, flattened edges). The final formation of such concrements apparently occurs when they are in the cavity of the renal pelvis in a free, not attached state, when the mineral-forming solution periodically affects different parts of the urolite.

Urinary stones of the second type (Fig. 3-4) are characterized by a "reniform" surface. The size of individual "gemmas" can be different, from a few micrometers to several millimeters across.

The third type of uroliths (Fig. 5-6) is characterized by a combination of attribute of the urinary stones morphology of the first two types, and we called this surface morphology combined.

A special group of this type is represented by aggregates with a more complex morphology. These include formations arising from the sequential or simultaneous formation of a polycrystalline and polysferolite surface form. For example, individual crystals and accumulations of organic material are often the centers of growth of

spherulites. Thus, fully formed spherulites are noted, over the surface of which protruding tops of crystals are visible.

The surface of urinary stones of the fourth type (Fig. 7) is intensely indented, "bay-shaped".

Uroliths of the fifth type (Fig. 8) refer to dendriform, they have an uneven surface, accumulated with a short-grained mass of various minerals. Their shape cannot be assigned to certain types of geometric bodies, often these are cylindrical aggregates with deviations of the long axis from the direct direction with numerous branches.



Fig. 1. Urolith with the first type of morphology



Fig. 2. Urolith with the first type of morphology



Fig. 3 Urolith with the second type of morphology



Fig. 4. Urolith with the second type of morphology



Fig. 5 Urolith with the third type of morphology

Fig. 6 Urolith with the third type of morphology



Fig. 7 Urolith with the fourth type of morphology

Fig. 8 Urolith with the fifth type of morphology

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Global warming: challenges for Ukraine

Global warming is considered to be the most important problem for humanity. If we do not act now, the situation may get out of control. Globally, the climate has become seven degrees warmer, and we know that the Earth gives off less heat than it takes. This means that warming is constantly growing. If the average climate temperature rises by two degrees, then we can already see a lot of changes, and the ocean level will rise by twenty five meters.

The aim of this study is to evaluate Ukraine's contribution to global warming and challenges arising as a result of it. We are losing money due to abnormal weather conditions caused by global warming. Ukrainian lands and steppes in the south are degrading. Soon, all of the southern Ukraine could become a desert. Ukrainian forests occupy only 16% of its territory, but they will also disappear from infectious diseases and pests. The spread of microorganisms due to warming leads to the mass extinction of coniferous forests, and if the use of hydrocarbons continues, in a few decades Ukraine may lose them. Warming will lead to increased soil erosion. Ukraine annually loses fertile black soil. Excessive and frequent droughts will enhance this effect, that means we will lose our national wealth. Ukrainian agriculture, on the one hand, is able to develop new crops and harvest two crops a year. On the other hand, farmers will be forced to invest in irrigation systems. They will still have to fight for water, carry out spring field work faster, protect crops from new pests and unpredictable weather anomalies like hail, which can destroy the crop altogether. In addition, new diseases that are common in the tropics will come to Ukraine: malaria, dengue fever and the like. Unfortunately, due to the excessive and irrational use of resources, the planet and life on it are on the verge of survival.

To take actions to save the planet, scientists have already found that carbon dioxide is the largest catalyst for global warming. Its emissions are growing at a tremendous rate, as is warming itself. In the world, everyone has already begun to fight these emissions through the adoption of referenda and various agreements, for example, the Paris Agreement - the most important of all. This is an agreement under the UN Framework Convention on Climate Change, which regulates measures to reduce carbon dioxide in the atmosphere since 2020. The purpose of the agreement is to "step up the implementation" of the UN Framework Convention on Climate Change, in particular, to keep the global average temperature increase "much lower" 2 ° C and "make efforts" to limit the temperature increase to 1.5 ° C. The parties of the agreement announced that the peak of CO₂ emissions should be achieved "as soon as possible." The participating countries determine their contributions to the achievement of the declared common goal on an individual basis, and review them once every five years. The agreement speaks of the insufficiency of the currently

proposed national contributions, as well as of “ambitiousness” and “progress” as they are revised. No coercive mechanism is envisaged, both in relation to the declaration of national goals and in ensuring the mandatory achievement of them. At the moment, the state statistics of Ukraine shows that carbon dioxide emissions have gradually decreased (Fig.1).

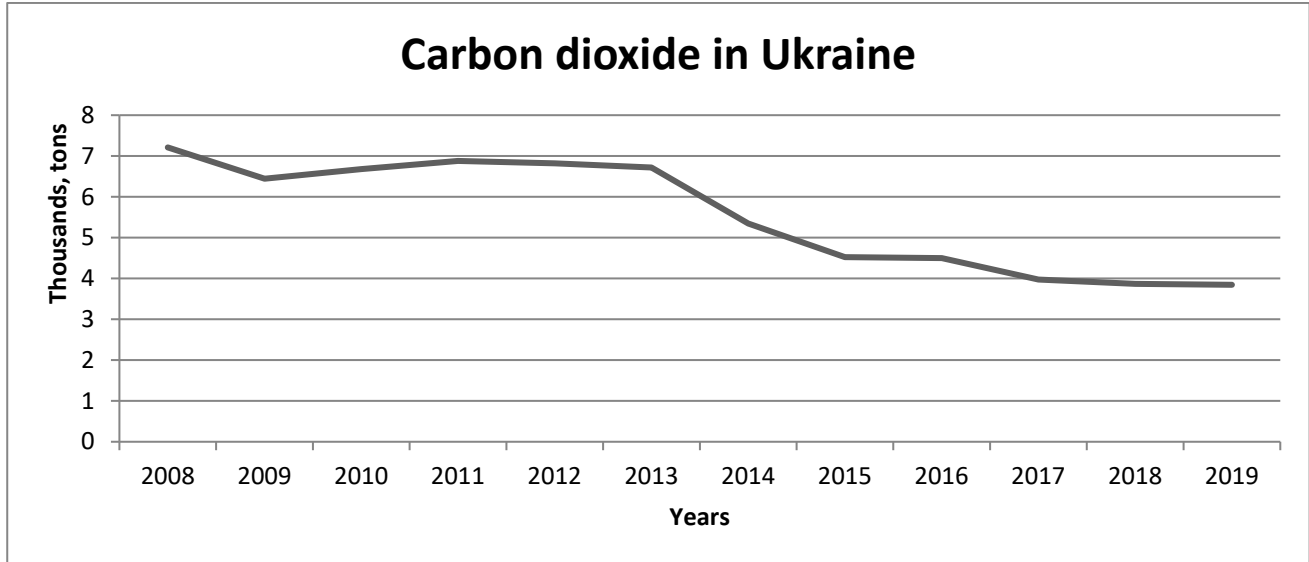


Fig.1. The trend in carbon dioxide emissions in Ukraine.

Years	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Thousands, tons	7210,3	6442,9	6678,0	6877,3	6821,1	6719,8	5346,2	4521,3	4498,1	3974,1	3866,7	3844,1

Fig.2. State statistics data

In 2019, Ukraine adopted the Paris Agreement on Combating Global Warming, which replaced the Kyoto Protocol. In accordance with the Association Agreement with the EU, Ukraine must also introduce greenhouse gas trading. So far, Ukraine has set a goal to reduce emissions by 40% compared to 1990 level. Since that time, emissions in Ukraine have fell from 618 million tons to 189 million tons in 2016, according to the World Energy Statistical Yearbook.

In order to achieve this goal, it is necessary to adhere to the tasks set by the Paris Agreement. To this end, we are talking about stopping the burning of fossil fuels and completely abandoning it by developing low-carbon technologies and adapting the country to climate change. In 2018, the Ukrainian government adopted the Concept for the implementation of state policy in climate change until 2030. This document is the first in Ukraine to limit carbon dioxide emissions. According to the agreement with the EU, the Cabinet of Ministers of Ukraine should introduce an internal system for trading in greenhouse gas emissions. It is necessary to develop a quota allocation plan and implement greenhouse gas emission permits. After creating emission monitoring for each enterprise, the Cabinet of Ministers of Ukraine needs to create a plan for allocating quotas for six sectors of the economy. After receiving a

certain quota, an enterprise will be able to implement measures aimed at reducing greenhouse gas emissions, and sell excess quotas to another enterprise. In addition to combating enterprise emissions, Ukraine plans to support the production and sale of electric vehicles. About 20% of gas emissions are produced by internal combustion vehicles, and the number of these cars is growing rapidly, which is why these plans should help reduce emissions by 20% if all countries support the system. The government wants to support this system by reducing VAT, Pension Fund and Excise Taxes. In addition, the government banned the establishment of tax deductions for car dealers on income tax and reimbursed the buyer for a portion of the cost of the car.

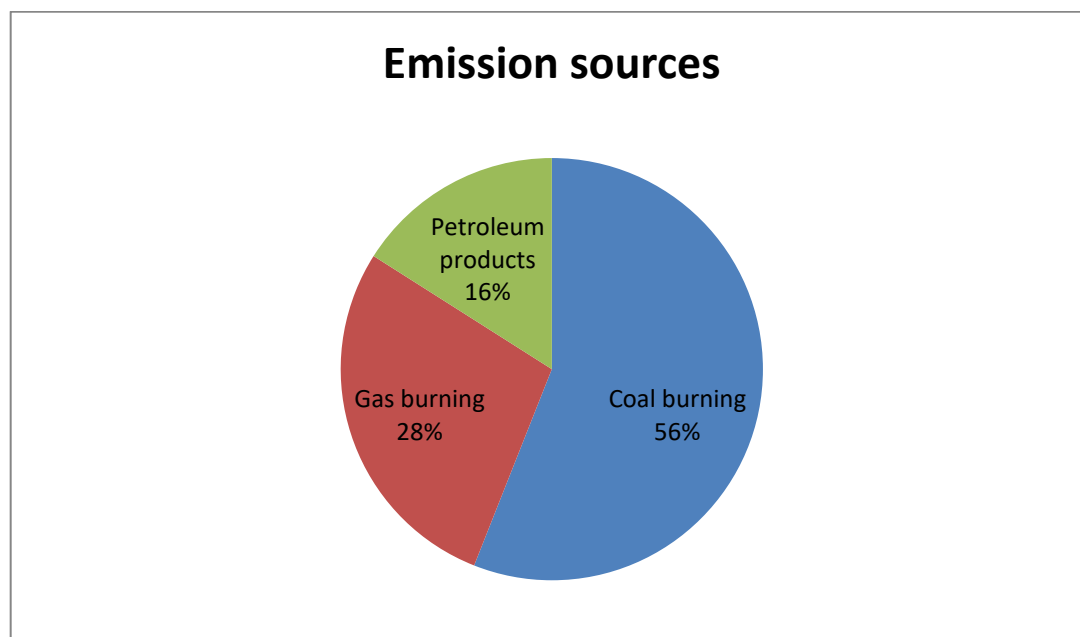


Fig. 3. Sources of emission

This study enhances our understanding of global warming and all economic and social problems that may arise.

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Injuries in Ukraine

It should be noted that there are no completely dangerous and harmless working conditions. As a rule, the actual production conditions are characterized by the presence of certain hazards and dangers, which result in occupational disease and injury. Occupational injuries at work have not accidentally started to equate to national disasters. It causes not only huge grief and suffering to specific people, their families and relatives, but it also directly affects the economy of the country, because personal tragedies become social losses, negatively affecting the standard of living of the people.

According to the International Labor Organization, there are approximately 125 million production-related accidents annually worldwide, including 10 million with severe and 220,000 with fatalities. For today, it's about 60-150 million cases of work-related illnesses have been reported, 500 million workers are incapable of work due to inconsistencies in health and safety.

Overseas economists have estimated that the death of a manufacturing worker as a result of an accident is too costly to society both financially and socially. These are expenses for education and training of the victim, not less costs for preparation of replacement for him, lost benefits from the products that could be produced by the victim during the years of his activity, compensation of his family and many others. The unsatisfactory state of labor protection has a heavy burden on the economy of the country.

According to statistics, in average, more than 200 workers are injured daily at enterprises, institutions, organizations of all types of property in Ukraine, of which about 30 become disabled and 5 die. The risk of becoming a victim of an industrial accident or suffering from occupational disease in Ukraine is 5-8 times higher than in developed countries.

Occupational injuries in the coal industry have remained high for many years. An analysis of the circumstances and causes of fatal injuries at the coal industry shows that the main factors are: deterioration of the coal mine, deterioration of mining and geological conditions of coal production, low level of production and technological discipline of employees, lack of proper control of safe conduct by managers regulatory acts on labor protection.

The inconsistency of reforms and lack of investment have caused a deep crisis in the coal industry. The industry has a very negative situation in the field of occupational safety, increased accident rates, decreased coal production, and sharply deteriorated working conditions. The same is true of the enterprises of the mining and metallurgical complex. Production levels have declined 2.3 times in recent years, and the fatal injury rate has increased in the same proportion.

A long period of work in harmful conditions causes occupational diseases. The total amount of compensation for damage to workers who have suffered from an industrial accident or occupational disease is 350-400 million UAH per year, which, under the difficult economic conditions of today, leads to an accumulation of arrears of these payments and an increase in social tension in some regions. The conditions and safety of work in the small business are constantly deteriorating: at private, rental, small enterprises, cooperatives and firms employing more than 7 million people, no occupational safety almost absent.

Occupational Safety in the USA

Regulations and laws on labor protection in the United States must be implemented and complied with at all enterprises (including small and medium). If violations detected, the state annually imposes fines on entrepreneurs, the amount of which millions of dollars. Maintaining healthy, safe, and secure jobs is one of the four strategic goals of the US leadership in the field of labor. The government pays particular attention to the mining industry, so in 1977 the law on the protection of health and labor in mines was approved, the implementation of which is constantly being improved. Improving the labor protection conditions in the USA occupies an important place in the future policy of the state. For small and medium-sized businesses, special simplified regulatory and methodological and information materials have been developed that facilitate understanding of safety rules, the main responsibilities of the employee and employer in risk management.

When comparing the state of labor protection in the USA and Ukraine, we can see significant differences. The high level of injury in Ukraine is explained not only by objective reasons: the difficult economic situation in the country, the changing nature of industrial relations between enterprises, the aging of fixed assets, etc. This is explained by the reduction of labor protection costs, the weakening of industrial discipline, the irregularity of work, the reduction of labor protection services, the increase in the number of small, uncontrolled enterprises. This is a consequence of mostly unsatisfactory organization of work and violations of technological discipline, inadequate thinking and attitude to safety issues.

In order to achieve a significant improvement in the situation of occupational safety and injury in our country, it is necessary to change our attitude to life safety and take measures to eliminate deficiencies.

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The device for collecting containers

In our country, the situation with garbage processing is getting worse every year. There is more and more garbage, and there is less and less space for it. Garbage not only occupies large areas, but also poisons the environment. But landfills are not the only problem. Ordinary people don't tend to recycle their garbage. Therefore, in order to solve this problem, engineers have come up with waste recycling devices. However, for recycling, it must first be sorted. But this problem is also solved by creating a device for collecting plastic containers.



Fig. 1 A device for collecting plastic containers and special image.

The device for collecting plastic containers can be the beginning of the waste processing industry in Ukraine. At the moment, Ukraine uses old technologies for elimination garbage, namely incineration. Recycling will have a positive impact on the country's environmental and economic condition. By hiding the garbage, we will not get rid of the negative impact on living beings. In addition, at the moment, recycling plants do not have enough material for processing, so they have to buy materials for processing.

A similar idea can be found in Germany (img.1). The device is designed to collect plastic bottles, and also issues checks for a certain amount of money. These devices are located in supermarkets and in order to pass the bottle you need to put it in the hole. However, not all bottles are recyclable only those that have a special image (img. 2) on them. A lot of companies are engaged in creating such machines, as Tomra (img. 3) and Sielaff.

The purposes of the project are to create a device that would be easy to use for ordinary people, as well as effectively cope with the task. The main task of the equipment is to press plastic bottles for further processing. Another goal is to create a device that is environmentally friendly and safe.

The following project has no analogue in Ukraine. The author of the article was inspired by the recycling system in Sweden where almost all garbage is recycled. Swedes carefully sort their garbage. In this way, food waste is converted into electricity, plastic is processed into new bottles, and paper into paper pulp from which new products are then produced. There is also non-recyclable garbage-it is electronics and dangerous chemicals, but for them there is also a place of delivery. However, in Sweden, garbage moves through the system of underground communications, which at the moment Ukraine can hardly afford. Another drawback is that Ukrainians are not used to sorting their garbage yet. Therefore, the machine for the collection of plastic needs to be more mobile and not so complicated. But in the process of collecting data, there was found a device similar to what the author came up with. So, the search area was switched to recycling in Germany.



Fig. 2 Recycling system by Tomra

And let us now proceed to consider how we see the tare collection machine. Conceptually, it is similar to what already exists in Germany but with a slight change in design and construction.

So, we should pay attention to the design of the machine. The case should be made of stainless steel and occupy a relatively small area. From our point of view, the machine is to be made in the style of minimalism. Due to the fact that the device presses bottles – this will help save a lot of space.

Now let's move on to the construction. The equipment has a compartment where you need to place the bottle, where it is further pressed. This device also needs a display that facilitates human interaction with the mechanism. Before placing the bottle inside, you need to scan the product code in order for the device to determine the type of bottle and its weight. After the entire operation, a check is issued for the amount of the deposited cash.

Also, the machine can be equipped with a compartment that gives out plastic mass coins with the image of the memory next to which this device is located. That is, when a plastic bottle gets into the device, it is pressed/molded into a mold, and then gets into the delivery compartment, where the user can pick it up.

In conclusion, this project is something new in our country. First of all, the container collection device should facilitate the collection and processing of plastic, as well as become a stylish addition to landscape design. This approach to the problem is a step towards civilized recycling.

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Women's activities and their importance in the sustainable development of the global mining industry

For many millennia, men have played a key role in mining. This was primarily due to the fact that initially all work on the extraction, transportation and processing of mineral resources was carried out with a large share of manual labor, which required considerable physical strength and endurance.

At the beginning of the 20th century, this trend changed; gradually, female representatives began to occupy different positions and positions at mining facilities. The development of new technologies, automation and robotics, the tightening of labor standards and safety rules have reduced the volume of manual labor and required high-quality new staffing.

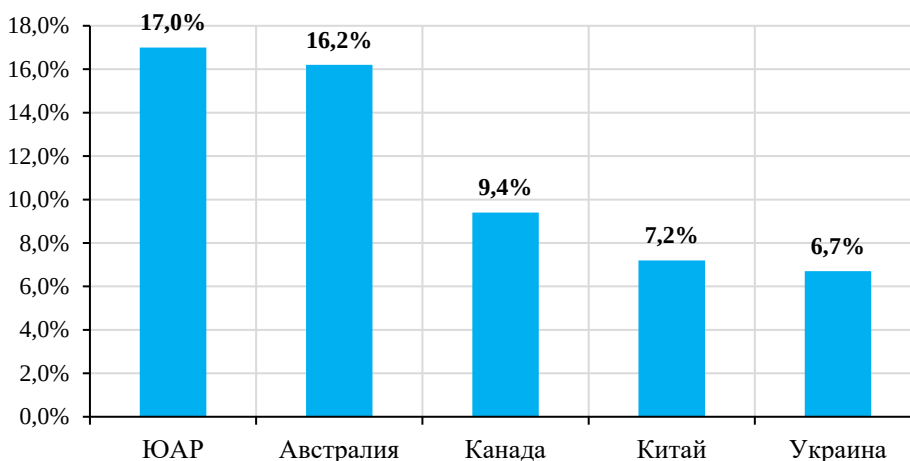


Fig. 1.1 - The proportion of women employed in the mining industry by country, %

However at present, despite the decrease in the complexity of the work, the proportion of women working in modern mining complexes is relatively small. The analysis of state statistics for the main mining countries shows the following. The largest number of women working in the mining industry belongs to South Africa - 17%, followed by Australia - 16.2%; Canada - 9.4%; China - 7.2% and Ukraine - 6.7%.

In a report by the non-profit organization Catalyst Inc., research was conducted on the work of women in some of the world's leading companies (Glencore, BHP Billiton, Rio Tinto, Anglo American). The studies provided showed that organizations that attract women to their work not only combat the shortage of qualified employees, but also receive the economic benefits that gender diversity

brings with them. In addition, in the long run, they are more competitive and stable. It should also be added that according to the Australian Human Rights Commission, an increase in the employment of women can increase the country's GDP by 11%.

In the annual report of PwC and social organization

Women in Mining notes that Australia's 500 mining companies, employing 3 or more women, were significantly more productive in terms of labor productivity than those where the fairer sex is absent. Also, there was an increase in sales by 73%, return on equity of the enterprise by 83% and X on invested capital by 112%.e

Moreover, in a number of countries there is a positive trend in the employment of the female half in production. So, the mining sector of South Africa, which is very promising, including for women, accounts for 3% of the total employment in the country. Moreover, despite the decline in production in South Africa, since 2008, the percentage of women employed in the mining sector has increased from 6 to 17% (at the same time, the percentage of women employed in other areas remains unchanged).

According to the Ministry of Energy and Environmental Protection of Ukraine, 92 thousand people work at the country's coal mining enterprises, of which 6.7% or 6.1 thousand are women. The main engineering professions in which the fair sex is occupied are: geologist, mine surveyor, process engineer, labor protection engineer, environmental engineer, software engineer. Figure 1.2 shows the distribution of the share of women in the total number of workers (a) and by profession (b) in the mines of Ukraine.

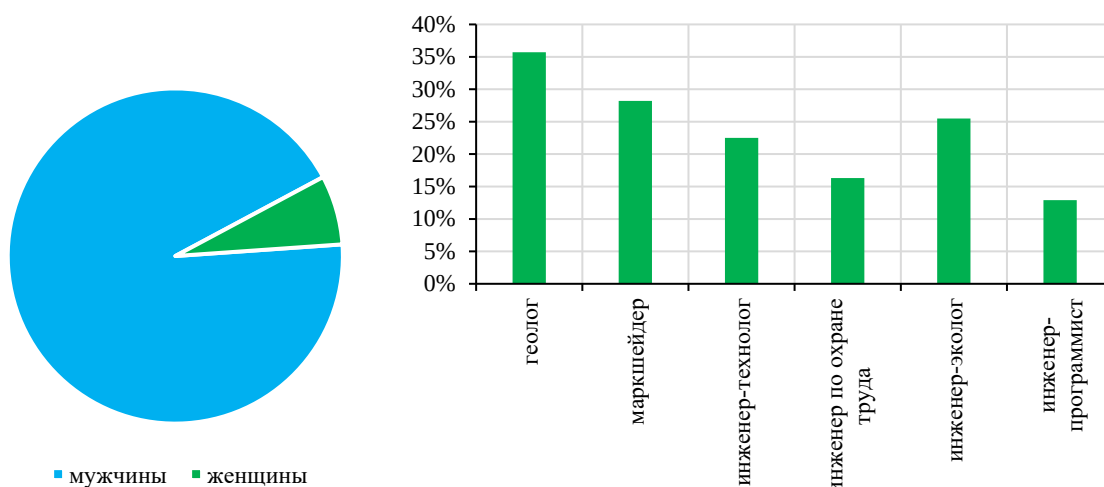


Fig. 1.2 - Distribution of the share of women in the total number of workers (a) and by profession (b) in the mines of Ukraine.

The work of a geologist is connected with the study of the composition of the earth's interior and rocks. The chief geologist manages the geological work at the enterprise, compiling the characteristics of mine fields, coal seams and rocks, provides constant monitoring of the state of the mineral resource base and the supply of mines and open pits with explored coal reserves and related mineral resources. It is the chief geologist who prepares the feasibility study on the industrial development

of coal deposits, takes part in the development and consideration of construction projects, reconstruction of mines, preparation of new horizons, development plans for mining operations, projects and development schemes for associated mineral deposits, drainage projects and other projects, associated with the use of subsoil.

A female surveyor is a specialist who carries out planning and control of all stages of the construction of underground structures and the development of mine workings (drifts, crosshairs, wells, etc.), the organization of work and process adjustment in accordance with the commissioning plan. She is engaged in geodetic measurements and marking, and the quality of the work of the diggers, the efficiency of coal mining and the work of the enterprise itself depend on their accuracy.

Technological engineer - is engaged in the development, organization and design of production processes for preparatory, treatment and auxiliary works. It develops using design automation tools and implements advanced technological processes, types of equipment, automation and mechanization tools, optimal production modes for products manufactured by the enterprise and all types of work of various complexity, ensuring the production of competitive products and reducing material and labor costs.

Draws up plans for the placement of equipment, technical equipment and organization of the enterprise. Considers rationalization proposals to improve production technology and gives conclusions on the appropriateness of their use. Therefore, the future of the company largely depends on the competence and responsibility of the chief engineer.

Summing up the above, we can say that work at mining enterprises is considered one of the most dangerous and for the safe and efficient functioning of enterprises it is necessary to have highly qualified staffing.

All over the world, women have a small share of up to 17% of the engineering professions, but this trend is increasing. Increasingly, women are being elected to the positions of process engineers, geologists or mine surveyors, but this work is very responsible, requires great knowledge and high professional training. In world practice, it is noted that the productivity and efficiency of production at which women work is much higher than those enterprises where representatives of the weaker sex are absent. Therefore, the role of women in the sustainable development of the global mining industry is significant.

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Biological reclamation of coal mine dumps

Land is one of the most important resources on which human beings depend. The rate of consumption of mineral resources is continuously increasing with the advancement of science and technology, economic development, industrial expansion, acceleration of urbanization and growth of population. The growth of our society and civilization heavily relies on the mining industry to operate and maintain comfort.

Self-growth of dumps after technical reclamation is considered to be an important part of the natural environment restoration, where various plant species can provide a high reclamation potential. Opencast excavation of coal deposits involves the removal of overlying soil and rock debris and their storage in dumps. These dumps change the natural land topography, affect drainage systems and prevent the natural sequence of plant growth, resulting in acute problems of soil erosion and environmental pollution. Therefore, self-sustainability and the regenerative capacities of abandoned mining areas should be developed for the proper functioning of the ecosystems through revegetation.

Ecological restoration and mine reclamation have become important parts of the sustainable development strategy in many countries. Good planning and environmental management will minimize the impacts of mining on the environment and will help in preserving eco-diversity.

Reclamation is the process of restoring the environmental integrity of affected mining areas. It involves managing all kinds of physical, chemical and biological soil disturbances, such as soil pH, fertility, microbial communities, and various soil nutrient cycles that make degraded soil productivity useful. Soil productivity can be enhanced by the addition of various natural additives, such as sawdust, wood residues, sewage sludge, animal manure, as these additives stimulate microbial activity that provides nutrients (N, P) and organic carbon in the soil.

The overlying soil is seriously damaged during the extraction of minerals. The consequences of physical disturbance of the overlying soil during storage and restoration cause unusually large N transformations and movement with significant losses. Managing of overlying soil is important for a reclamation plan to reduce nitrogen loss and increase soil nutrients and germs.

Successful biological reclamation mostly depends on the selection of suitable species for the restoration of vegetation. The choice of plant species for vegetation restoration depends on various parameters such as climate, physical and chemical properties of waste materials, natural land topography, viability and surrounding vegetation. The main goals of vegetation restoration are to reduce erosion, stabilize mining and develop processes for sustainable land use during the post-mining period.

Vegetation has an important role in protecting the soil surface from erosion and allowing accumulation of fine particles. They can reverse degradation process by stabilizing soils through development of extensive root systems. Normal practice for revegetation is to choose drought-resistant, fast growing crops or fodder which can grow in nutrient deficient soils. Selected plants should be easy to establish, grow quickly, and have dense canopies and root systems.

Phytomelioration is the most common and useful way to reduce erosion and protect soil from degradation during reclamation. Efforts to restore disturbed lands are focused on N-fixing species of legumes, grasses, grasses and trees. Metal tolerant plants can be effective for acid and heavy metals that carry soil.

Assessment of reclamation success is focused on measuring the emergence and distribution of the soil microflora community, which is governed by the interaction between C and the available nutrients.

The three major macronutrients, namely nitrogen, phosphorus and potassium are generally found to be deficient in overburden dumps. All newly created mine soils, and many older ones will require significant fertilizer element applications for the establishment and maintenance of any plant community. Organic matter is the major source of nutrients such as nitrogen, and available P and K in unfertilized soils. A level of organic carbon greater than 0.75% indicates good fertility. The level of organic carbon in overburden was found to be 0.35% to 0.85%. Organic carbon is positively correlated with available N and K and negatively correlated with Fe, Mn, Cu, and Zn. Initial applications of fertilizers have shown to increase the specific numbers, plants co-density and growth rates of vegetation.

Soil microbe populations must be addressed deliberately as another soil component. It plays a major role in aggregate stabilization, which is important for maintaining suitable structural conditions for cultivation and porosity for crop growth. Their activity declines when soil layers are disrupted and is slow to resume independently. Soil microbes include several bacterial species active in decomposition of plant material as well as fungal species whose symbiotic relationship with many plants facilitates uptake of nitrogen and phosphorus in exchange of carbon. They produce polysaccharides that improve soil aggregation and positively affect plant growth. Sites with an active soil microbe community exhibit stable soil aggregation, whereas sites with decreased microbial activity have compacted soil and poor aggregation. Microbial activity decreases with depth and time as topsoil continues to be stored during mining operations.

Reclamation is an integral part of the development of mineral resources in accordance with the principles of sustainable development. The purpose of reclamation is to restore the ecological integrity of the affected areas. Phytomelioration is the most common and useful remediation method to reduce erosion and protect soil from degradation. Reclamation should be carried out with plants selected on the basis of their ability to survive and regenerate in the local environment, as well as their ability to stabilize the soil structure. Phytomelioration promotes the development of N-fixing bacteria and mycorrhizal association, which are fundamental to maintaining soil quality.

For instance, our investigations were conducted at the sites of reclamation of the Pavlograd experimental station for the restoration of disturbed lands in Western Donbass. The basis of the plots was formed by a thick layer of empty rock (8-10 m), on the top of which soil substrates of various thickness were placed. In our explorations we studied areas of reclamation with chernozem, covering the rock, of various thicknesses: 30 cm (variant 1), 50 cm (variant 2) and 70 cm (variant 3).

For the chemical analysis, soil samples were taken from the depth of 0-20 cm as well as from two prevailing plant species: cereal – *Bromopsis inermis* (grows on all areas) and legumes – *Lathyrus tuberosus* (found only in the third area with the thickest layer of chernozem). The plant and soil samples were treated and prepared in accordance with the standard methods for ICP-MS analysis.

The conducted analysis showed high reclamation potential of the plant species under the study. The distribution of wild-growing forms is significantly influenced by the qualitative and quantitative composition of the mineral nutrition of the plants. Besides, *Bromopsis inermis* and *Lathyrus tuberosus* have the potential to be used for phytomining technology developments in order to obtain the particular rare elements.

Reclamation must go beyond planting a new landscape by considering the land as an integrated system that functions above and below the ground. Reclamation of overburden dumps is not an operation, which should be considered only at or just before mine closure. Rather, it should be a part of an integrated programme of an effective environmental management through all phases of resource development - from exploration to construction, operation, and closure.

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Plastic debris in the world ocean

Plastic wastes appear to be a large-scale problem affecting the marine environment not only in coastal areas where there is no appropriate waste management infrastructure, but also in the oceans in general, because the slow destruction of large plastic products leads to the formation of microplastics. Particles that travel long distances are carried by the wind and form huge ocean islands of debris. Public awareness increases global concern regarding the effects of plastics absorbed by marine species and the accumulation of plastics in coastal and remote oceans. Private and public initiatives, such as volunteer beach cleaning and beach garbage disposal campaigns are the main source of information on the quantity and types of marine debris. Regular cleaning by municipalities and government agencies to maintain attractive beaches for tourists entails significant economic costs.

Drifting plastic wastes have adverse effects on ecosystems and marine species. However, accurate knowledge of the quantity, sources and accumulation of plastics in the oceans is still lacking. Ingestion, strangulation and entanglement of hundreds of marine species are the most visible and disturbing effects of marine plastic pollution. Floating items accumulate toxic pollutants on the surface of polluted sea water, and therefore, can be a concentrated source of environmental pollution.

The detailed study of this issue includes:

- ✓ comparing the amount of plastic debris in the global ocean;
- ✓ researching the most harmful wastes to the environment;
- ✓ making a possible forecast of what will happen in a few decades in the absence of any measures;
- ✓ offering the main options for reducing usage of plastic and methods for partial purification of the world's oceans from this type of waste.

The graph below shows that since 1950 the accumulation of plastic waste from regional industries has amounted to almost 300 million tons. The main problem is with packaging occupying about 50% of the total mass of plastic waste around the world.

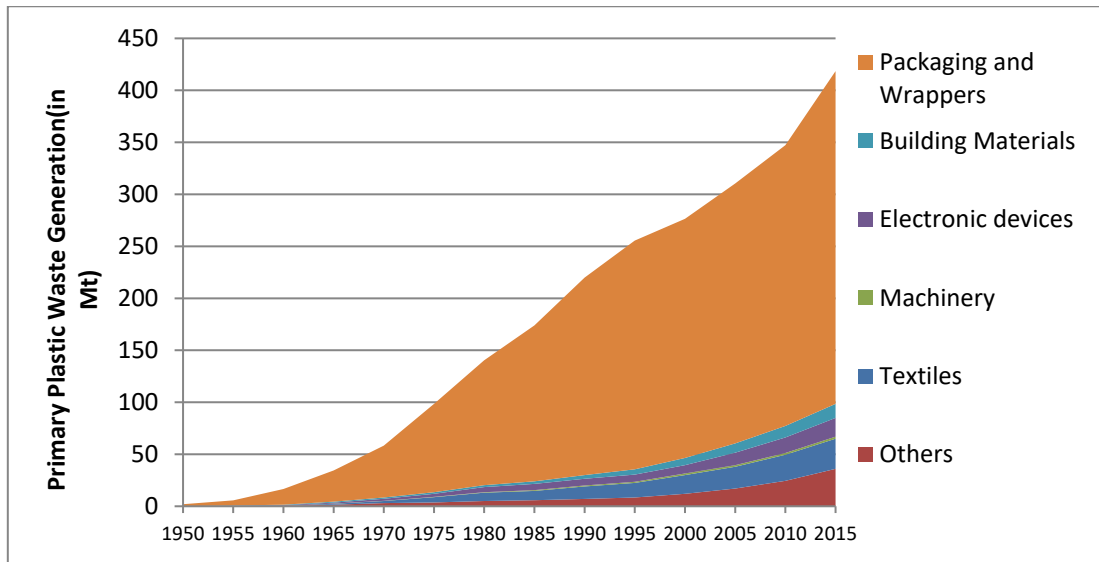


Fig.1 Plastic debris from 1950 to 2015

The logical conclusion to be drawn: with an increase in the population, there will be more demand for plastics in its various forms, and in 10 years this figure may increase twice.

A lot of marine animals have been killed or harmed by this debris because they either become entangled in it, or, they eat plastic debris and ingest it. A review of entanglement and ingestion of ocean debris by marine organisms was held in 2016. It showed that these accidents had been known to affect at least 267 species around the world. This included 86% of all sea turtles, 44% of all seabird species, 43% of all marine mammal species and numerous fish and crustacean species. For most of the species concerned, significant numbers of them were affected [1-3].

Table 1 lists the number of species that have been affected by entanglement or ingestion of marine debris. Since the publication of this list, other species have been found to be affected.

An additional and potentially dangerous side of marine debris is its possible influence on microorganisms living on the sea floor. Plastic debris is often floating, but it in the end may break down and settle on the sea floor. An accumulation of these wastes on the seabed may affect the organisms present.

Species Group	Total number of species worldwide	Number and percentage of species with entanglement records	Number and percentage of species with ingestion records
Sea Turtles	7	6(86%)	6(86%)
Seabirds	312	51(16%)	111(36%)
Penguins (Sphenisciformes)	16	6(38%)	1(6%)
Grebes (Podicipediformes)	19	2(10%)	0
Albatrosses, Petrels, and Shearwaters (Procellariiformes)	99	10(10%)	62(63%)

Section 02 Environmental Problems and their Solutions

Pelicans, Boobies Gannets, Cormorants, Frigatebirds and Tropicbirds (Pelicaniformes)	51	11(22%)	8(16%)
Shorebirds, Skuas, Gulls, Terns, Auks (Charadriiformes)	122	22(18%)	40(33%)
Other birds	-	5	0
Marine Mammals	115	32(28%)	26(23%)
Baleen Whales (Mysticeti)	10	6(60%)	2(20%)
Toothed Whales (Odontoceti)	65	5(8%)	21(32%)
Fur Seals and Sea Lions	14	11(79%)	1(7%)
True Seals	19	8(42%)	1(5%)
Manatees and Dugongs	4	1(25%)	1(25%)
Sea Otter (Mustellidae)	1	1(100%)	0
Fish	-	34	33
Crustaceans	-	8	0
Squid	-	0	1
Species Total	854	136(16%)	177(21%)

Table 1 Number and percentage of marine species worldwide

Marine debris items are presented in the graph that follow.

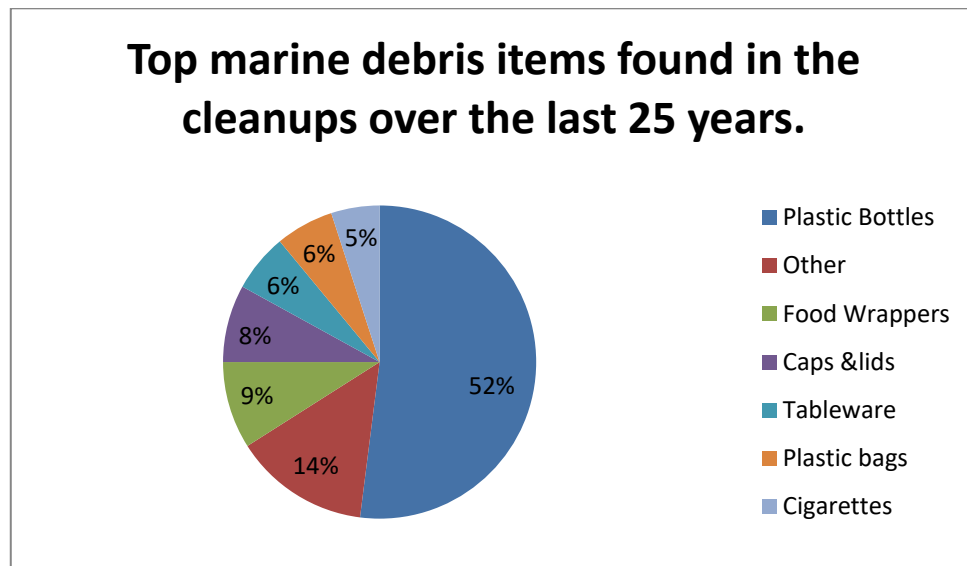


Fig. 2 Top marine debris items found in the cleanups over the last 25 years.

Additional actions need to be taken to solve the problems discussed.

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Section 03 Innovations in Engineering, Energy Efficiency and Alternative Sources of Energy

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Prospects for Implementing Mine Locomotives with Gear Drive

With a constant tendency to increase the load on treatment faces as well as increasing the cross-section area of preparatory workings and the speed of their implementation, the volume of auxiliary cargo, the cost and labor intensity of their transportation also increase. Thus, according to foreign researchers [1] the materials delivery is 10 times more expensive and 20 times more time-consuming compared to the transportation of coal and rock. Domestic scientists come to similar conclusions [2], noting that the development of technology and techniques for mining and mining operations will inevitably lead to a further increase in auxiliary cargo flows and the mass of piece cargo, the transportation distance, and the complexity of profiles and route plans.

During the last decades, a great experience in design, production and operation of auxiliary transport vehicles (i.e. electric locomotives, diesel locomotives, cable-stayed ground and monorails) has been gained. The study of these systems allows identifying the maximum limits of their application by the main indicators such as: drive pull, speed, slope of route and length of transportation.

Using traditional rollback equipment to deliver equipment, supplies, and people to their destinations is a cost-effective and proven solution, but has significant limitations on path offset and battery power.

The objective is to expand the scope of mine locomotive transport by introducing new technical solutions.

Mine diesel carriers are widely used in coal mines abroad. They use high-energy fuels, and their trajectory is almost unlimited during the shift period. The group drive of the locomotive, hydrotransmission and hydraulic drive of brakes allow to realize a larger traction and braking force, compared to traditionally used locomotives. However, the transmission of traction and braking forces due to the interaction of the wheel with the rail imposes the same restrictions on their use on large slopes as on electric locomotives. In this regard, the article considers the possibility of using a locomotive of a new technical level with a rack.

A well-known road with gears, in accordance with patents PL 179457 (E21F13 / 02, publication date 29.09.2000) and PL 352234. [4]

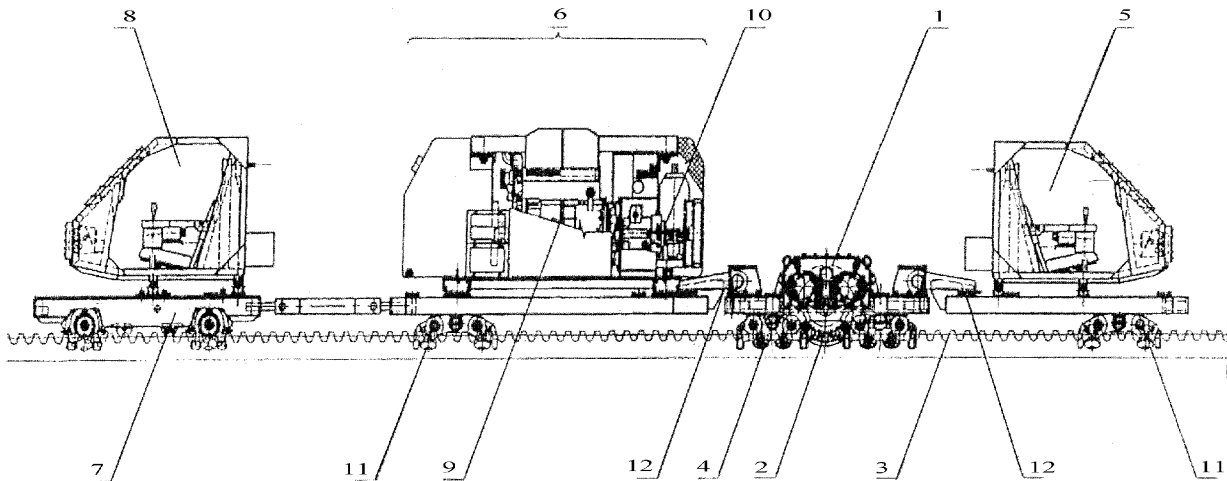


Fig. 1 Road with gear drive

The road structure with a gear drive (figure 1) moves along rails with a gear steel concentrated between them; the finger wheel of a traction organ driven by any type of engine rolls along a gear steel. On the one hand, the traction organ (1) is connected to the control cabin (5), and on the other hand, to the driving station (6) and the brake trolley (7) with the control cabin (8), similar to the mentioned control cabin (5), with general control, so that the road can be controlled from each cab. Moreover, the first mentioned control cabin (5) and the drive station (6) have the same chassis (11), displaced as much as possible from the traction body (1), and connected to the traction body by means of pressure joint couplings (12) with vertical rotation surfaces at the connections (1 and 5, as well as 1 and 6) [4].

Diesel locomotives implementation in the mines of Ukraine has revealed a discrepancy between the standards for the content of harmful substances in the exhaust of diesel locomotives produced in the European Union and Ukrainian standards. To reduce the harmful effects of exhaust gases on personnel, a technical solution can be recommended [3], the essence of which is to introduce a compressor to the design of a diesel locomotive that compresses exhaust gases and directs them to a trailer container- trolley with cylinders.

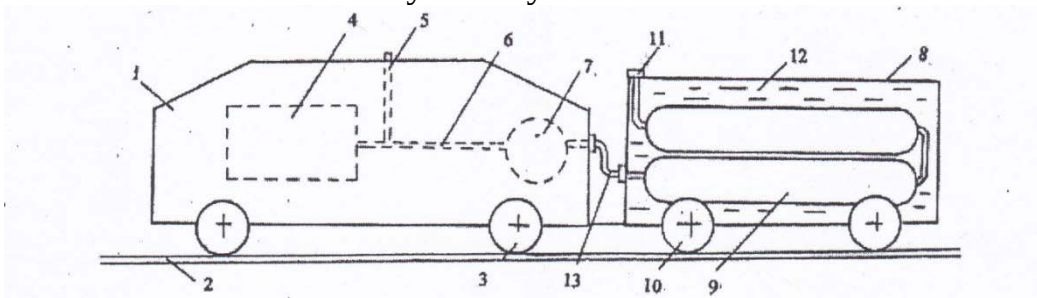


Fig. 2. Mine diesel locomotive

During the locomotive movement (1) along the track (2) towards the fresh jet, exhaust gases of the engine (4) through the branch pipe (5) go into the atmosphere. In the case of working in dead-end workings or when driving behind the jet, the driver closes the branch pipe (5), turns on the compressor (7). The latter compresses the exhaust gases, and sends them to the tanks (9) through the branch pipe (13), where they are cooled by liquid (12). Exhaust gases are released through a ventilation hole

in the main trunk or on the route through a specially equipped well to the output with an outgoing jet, which is equipped with a dilution chamber.

The paper determines the longest route of locomotive rollback per shift – 9.6 km. The average diesel locomotive speed is 13.14 km/h or 3.5 m/sec. The required number of cylinders – 10 has been determined after performing the calculation, under the condition of a permanently connected tender-trolley with 100L cylindrical cylinders (1004 mm x 376 mm). The real number of required cylinders will be less, since the work with the tender can be provided only in dead-end workings or when moving along the jet.

The main advantage of a diesel locomotive is its autonomy compared to a battery electric locomotive. Since it takes much less time to refuel a diesel locomotive than to replace the battery of an electric locomotive, this reduces the locomotive technical downtime.

If we place the rack rails on all areas with high slopes, we get high performance without changing the mine's transportation network. As a result, it is possible to remove the step, reduce a trip time, and increase a replacement performance of the locomotive rollback.

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Nanomaterials are the future of our planet

Our modern world is filled with many things that humanity has created for itself. The profession of materials scientist is to study the properties of materials and develop new materials. The main purpose of this profession is to acquire knowledge about the structure and properties of materials and to establish a connection between the composition of materials. All the knowledge that a material scientist acquires not only helps to explore our planet, but also helps to create new materials that help maximize the conservation of natural resources and not pollute the Earth.

Research methods: 1) Analysis of scientific works of famous scientists. 2) Research of materials science technologies used abroad. 3) Generalization of ideas of scientists and specialists who have directly studied this problem. 4) Creating a model for solving ecological problems at the present stage with the use of nanomaterials.

Steels are made on the basis of nanotechnology, practically not subject to corrosion effects. A vapor permeable glass was created using these same technologies. There are also energy-saving pellicle that are self-cleaning and used for translucent structures. In addition, the study found that the service life of buildings that were built using nanotechnology exceeds 2-5 times the service life of the strongest buildings of the late 20s early 21st century.

The "lotus effect" technology, developed in Beijing, helps to create non-pollutant materials. This is due to the high density of particles that do not allow water droplets or dirt to linger on it. Also, these materials are completely transparent.

Material scientists from Shanghai have created translucent nanoclays that have the ability to accumulate solar energy, these pellicles are applied to the windows of homes and significantly reduce energy costs.

Electric trunk cables on carbon nanotubes may appear in the near future. They will be able to conduct high voltage currents much better than copper wires, while weighing five to six times less.

Nanomaterials will reduce the cost of precious metals by 15-20 times. For example, by replacing with nanomaterials the platinum used in automotive catalytic converters, which cleanse the exhaust from harmful impurities.

Nanobots:

Robot can designing any object. Modern scientists and experts argue that such robots can appear as early as 2025. It is theoretically possible that these robots will be able to construct from ready atoms anything.

It is also theoretically possible that molecular work will be able to create food by replacing farm animals and plants. For example, create milk directly from the grass. This significantly stabilizes the environment, as new types of industry will not produce waste.

Incredible possibilities can become real, such as the colonization of other planets. Nanorobots will be able to create the habitat necessary for human life on other planets.

Aerospace Engineering:

Spare parts of which can be made can be much easier and better, made with minimal or no metal. [1]

Water purification using nanomaterials and nanotechnologies:

Nanomaterials are endowed with unique properties, such as high surface-to-volume ratio, high reactivity and sensitivity, self-assembly properties on substrates for film formation, high adsorption, and more. Due to these properties, nanomaterials are effective against various organic and inorganic pollutants, heavy metals, as well as against various harmful microorganisms present in contaminated water. [2]

Nanostructured catalysts are widely used in the treatment of industrial waste and the purification of industrial waste gas. [3]

Eco-friendly food packaging:

In the area of food packaging, an example of the use of nanotechnology is materials that come into contact with food. Nowadays, nanocomposite materials are widely used as packages or coatings, which are applied to plastic containers in order to limit gas diffusion and increase the shelf life. These packages are also used in the production of antimicrobial materials in contact with food. [4]

Material science is a leading science in the field of ecology, with which you can save the resources of the earth and the sustainability of ecology.

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Development of the construction hydraulic grapple for sorting debris

Sorting grapples are designed to perform a wide variety of tasks, such as moving and loading stone, backfilling, excavating, overloading items of various shapes, volumes and degrees of hardness, as well as for other sorting and dismantling operations. Grapple refers to the types of handling equipment that should facilitate manipulation when carrying out loading and unloading operations. The use of grapples is not limited to any industry. They can be found at construction sites, at industrial, processing plants, in mining quarries etc. Besides, it can be used as a working element of production processes. The principle of operation of all grapple mechanisms is capturing or drawing of materials by jaws of the grapple. Sorting grapples are used as an element of loading machines or special equipment and are most often mounted on excavators weighing from one to forty tons. Large and small grapples cope with the tasks of sorting and are highly demanded by industrial and construction companies.

Work on this project is related to the research of the Department of Mining Machines and Engineering and is commissioned by the enterprise of LLC "Grabiron". The purpose of the study is to develop the design of a hydraulic grapple for sorting construction debris. The design of the grapple should provide the best operational ratio of load characteristics, by reducing the weight of the grapple and justifying the construction of the jaws.

The main components of the hydraulic grapple are shown in figure 1: body (1), left jaw (2), right jaw (3) and hydraulic cylinder (4) with lever (5). The jaws open when the working fluid is pressurized into the piston cavity of the hydraulic cylinder. The jaws close when the working fluid is fed into the rod cavity of the hydraulic cylinder.

The safety of moving the load is ensured by the presence of a lever in the grapple design that prevents the involuntary opening of the gripper jaws.

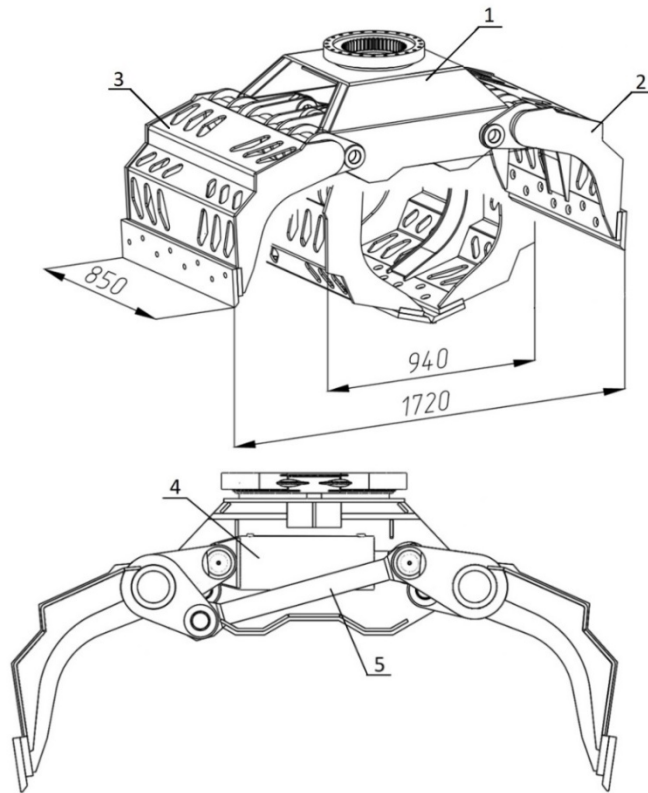


Fig. 1 The hydraulic grapple

The hydraulic grapple is equipped with two gripping jaws (Fig. 2). Each jaw has side walls (1), support (2), lugs (3), gains (4), plate (5), strap (6), ribs (7), spacer (8) and replaceable knife (9).

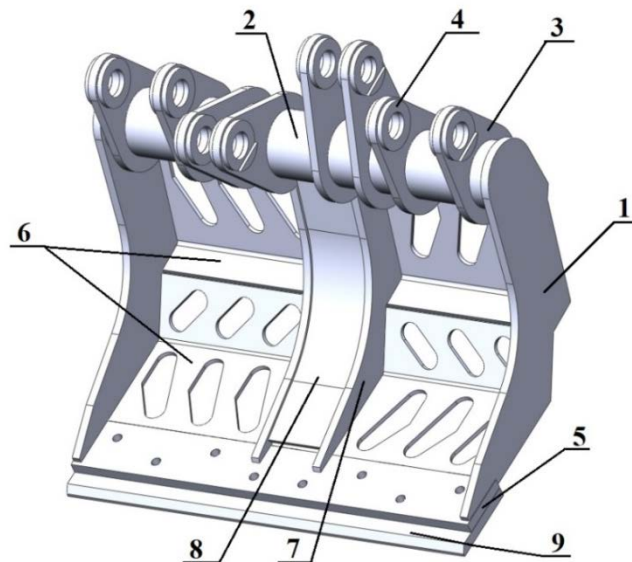


Fig. 2 The grapple jaw

Each jaw is pivotally connected to the grapple body, hydraulic cylinder and lever. This connection is ensured by the presence of the jaws of the lugs and the gains, which receive heavy loads from the weight of the whole grapple and the captured material. The lugs are welded to the support. While grabbing construction debris, the plate and the strap of the jaw slides over the captured material. The

strapping consists of two parts welded together, which have a curved shape and cutouts to facilitate construction, a shape that does not allow the captured material to spill. The grips and retention of the material are also provided with the walls. The design of each jaw ensures the presence of ribs and spacers between them. Each jaw is equipped with a replaceable knife, which joins the jaw with the bolt connection. All elements of the jaw structure are made of high strength steel (yield point - 750MPa, breaking stress - 830MPa) welded together.

To achieve the goal of this project, we use rules of theoretical mechanics as well as CAD, Mathcad, Microsoft Excel and SolidWorks. A number of calculations for this grapple model were made. The value of the forces arising on the grapple knives are shown on the graph below (Fig. 3). These efforts indicate the ability of the grapple to grip and hold material.

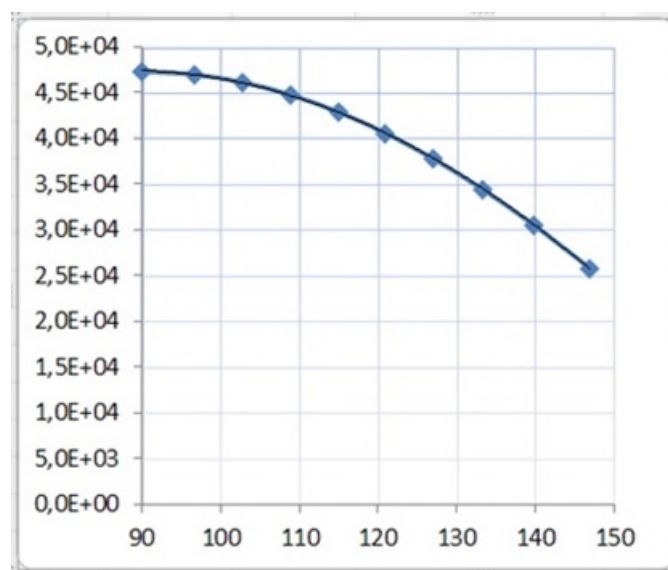


Fig. 3 The forces arising on the grapple knives

The graph shows that the jaw forces vary in the range from 25 to 47 kN. The obtained values completely satisfy the given conditions.

The results of the calculations are taken into account. A computer model of the grapple is designed, and design documentation is made.

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Critical analysis of the prospects of the Ukrainian electric power development

It is known that the structure of modern electricity production is distributed as follows: thermal power generation is approximately 65%, nuclear energy production - 15% and 20% generated by sources of renewable type such as solar systems - hydroelectric power station, SES, stations using movement of air masses - hydroelectric power station etc. It should be noted that the situation at the global energy market reflects a trend towards a constant rise in prices for primary energy sources such as oil, gas and coal. Consequently, electricity also becomes more expensive. With limited natural resources, the replacement of thermal energy is only a matter of time. In order to avoid the energy crisis in the next 10-15 years, it is necessary to begin to transit the Ukrainian energy grid to innovative types of power plants. The comparative analysis of the prospective development of various methods of electricity generation is given in this paper from the perspective of their potential applicability in Ukraine.

Nuclear power plant(s) (NPP) is an industry that produces electricity and heat using a fission of radioactive raw materials. The main advantage of this type of energy is high productivity, rather low-cost of the final product of production (50 kop. / kW * time), low fuel consumption.

However, such systems have significant disadvantages: high cost of NPP construction, complications associated with the disposal of radioactive outputs and elimination of possible consequences of emergencies.

But in such circumstances, the NPP is the best alternative to the TPP in areas where there is a need for a large amount of electricity.

Geleo energetics is a direction that uses solar radiation to generate electricity directly. Its main advantages:

- environment-friendliness;
- absence of third-party energy utilization;
- easy maintenance;
- possibility of location in the immediate vicinity of the consumer.

However, it also has some disadvantages such as small efficiency, need in large areas, dependence on weather conditions and the time of a day, and high initial cost.

To solve the named drawbacks of solar systems it could be proposed to:

1. place solar panels on the roofs of buildings.
2. reduce the cost of solar panels by 10-15% due to their mass production.

3. use rechargeable batteries to ensure interruption-free power supply on cloudy weather and in the nighttime.

Wind power is an energy industry that converts the kinetic energy of air masses into the other types of energy.

Advantages: environmental friendliness, possibility of location in close proximity to the consumer.

The methods of this generation also have negative features and properties, among which is inability to work at a sufficiently low and high wind speed, high levels of working noise, complexity of maintenance, the lack of the possibility of even energy production.

The latter can be eliminated by the location of wind generators in locations with sufficient wind flow activity, which are currently identified within Ukraine. Other shortcomings can't be corrected in any way now that ultimately limits the use of wind turbines and makes their installation only viable, when no other types of energy sources are possible.

Hydropower as a set of systems is aimed at converting water flow energy into electricity.

The advantage of this type of energy generation is that this type is the cheapest (in Ukraine - the price of kWh is 0.315 kopecks). Environmental friendliness and relative ease of maintenance distinguish hydropower from other types of power generation.

However, there are some drawbacks. To build a hydropower station needs use of a large amount of construction materials. Moreover, it is difficult to build HPPs in the areas with low energy flows that limits the number of power plants within a single water resource.

Based on the analysis, we can draw the following conclusions.

As mentioned above, 20% of all electricity is generated from green sources, 19% of which is hydroelectric. Therefore, the use of hydropower should be continued.

The most promising and efficient alternative source of electricity for high-energy consuming areas is the combination of nuclear and hydropower.

A partial switch on to the wind and solar sources of energy is recommended, especially in the low-energy consuming areas.

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Improvement of the insulation resistance control device

The operation of industrial electrical installations is accompanied by problems associated with the presence of leakage currents through imperfect insulation in cable networks. The latter leads to unproductive losses of electricity, a decrease in the efficiency of the network, accelerated aging of the insulation, an increase in the likelihood of breakdown and the emergence, as a result, of emergency situations. Solving the problem of monitoring and limiting leakage currents is a significant reserve for solving the complex problem of energy conservation.

Errors in the design and selection of components, types of wires and types of insulation, low culture of installation of electrical installations of buildings, poor-quality scheduled maintenance and routine work are the main causes of leakage currents.

According to the rules for the installation of electrical installations, during the installation of new networks and the reconstruction of existing electricity supply networks, three- and five-wire circuits are introduced, providing for the use of an additional zero protective conductor. A very common mistake in connecting electrical equipment according to these schemes is that the zero protective and zero working conductors have one or even several common electrical contacts in the internal distribution network, and this leads to the appearance of uncontrolled spreading of currents through metal structures, pipelines of water supply systems, heating and sewage of buildings.

In addition to installation errors, there are a number of other reasons that lead to the appearance of leakage currents: deterioration of the state of contact connections in the circuits of zero working conductors, deterioration of the insulation state of phase wires, etc.

The presence of leakage currents, in addition to unproductive energy losses, causes accelerated aging of the insulation, which, in turn, leads to an even greater increase in leakage currents, “unjustified” tripping of protection devices and, as a result, an inadequate decrease in the reliability of power supply.

Insulation aging associated with an increase in leakage currents can also be avalanche-like, which will lead to the operation of protective devices for reasons unknown to the technical staff and interruptions in power supply.

In addition, the presence of leakage currents in distribution networks causes accelerated corrosion of metal structures.

To assess the leakage currents through insulation to earth, studies have been conducted on various devices for monitoring insulation resistance [1].

The aim of the research was to develop an improved device for monitoring insulation resistance, which allows to reduce leakage currents through the insulation to a specified minimum value.

Currently, in industrial production, a residual current device (RCD) has been widely used - an automatic device for protecting people from electric shock and electrical equipment from fire while reducing insulation resistance. This device essentially performs the function of monitoring leakage currents and works on the principle of disconnecting the controlled network when the leakage current exceeds the RCD trip threshold.

Although RCDs, due to their simplicity, reliability and effectiveness of protection, have gained widespread use, they have one significant drawback: RCDs are produced for one fixed current value from the standard series (10, 30, 100 and 300 mA) and operate according to the simplified principle “on / off”. This often leads to inadequate shutdowns of the electrical installation.

All known RCDs contain a differential current sensor (DI), a threshold element (TE) and an actuator (A). The signal emitted by the DI sensor — an alternating voltage or current with a frequency of the protected network — enters the threshold element and, when its threshold value is exceeded (a predetermined fixed current value), leads to the transition of the TE to the state in which the actuator is activated and the electrical installation is switched off.

The Department of Electrical Engineering of Dnipro University of Technology in conjunction with LLC “ORKIS” (Ukraine, Krivoy Rog) proposed a new device for monitoring insulation resistance with the function of analyzing leakage currents [2].

The developed RCD with the function of monitoring leakage currents will allow timely detecting the decrease in insulation resistance and take preventive measures to prevent an emergency – disconnection of the consumer.

The use of this device will allow to obtain a significant economic effect due to the prevented material damage from the occurrence of unacceptable leakage currents and the absence of unjustified shutdowns of electrical installations.

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Effect of the motion modes of the motor vehicles and characteristics of the road carpet on the results of automatic measuring of their dimension parameters

In terms of the HS WIM world practice (automatic systems to measure weight in motion at high speed), it is not conventional to single out an error of a measuring device (automatic station of weight control (ASWC)) from the dynamic variations of the measured parameters of the freight motor vehicles (FMV). The fact that the values of the measured dynamic axial loads and overall dimensions during the FMV motion experience constant changes relative to their magnitudes measured in statics has not been mentioned so far by either national or foreign specialists.

Variations of the measured large-dimension FMV meters may exceed the ASWC errors; it should be taken into consideration while testing and checking those measuring means. New results of the calculation and experimental studies has been represented; the results concern the changes in large-dimension FMV parameters with the help of a dynamic model with four degrees of freedom and direct measurements of vertical accelerations of the spring mass while moving along the rough road. International Roughness Index (IRI) is given in terms of the ISO 8068 standard. Effect of the forward acceleration of FMC on the value of its dynamic axial loads has been modeled as well.

Serial two-axial platform truck MAZ has been used as the research object. Parameters of the model including stiffness of springs and tires of the front and rare axes have been defined with the help of the truck body loading with the reference weighs with the simultaneous measuring of axial loads by means of truck scales and vertical suspension travel and tire deformations.

Mathematical expectations of the axial loading tend to the values measured in statics; and variation range of axial loads depends on the road quality, FMV speed, and ratio of sprung and unsprung weights. In terms of acceleration or deceleration, one can observe dynamic redistribution of the loads between the front and rare axes with the vehicle “rocking”.

Thus, it is required to increase the non-fined thresholds of the exceedances of weight and dimension FMC parameters, measured automatically by means of ASWC. It is proposed to improve the procedures of evaluating the accuracy of automatic stations for measuring large-dimension parameters with the help of the dynamic axial load reference and represent them in the project of state standard at ASWC. Moreover, it is necessary to develop recommendations as for the correct FMC loading for transpiration companies.

Long-terms world practice of weighing the mobile objects (being, in most cases, the motor vehicles and railcars) is generalized in the international recommendations by

the OIML. The objective of such measuring procedures is the freight or commercial weighing aimed at monetary settlements between the suppliers and consumers.

From the metrological viewpoint, an example of animal weighing is rather interesting. Such a process may be called static with certain assumptions. For instance, a cow may be nervous, its motions are expressed in the application of changing vertical forces of impulse nature to the platform of a weighing system. Thus, the weighing process may be also considered as the dynamic one – weighing of an object moving constantly in the space. Difference between the wagon truck scales is in the fact that a cow does not leave the scale platform. That helps carryout multiple measuring, which average value maybe close to the real mass. Everything depends on the time and number of measurements.

In case of platform scale to weigh cattle, that algorithm is proposed in a weighing terminal. It helps reach accuracy characterized by the number of divisions $n = 1000 \dots 2000$. However, it is impossible to weigh a cow, running over the platform, with that accuracy; from the metrological viewpoint, it is similar to the process of automatic FMC weighing. It is most probable that the result will be close to rough accuracy classes stipulated for the automatic scale. Since it is impossible to make the cow run over the scale, one will not be able to accumulate the statistics; and impulse impacts from the hoofs on the loading platform may differ considerably from the static ones.

Such objects as motor vehicles and railcar, being weighted in motion, are quite similar to the cow running across the platform scale. On the one hand, the objects experience constant oscillations, and force of the effect of their wheels on the scale is changing in time and space. On the other hand, we cannot force them going over the scale the required number of times to accumulate the statistics and calculate the average values of axial loads and total mass to get errors close to the errors of statistic weighing. Amplitude, character, and frequency of the FMV vibrations depend on its design and wheel formula, velocity, and the road roughness.

To have the most correct freight weighing in motion and obtain the error, e.g. $\pm 0.5\%$, the approach road of the railway truck scale are made as smooth and horizontal as possible; the rolling stock is tried to be operated without decelerations, jerking, at constant speed etc.

Contrary to the railroads, there is no freight weighing for motor vehicles on motorways. To do that, both shippers and recipients of the goods have freight full-dimensional static motor-truck scales. Vehicle weighing, i.e. measuring of axial loads and total weight of FMV in terms of the traffic path without the traffic slowdown is performed for the freight control. The aim is to prevent the road carpet with the overloaded freight vehicles. The mentioned FMV parameters are measured in motion within the wide range of speeds from 5 to 140 km/h.

To model the effect of the motion modes and FMV parameters on the values of the dynamic axial loads, a dynamic vehicle model has been used, a model with four degrees of freedom – vertical displacement of the center of the sprung mass, without spring mass of the front and rare axes, and turning angle of the vehicle body around the mass center.

Dynamics of the FMV forward motion – acceleration or deceleration – was modeled by adding the external moment affecting the body. The applied model is based on the dynamic model of a motor car. Height of road cutting under the front and rear axes, motion speed, and the moment resulted from the FMC acceleration or deceleration were the initial effects.

Variations of the measured FMV parameters were measured in terms of the following methodology. First, the cutting of a road section was generated with the required IRI (International Roughness Index). Taking into consideration the fact that a plane truck model was used, overall dimension heights might be replaced in first approximation with the variation of vertical coordinate of the sprung mass center.

Since two successive weighing modules, cut into the road carper, measure the dynamic axial loads, DAL of each axis is defined as the semi-total of their values calculated for the road crossings with the distance of 4 m. DAL sampling includes several thousands of implementations.

Coefficient of stiffness of the front and rear springs as well as the tires of MAZ vehicle was defined experimentally by loading the body with 2-tonne weights of M2 class with the simultaneous record of axial loads. It turned out that the spring has practically linear characteristic in the “load-bending” characteristic; however, it has only minimal damping features.

In terms of the computational experiment, the IRI value varied from 0.97 m/km to 2.6 m/km; the FMV speed was constant and equal to 15 m/s (54 km/h). The modeling was performed for two values of total weight 13 t and 19 t.

The obtained results show that the deteriorated quality of the road carpet affects the growing variations of the weight parameters of a vehicle.

The analyzed results show that the error of the ASWC measuring consists of two components: variation of the measuring parameters (e.g. axial load and FMV height) and instrumental error of the measuring devices.

Results of numerous primary and periodic calibration tests of ASWC shows that the errors of measuring results are understood mostly as the error of the measuring devices being within the required range of 11 and 5% for axial loads and total weight respectively.

It shows that the error of the measuring means is much lower not exceeding even the half of the aforementioned values. Thus, to control the ASWC metrological characteristics, it is required to develop and attest the reference of dynamic axial load.

Thus, in case of automatic measuring of the FMV overall dimension, it is required to introduce the “non-fixed thresholds” of the exceeded normative overall dimensions.

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Enhancement of the ultrasonic cleaning process control

The quality and reliability of the products are directly dependent on the degree of purity, so there are many different cleaning methods used in certain industries. This is a combination of various chemical solvents, manual or mechanical cleaning, as well as ultrasonic cleaning, which eliminates the disadvantages inherent in other methods, such as environmental pollution. Ultrasonic cleaning is one of the most effective in terms of quality and cost. Many factors affect the efficiency of the ultrasonic cleaning process. These include washing solution, temperature, no standing waves, power and frequency of ultrasound, size and shape of the tank, type of contamination, location of ultrasonic transducer, etc. Consequently, as many as possible factors must be taken into account when designing a control action. The control action should also be based on the available system status information.

Ultrasonic radiation in a liquid causes a number of physical phenomena: acoustic currents, radiation pressure, cavitation. The last phenomenon influences the course of ultrasonic cleaning the most. Cavitation is explained by the local pressure in the fluid, which falls below the critical pressure, which drives the nano- and micro-bubbles rapidly increasing in size. When the pressure returns to high, a bubble implosion occurs, which generates high-pressure pulses and shock waves. Thus, the effectiveness of ultrasonic cleaning is closely related to the control of cavitation. Numerous studies have been conducted around cavitation as a complex physical phenomenon. This is the search for the optimal concentration of oxygen in the cleaning fluid for maximum efficiency of removal of pollution [1], which revealed the presence of the optimal value of gas saturation for maximum efficiency of pollution removal. This study of the location of the cavitation zones for the use of additional emitters to enhance the implosion of cavitation bubbles in the far cavitation zone [2], has proved the effectiveness of the use of an additional low-amplitude emitter to increase the activity of cavitation in far cavitation zones. Ways to evaluate the level of cavitation are expanding. In [3], a new sensitive method of measuring the level of cavitation influence is presented, which can be applied even in hard-to-reach places. In the study [4], the level of cavitation is investigated by analyzing the spectrum produced by the oscillating wave. Based on this analysis, the following dependencies were identified: cavitation becomes unstable with prolonged insertion, gas content and the addition of a cleanser enhances cavitation, but only to a certain level - with too high values of gas contamination and the content of the cleansing fluid, the cavitation activity begins to decrease. The same thing happens with the increase of temperature and power: the cavitation activity increases to a certain peak value and then begins to decrease. In addition to the influence on cavitation, temperature, time of indentation, gas content are interdependent values.

A simulation of the ultrasonic cleaning process is carried out in order to reveal the dependence of the temperature, pressure and intensity of ultrasound with the prevalence of ultrasonic pressure, and, accordingly, the picture of cavitation [5]. Since there is no mathematical equation describing the process of creating cavitation, the simulation is based on the Helmholtz equation

$$\nabla \left(\frac{1}{\rho} \nabla P(r, t) \right) - \frac{1}{c^2 \rho} \cdot \frac{\partial^2 P(r, t)}{\partial t^2} = 0,$$

where the acoustic pressure $p = p_0 \exp(i\omega t)$, ω is the angular frequency of the wave. The constants c and ρ are the velocity of the wave and the density of water, respectively and the analytical conclusions regarding the appearance of the acoustic pressure field picture. Since, to initiate the cavitation process, the average effective pressure must be reduced to a certain value, and after this pressure point the ultrasonic effect leads to the expansion of the cavitation bubbles and their contraction down to the gap, the cavitation process begins in regions with sufficient negative pressure. It is important to identify the negative pressure zones as well as the magnitude of their pressure, which was done in this study, and it is also found that the pressure scheme is strongly dependent on ω of the wave velocity, and the temperature only shifts the pressure values. In Fig. 1 shows the effect of temperature, oscillation frequency on the pressure field over the entire flow area. As a result of the induced pressure at the tip of the emitter, the pressure fields fluctuate around certain averages in different places. These pressure amplitudes play an important role in determining the active cavitation regions, which are pressure zones below a specific level. specific level. These zones are defined by the black line around these regions (Fig. 1).

Based on these studies, we can observe that there is an uneven distribution of cavitation in the washing tank, which is most dependent on the frequency of the emitters, the distance from the emitter and the number of emitters and their interaction.

Available automated ultrasonic cleaning systems are limited to the controlling of time indicators or indicators of the condition of the washing liquid, which is judged by the conductivity and turbidity. In [6], an ultrasonic cleaning device was developed and implemented, the control of which was based on the information of the cleaning fluid resistance sensors and the optical turbidity sensor, the data interpretation of which was carried out through the amount of light received from the receiver to the transmitter. In the absence of changes in the values obtained from the sensors, the process of ultrasonic cleaning stops for 5 cycles. In the work [7] it is proposed an ultrasonic cleaning system with a frequency range from 30 kHz to 60 kHz, which changes automatically depending on the temperature change of the liquid. The system employs 9 piezoelectric transducers, one of which is located on the bottom of a stainless steel tank and the rest is located on the sides.

Attempts have been made to evaluate the completion of the purification process

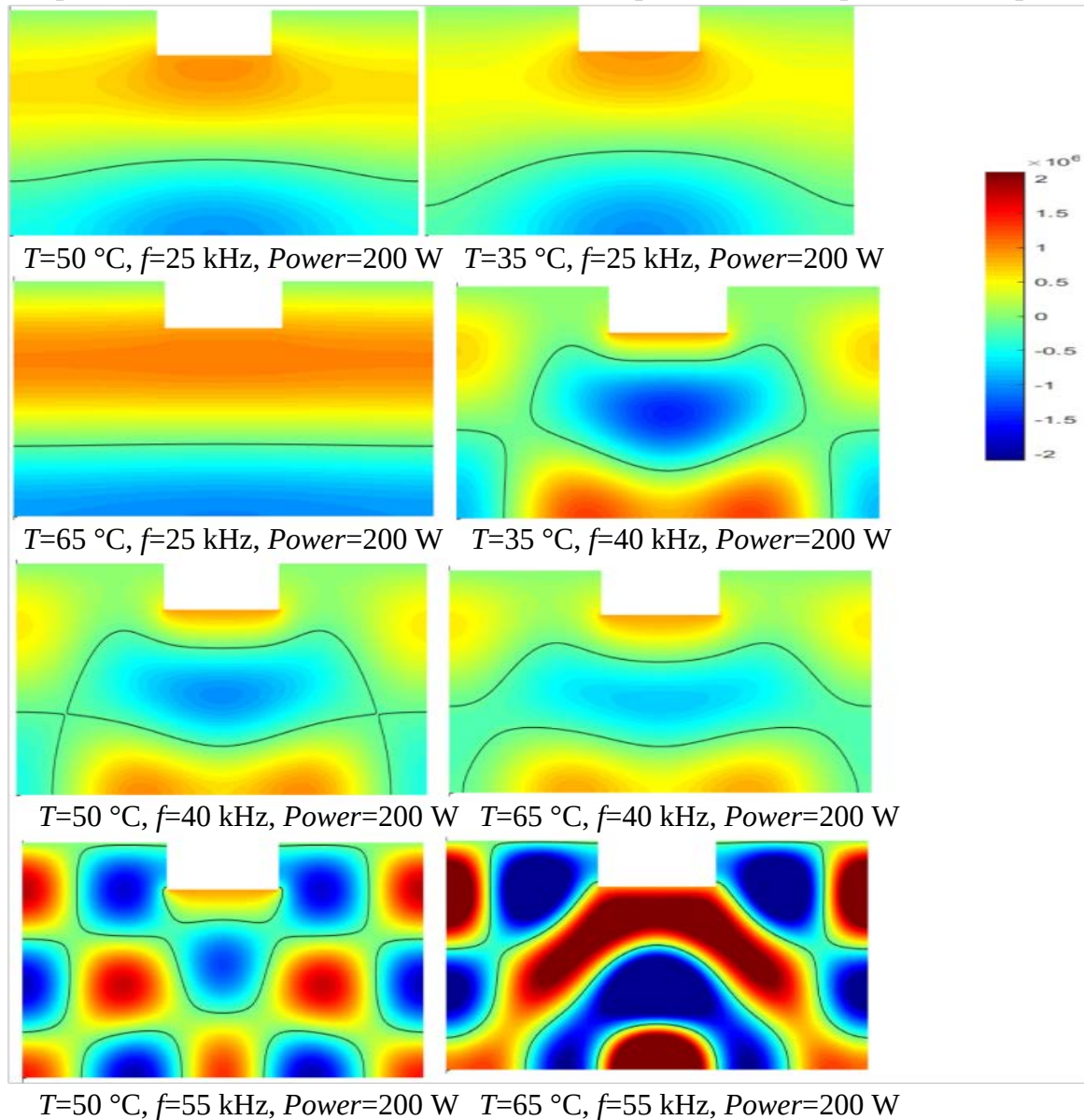


Fig. 1. Pressure field depending on temperature (T), intensity (Power) and frequency (f) of ultrasound

by ultrasonic reflections generated in the middle of a heat exchanger or pipe and the energy efficiency of this process has been confirmed in laboratory conditions. But this method is used for non-invasive cleaning of pipelines with fairly uniform configuration [8].

Thus, the issue of improving the efficiency of ultrasonic cleaning is very urgent, especially given the worldwide tendency to reduce energy use. Consequently, there is a need to develop an automated control system for ultrasonic cleaning, taking into account its spatial distribution in this process. This is the system that would maximize the efficiency of cavitation distribution in the purification tank. The parameter that determines the duration of the process should be the state of the object, that is, its contamination. Contamination should be evaluated on the basis of ultrasound reflection analysis. The control system must control several emitters, which will

affect almost independently the individual sections of the treating facility.

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Autodesk Inventor 3D Max

Methodology: an analysis of main fields of application of 3D modeling, indication of main features of 3Ds Max.

The rapid development of technology in the last decade has led to equally rapid growth in computer hardware and software. Just recently, a minor episode of the film, created with the help of special effects, caused a storm of delight and discussion. Today, special effects in movies and on television do not surprise anyone. They have become commonplace thanks to the mass distribution of computer graphics programs and, in particular, three-dimensional modeling. 3D graphics programs are the most interesting in their capabilities and difficult to master applications.

3Ds Max is one of the leading positions among such programs. Due to its unique capabilities and availability in mastering this program, today it has the largest number of fans, both amateurs and professionals. Perhaps there are very few areas of human activity associated with three-dimensional graphics, which do not use 3Ds Max. It is actively used in gaming and films, architecture and construction, medicine and physics, as well as in many other fields.

Three-dimensional graphics have already entered our lives so firmly that when we come across it, we sometimes do not even notice it. When looking at a room interior on a huge billboard, the amber shine of pouring beer in a commercial, watching as a plane explodes in an action movie, many do not realize that they are not real shootings, but the work result of masters of three-dimensional graphics. The field of application of three-dimensional graphics is extremely wide: from advertising and film industry to interior design and production of computer games.

When you create an advertisement, three-dimensional graphics help present the product promoted in the most favorable light. For example, with its help you can create an illusion of a perfectly white shirt, crystal clear mineral water, deliciously broken chocolate bar, well-foamed detergent, etc. In real life, the advertised object may have some flaws that can be easily hidden by using three-dimensional “twins” in advertising. You’ve probably noticed that dishes shine much more dully after using detergent in advertising, and hair does not look as beautiful after shampooing as on the TV screen. The reason for this is simple: too clean dishes are just a computer-calculated image, such dishes do not really exist.

The usage of computer technology in design and, particularly, in interior design helps see the final result long before it is recreated in reality. Three-dimensional graphics allows creating three-dimensional models of various objects (chairs, sofas, etc.), repeating their geometric shape and imitating the material, from which they are created. To get a complete picture of a certain object, you need to inspect it from all sides, from different points, in different light conditions. Three-dimensional graphics allows creating a demo movie, which captures a virtual walk on the floors of a future

cottage, which is just beginning to be built. As for the film industry, computer graphics are indispensable today there. It is hard to believe that a waterfall scene was created with ordinary salt for one of the first “Star Wars” films. Today you don’t have to order kilograms of salt to create such scenes. You can easily simulate any waterfall with a 3D graphics editor and the viewer cannot distinguish it from a real one [1].

Autodesk 3Ds Max is a truly powerful visualization software that is compatible with many light modeling modules, the materials used and various effects. The application provides flexible control over settings, including exposure, depth of field, and more.

The window Material Editor in 3Ds Max is realized by a nodal principle, i.e. each function is taken out in a separate dialogue window. It is easy and convenient to operate materials due to this.

Let’s start our 3Ds Max overview with a short program description. 3Ds Max is one of the first 3D graphics editors and has a history since 1990. During its existence, the package has managed to change several names. Since 2005, the program is released under the already familiar name Autodesk 3Ds Max. The application is rightly considered one of the most extensive 3D modeling packages, which contains many plugins and add-ons for a wide variety of tasks.

Traditionally, this program has been considered a professional tool for architects and interior designers. The reason for this is convenience in 3D modeling of solid-state objects, great freedom in creating models and quality modules for photorealistic visualization. Nevertheless, the latest versions of Autodesk 3Ds Max allow running a plenty of functions and creating something bigger than architectural models.

Thus, the particle system and animation tools are well implemented in the program. Due to a well-thought-out mechanism for calculating physics, modeling the behavior of hard and soft bodies is not very difficult. Users manage [3D models according to the](#) actual laws of physics, thus achieving incredible realism. And it is impossible not to mention the Hairand Fur module, with which the creation and “styling” of hair and wool is done in two clicks.

Program features

First of all, it is necessary to enumerate the main and most impressive opportunities and features that many people want to explore the package for. Specifically:

3D modeling

The main function of the program is creation and editing of 3D graphics. Other options are designed to complement the created objects and bring them to a realistic appearance. The program is equipped with a huge number of various modifiers, tools for working with models. 3Ds Max offers these types of 3D object design:

- Polygonal modeling. The most widespread type of 3D modeling, found in many 3D graphics packages. It can be used to develop models of various complexity.
- Simulation based on primitives. 3Ds Max contains a built-in library of standard objects, the so-called primitives. In many cases creation of models begins with them, after all various modifiers are applicable to such primitive things.

- It's based on splines. Being also one of the basic methods of modelling, it is concluded in the construction of the product frame of three-dimensional curves (splines). It is used to generate the 3D object itself.

- Based on NURBS curves. NURBS, or heterogeneous rational B-spline, is a special technology for developing 3D models. Ideal for modeling organics and objects with a smooth surface.

- Based on Bezier surfaces. A special way of 3D modeling based on Bezier curves. It is often applied to separate parts of 3D models, for which a network of control points is created. With their help, the surface can be stretched in any direction.

- Texture and UV mapping. Overlaying textures in the latest versions of 3Ds Max is greatly simplified and provides high flexibility.

- Simulation of solid-state objects. Autodesk 3Ds Max is an extremely convenient program for this purpose. The package is equipped with all necessary tools for 3D modeling of Hard Surfaces;

- Booleans. Designed for simple and fast addition/subtraction of one object from another. Very popular option in 3D modeling environment.

- Particle system. Thanks to this system, implemented in a very high quality, it is possible to develop abstract components - smoke, rain drops, fountain splashes, etc.

Of course, these are not all application features, but they may vary depending on the version of the program.

Of course, the overview of 3Ds Max is not complete unless the scope of the program is discussed. A list of areas where the application is most useful is below:

- 3D modeling and visualization of architectural objects;
- Visualization and interior design;
- 3D modeling for computer games;
- Multiprofile design;
- Advertising animation;
- Artistic animation and creation of special effects;
- WEB-design and computer graphics [2].

A versatile program such as 3Ds Max can be used for a variety of purposes and is not limited to the areas listed. However, these are the most common areas, in which an application is not only used most, but also best suited.

From the above it can be concluded that polygonal modeling is necessary only for creative people (artists, designers, sculptors). However, it's not definite. For example, another major field of application of 3D models is **medicine**, namely, surgery. You can grow a prosthesis to replace a shattered bone. Like the lower jaw for a turtle.

At the moment, there are many interesting technologies in medicine, the application of which opens up additional opportunities and helps improve the results of treatment. But the most popular and interesting is the modeling technology, which is the basis for diagnosis in practical medicine, as well as for scientific experimental research. The application of this technology greatly simplifies making the right diagnosis and, importantly, does not require high financial costs.

Graphics allows visual recreation and study human organs without any harm to health. In this way, it is possible not only to examine the simulated organs, but also to perform various manipulations, which leads to early detection of the disease and its timely treatment.

It is possible to note 3D animation separately in medicine. It is actively used in demonstration of unique operations, modeling of processes of treatment of illnesses, creation of virtual video aids. Surgical simulators play an important role here, allowing students of medical specialties mastering and practicing surgery techniques and undergo testing, while practicing surgeons improve their skills and become familiar with new technologies. It is possible to clearly describe the processes taking place inside a person. Thanks to the above properties, 3D animation is often used in student learning. Visualization is used for technical installations, demonstration of devices and all kinds of physiological processes. In this way, students are able to see many processes in dynamics that were previously impossible to access.

Developments in the field of object imaging allow not just a more accurate disease diagnosis, but also improve and simplify the quality of patient care. And due to the fact that many models are publicly available and anyone can see how the body works, there is also an increase in medical literacy.

3D modeling has firmly entered our life, partially or completely reconstructing some kinds of business. There are both own certain standards, and tacit rules in each branch in which 3D modeling has brought the changes. But even within one industry, there are so many software packages that it can be very difficult for a beginner to understand and navigate where to start.

Autodesk, Inc. is a world leader in 3D design, engineering and virtual reality solutions. All Fortune 100 companies use Autodesk tools to design, model and visualize their ideas to save time and money, improve product quality and accelerate innovation. Since the release of AutoCAD in 1982, the company has developed a wide range of innovative programs that allow engineers, architects and designers to test their ideas before they are implemented [3].

In conclusion, we want to say, that 3D has long been a part of our lives and our jobs. It is not necessary to have a powerful device to create or animate something in 3D, so, everybody who wants to start practicing their 3D skills, can do so in an easy way, even if they haven't got a lot of money, there are lots of free software solutions, which can replace paid programs! It helps us sharing ideas in a way that is easier to understand, and, we suppose, this technology will only bloom in the future.

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Correspondence of the experimental spooling hoist parameters to the mining industry trends

Lifts are the main mechanization tools in construction, industry, mining and agriculture. Since lifts are an integral part of the mine process, to improve technology and increase profits, it is necessary to consider and explore different design options and choose the best one.

Until now, hoisting systems with a steel round rope that is wound in one layer onto a long drum with grooves are considered the most widely used. However, the common disadvantages of such a machine are large dimensions, difficulties in assembling and welding large structures, rope abrasion and fast wear of the traction body which leads to risks of accidents, high costs for the manufacture and maintenance of the machine as well as the entire complex.

The major task of young engineers is to keep up with the times and offer modern projects that can optimize the process of work improving both safety and economic performance with a fresh engineering solution.

The aim of this work is to reveal the possibilities of reel hoists and to prove the expediency of their study and application in production based on modern trends in technology development.

The report presents statements of the general principle of operation of a spooling machine, as well as its features related to metal capacity, dimensions and safety. Our research deals with the tachogram of the machine lifting, but for reasons of space, calculations are not given in this paper.

Much work has been carried out on the potential of the experimental spooling machine [1, 2]. The conceptual model of an experimental spooling machine is simple and effective at the same time [2]. The energy is transferred as follows: from the motor, through gear drives of the gear unit to the drum, the flange of which is combined with the output shaft of the gear unit via a key. The drum, rotating, wraps a flat rope, thrown over the deflecting pulley. The free end of the rope clings to the load through a reserve mechanism.

In order to determine the relevance of using a spooling machine, attention should be paid to the main directions of industrial hoist development. At the moment, the current trends are reducing size and metal intensity, as well as increasing safety and automation [3]. Obviously, a reduction in material consumption for manufacturing machines leads to a reduction in the cost of equipment, and as a result, to the possible increase in profits. In addition, the problem with size is up-to-date for mining engineers, as this equipment must be installed high above the ground. Its life cycle should be multiple of the life of the shaft and dimensions should be as small as possible.

The properties of rubber rope are of some interest. A rope consists of steel round woven cables arranged in one or more rows. Ropes are pulling bodies and are bonded with rubber. It is rubber that gives wear and frictional properties to the rope and is also the main binder. Figure 1 shows the ratio of areas of steel to rubber components of the RTK1400 cross-section.

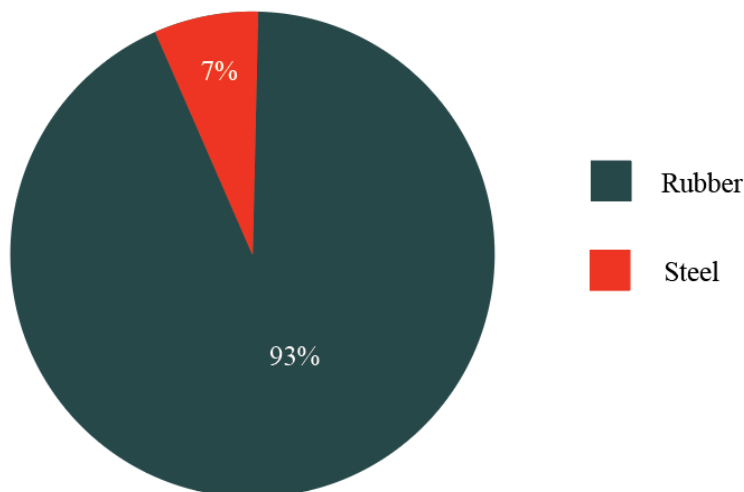


Figure 1 – the ratio of steel areas to RTK1400 rubber components

The sample that we consider is flat and not curled as round ropes, and the bearing ropes are protected against abrasion by rubber, which increases their service life and reduces the risk of injury. In addition, the smaller diameter of the rope with the same bearing capacity allows the use of a smaller diameter drum, which leads to lower installation dimensions. However, special attention should be paid to such problems when calculating the operating modes of installation during the design. The rope drum operates in a mode when the diameter of the rope drum changes depending on the number of rope turns. The torque increases unevenly and engine life reduces. The tachogram in Figure 1 shows the temporal dependence of such parameters as linear and angular speed, acceleration and travel. The angular dependencies are in the form of trapezoid similar to that of other elevators. However, significant changes are visible in the linear parameter plots. Lift and travel speeds increase; jumps indicate the beginning of a new coil of the belt. The winding body deforms during the process.

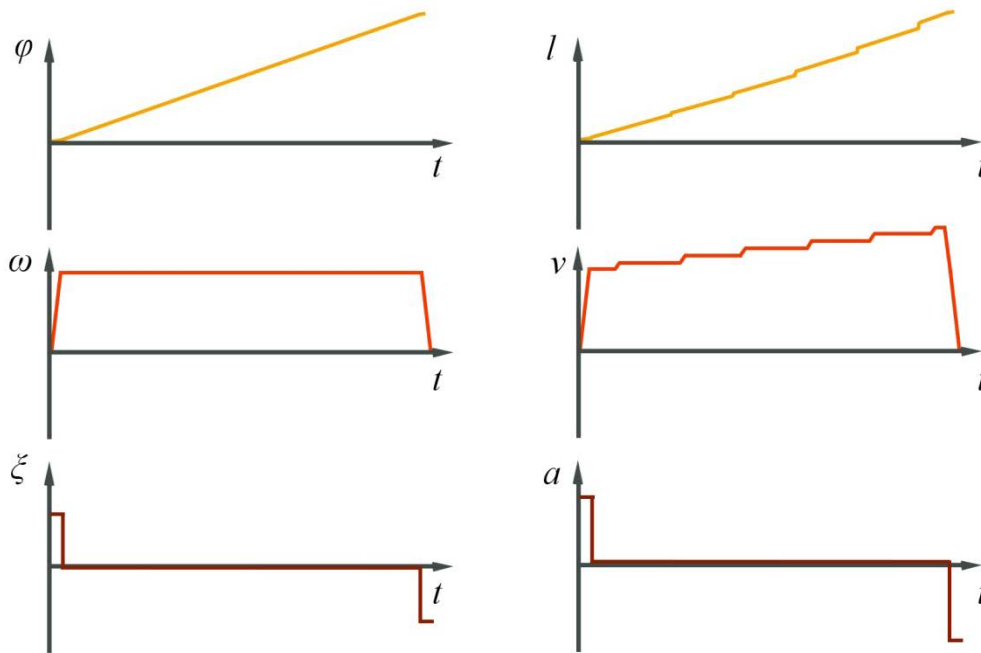


Figure 2 – the tachogram of the machine

Another proof of the relevance of the spool lift is the placement of the winding brake inside the rope drum. This solution reduces the size of the machine. However, this statement is also true for other types of hoisting machines and winches. The use of this method in a smaller drum reduces the contact area between drum and linings, which significantly reduces braking efficiency and has negative consequences. In order for the machine to work efficiently, it is necessary to study modern and reliable brake designs and choose the optimal one.

Researchers have revealed that a smaller drum lining will be lighter, but just as efficient. Linings on other machines can also be made from modern materials that are less dense but more resistant to wear. This will reduce the weight of the machine, but the diameter will be much larger.

One of the most important developments in technology is to improve safety. As with any machine, when working with a reel hoist machine, it is necessary to observe safety rules when operating.

It should be noted that by carrying out safety procedures at work, as well as by observing the inspection and maintenance schedule, accidents can be prevented. The rubber surface of the belt protects the steel wire rope against corrosion and drying out, as well as isolating the strands, preventing overlapping of the coils. As a result, the rope will last longer and there is less chance of injury when in contact with the rope. The installation itself is considerably lighter, which also has a positive effect on safety.

To sum up, in some cases it is more advantageous to use a drum hoist with a rubber rope in mines with shallow mining depths. However, there are problems that need to be studied more closely, such as unstable loads and brakes.

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Types of Semiconductors, their Properties and Application

Semiconductors as a special class of substances have been known since the end of the 19th century, only the development of the theory of solids made it possible to understand their peculiarity. Silicon (Si) is one of the most famous semiconductors. But besides him, there are many others. There are also such natural semiconductor materials as zinc blende (ZnS), cuprite (Cu₂O), galena (PbS) and many others. The semiconductor family is one of the most versatile classes of materials [1].

Characteristics of semiconductors.

Semiconductors are substances with electronic conductivity that occupies an intermediate position between metals and insulators. They differ from metals that the carriers of electric current in them are created by thermal motion, light, electron flow, etc. source of energy. Without thermal motion (near absolute zero), semiconductors are insulators. The conductivity of semiconductors also changes with the introduction of a small amount of impurity.

Among chemical compounds, semiconductors are also found, for example, such elements as silicon, selenium, gallium arsenide. Organic compounds can be semiconductors too (polyacetylene). Some semiconductors exhibit magnetic or ferroelectric properties. Others upon doping become superconductors. Many of the recently discovered high-temperature superconductors have non-metallic semiconducting phases. For example, La₂CuO₄ is a semiconductor, but when an alloy with Sr is formed, it becomes a superconductor.

The semiconductor band gap is from 0 to 3 eV. Metals and semimetals are materials with a zero-energy gap, and substances in which it exceeds 3 eV are called insulators. There are exceptions. For example, the band gap of a semiconductor diamond has a width of 6 eV.

Types of semiconductors, energy gap.

In the crystal lattice, the valence orbitals of atoms are divided into 2 groups according to energy levels - the free zone, which is at the highest level, which determines the electrical conductivity, and the valence zone, which is lower. These levels, depending on the symmetry of the crystal lattice, can intersect or be located at a distance from each other. When there is a distance between the zones, an energy gap appears or, in other words, a band gap.

The location and filling of the levels determines the conductive properties of the substance. On this basis, substances are divided into conductors, insulators and semiconductors. The semiconductor band gap varies between 0.01–3 eV, and the dielectric energy gap exceeds 3 eV. Metals do not have energy breaks due to overlapping levels.

Semiconductors and dielectrics have a valence band filled with electrons, and the nearest free zone, or conduction band, is fenced off from the valence by the energy gap - a region of the electrons band energy gap.

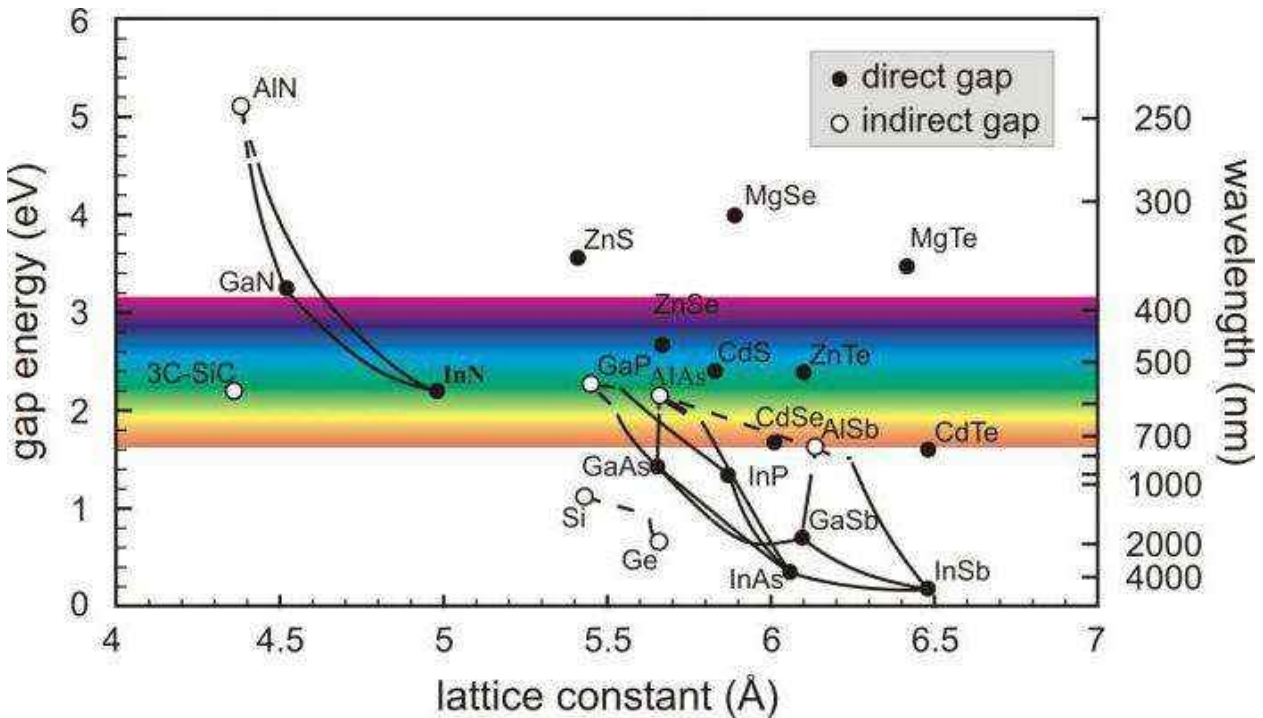


Figure 1. Band energy gap.

In dielectrics, there is insufficient thermal energy or an insignificant electric field for a jump through this gap; electrons do not enter the conduction band. They cannot move along the crystal lattice and be carriers of electric current [2].

To excite electrical conductivity, at the valence level the electron should be given the energy that would be enough to bridge the energy gap. Only when the amount of energy absorbed is no less than the magnitude of the energy gap, an electron can get from the valence level to the conductivity level.

If the width of the energy gap becomes greater than 4 eV, it is practically impossible to excite the semiconductor's conductivity when irradiated or heated — the energy of electron excitation at the melting temperature is insufficient to jump through the energy gap. When the crystal is heated, it will melt until electronic conductivity occurs. These substances include quartz ($dE = 5.2$ eV), diamond ($dE = 5.1$ eV), many salts.

Impurities and intrinsic conductivity of semiconductors.

Pure semiconductor crystals have intrinsic conductivity. Semiconductors of this type are called proprietary. An intrinsic semiconductor contains the same number of holes and free electrons. When heated, the intrinsic conductivity of semiconductors increases. When the temperature is constant, a state of dynamic equilibrium arises of the number of generated electron-hole pairs and the number of recombining electrons and holes that remain constant [3].

The presence of impurities has a significant effect on the electrical conductivity of semiconductors. Adding them allows you to significantly increase the number of free electrons with a small number of holes and increase the number of holes with a small number of electrons at the conductivity level.

Impurity semiconductors are conductors that have impurity conductivity. The impurities that give up the electrons are called donor. Donor impurities can be chemical elements with atoms, the valence levels of which contain a greater number of electrons than the atoms of the basic substance. For example, phosphorus is a donor impurity of silicon. An insignificant addition of a donor impurity increases the number of conduction electrons by several orders of magnitude in comparison with the number of free electrons in an intrinsic semiconductor. The main carriers of atomic charges of impurity semiconductors are electrons. These substances are classified as n-type semiconductors. The impurities that bind the electrons of the semiconductor, increasing the number of holes in it, are called acceptor ones. Acceptor impurities are chemical elements with fewer electrons at the valence level than that of the base semiconductor. For example, boron, gallium, indium are acceptor impurities for silicon.

Single element semiconductors.

The most common semiconductor is silicon. Together with germanium, it became the prototype of a wide class of semiconductors with similar crystal structures. The structure of Si and Ge crystals is the same as that of diamond and α -tin. In it, each atom is surrounded by 4 nearest atoms that form a tetrahedron. This coordination was called fourfold. Tetradically coupled crystals have become the base crystals for the electronics industry and play an important role in modern technology [3]. Semiconductors of groups 2-6 with a large energy gap are used in the manufacture of lasers and displays. Binary compounds of 2-6 groups with a narrowed energy gap are suitable for infrared receivers. The strong magneto-optical effects of magnetic semiconductors make it possible to use them for optical modulation. Perovskites, such as $\text{Mn}_{0.7}\text{Ca}_{0.3}\text{O}_3$, surpass the metal-semiconductor transition in their properties, the direct dependence of which on the magnetic field results in the phenomenon of giant magneto-resistance. They are used in radio engineering, optical devices that are controlled by a magnetic field, in waveguides of microwave devices.

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Constructing and researching a simulation model of heating and air conditioning system for residential building

Nowadays, one of the most pressing problems in the world is the shortage of energy resources. This is due to the increasing consumption of all types of energy, both in the industrial sector of the economy and in the equally popular service sector for modern consumers.

In the energy sector of Ukraine, and not least in the utilities sector, there is an urgent problem arisen in saving energy resources [1]. For many years there has been a problem of centralized hot water supply, which has long been disconnected in most of the country. In most cases, the population uses electric boilers for hot water supply, which is very expensive and has a clear tendency to constantly increase in price. The same can be said for gas boilers and, accordingly, gas cost.

This paper objective is to construct a mathematical and simulation model of the heating and air conditioning system for a residential building to assess energy and financial costs while operating a building in various conditions.

Today, computer mathematics is well known and is at a stage of rapid development. Starting with the use of programmable microcalculators and calculations on personal computers, it has generated a number of its special software tools – computer mathematics systems (SCM) and their extension packages.

Among SCM, primarily oriented on numerical calculations, the matrix mathematical system MATLAB is one of the most effective among the systems of simulation and numerical calculations. The system has actually become the world standard in the field of modern mathematical and scientific and technical software [2].

Mathematical models are formalized descriptions of an object or system using some abstract language, such as a set of mathematical relations or an algorithm schema. If a mathematical model is used to simulate the real object behavior in time, it is called a simulation model. Simulation modeling is the main one for the Simulink expansion package of the MATLAB system.

This paper presents the results of an analysis of the simulation model developed by the authors, taking into account the building configuration and the climatic area mode of building location.

The model sets the thermal and physical characteristics of the building, taking into account such important parameters as thermal conductivity and thickness of the layers of building envelopes, the area and type of glazing, the level of household heat, etc. The model also describes the temperature mode of the external environment

based on statistical data for the selected climate zone. It is characterized by an average monthly temperature accounting daily temperature fluctuations.

The values of the supported room temperatures in heating mode and air conditioning mode have been set. This eliminates the possibility of simultaneous activation of heating and air conditioning systems.

The model of air electric heating has been used for heating, and the standard air conditioner of on/off type has been selected for air conditioning.

The simulation has been carried out for a period of one year (8760 hours) and allowed to estimate the energy consumption for heating, and separately for air conditioning. In addition, the simulation model recalculates the monetary value of this energy at the current tariff. All this allows to evaluate the effectiveness of such measures as: external building insulation, double-glazed windows replacement, changing the temperature regime inside the room, changing the thermostat deviation. The final result for a household consumer is the amount of money that will be spent on heating, and separately the amount for air conditioning.

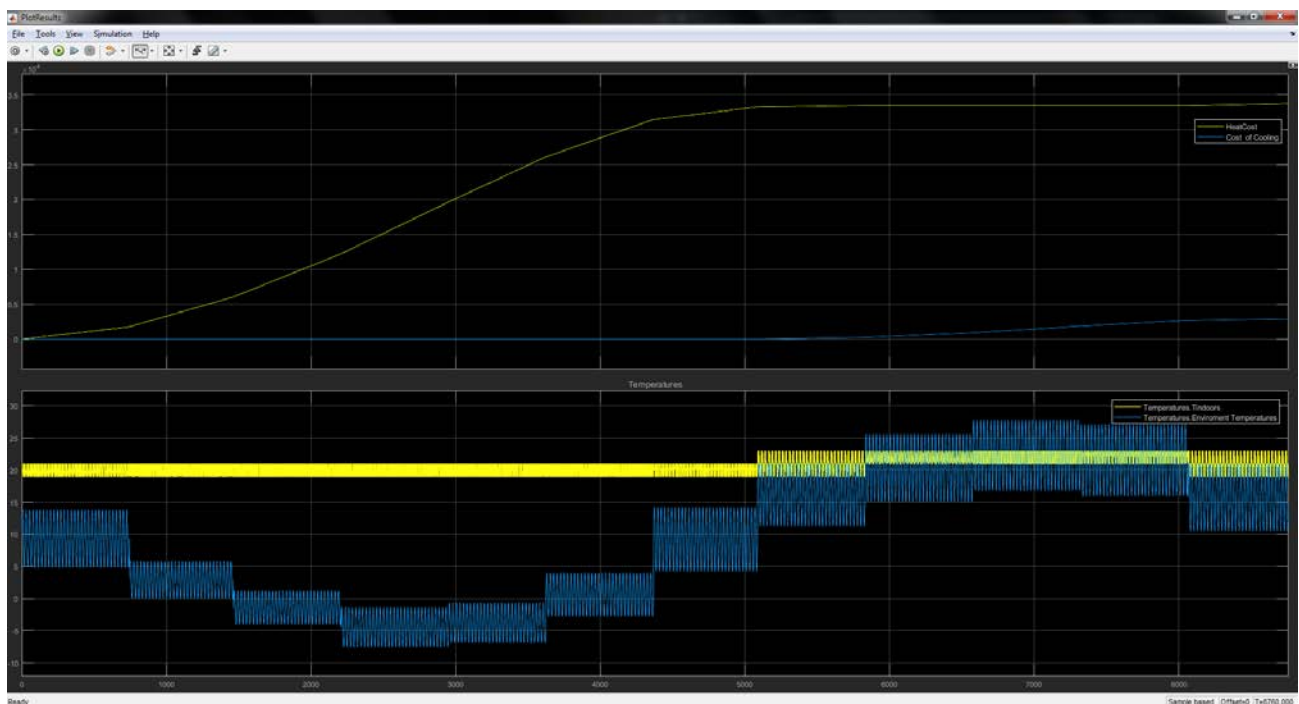


Figure 1 - Change in time of energy consumed for heating and air conditioning (upper graph), change in time of temperatures inside and outside the building (lower graph)

Figure 1 shows a screenshot of the simulation results for a two-story building in the climatic conditions of Dnipro city. The model makes it possible to increase the sections of the graph that we are interested in to track ongoing processes at any given time. Figure 2 shows a screenshot for an enlarged time period, at April and May junction.

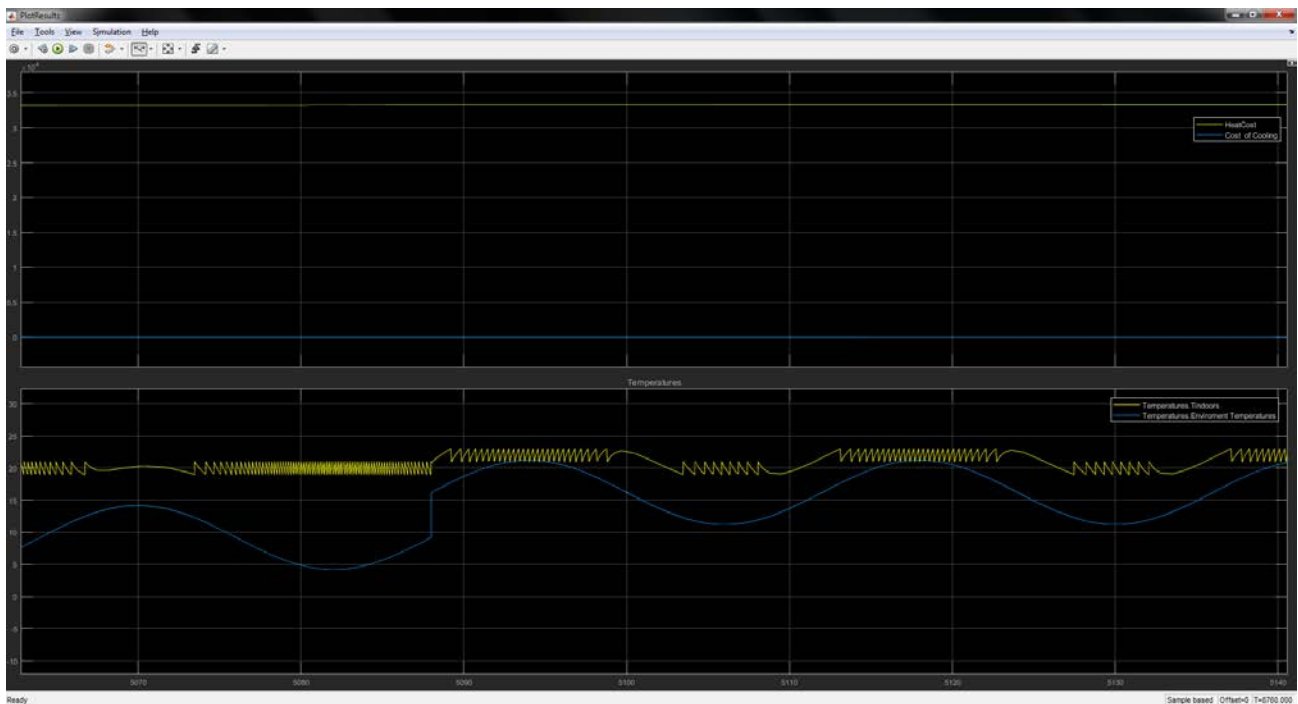


Figure 2 - An enlarged graph of changes in time of energy consumed for heating and air conditioning (upper graph), and changes in time of temperatures inside and outside the building (lower graph) at April-May junction

Figure 2 clearly shows the operating mode of the heating system at night, and the air conditioning system during daytime peak temperatures. Here you can visually see the set temperature for heating: 20°C , and air conditioning temperature 22°C , as well as thermostat deflection mode $\pm 1^{\circ}\text{C}$.

The developed model allows not only to study the operating modes of the heating and air conditioning system, but also makes it possible to compare the types of heating and air conditioning systems, i.e. heat pump heating, gas heating, inverter control of heat pumps, combined heating and air conditioning [3] and so on. Thus, the model makes it possible to compare the effectiveness of the listed systems for the same building, replacing the corresponding blocks of heating and air conditioning systems. In addition, this model opens up opportunities for the construction and study of an automatic control system for the applied thermal units.

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Analysis of the Efficiency of Wastewater Treatment from Phenols, a Case Study of EVRAZ - DMZ

Coal coke is used for smelting cast iron (blast furnace coke) as a high-quality smokeless fuel, an iron ore reducing agent, and a baking powder for batch materials.

Coal coke is used in the same way as cupola fuel in foundry (foundry coke), for domestic purposes (household coke), in the chemical and ferroalloy industries (special types of coke).

Coking is decomposition of solid and liquid fossil fuels at high temperature without access of air with the formation of volatile substances and a solid residue - coke. Raw materials for coking is mainly coal. Coal coking is its processing at 900-1100 ° C in order to obtain coal coke, coke oven gas, tar and other products.

When coking is complete, the doors of the chamber are opened with the help of special mechanisms and the red-hot “cake” is fed by the coke ejector into the car which moves behind the rails along of a coke oven battery.

Coke is extinguished in this car in a wet way - it is abundantly irrigated with water for about 2 minutes. Wet quenching of coke has a number of major drawbacks, among which: huge harmful emissions, reduction of strength due to sudden cooling, complete loss of heat of hot coke. Chilled coke is discharged in a uniform layer onto an inclined coke bed [1].

In a coke plant, wastewater is generated from chemical workshops (phenolic wastewater) and from the coke quenching process. The main amount of wastewater is formed due to the moisture of coking coal. The quantity and composition of wastewater depend on the quality of coking coal, the technological parameters of the coking process, the design of coke ovens and therefore are different for different coke plants.

The discharge of phenolic waters into water bodies and streams sharply worsens their general sanitary condition, affecting living organisms not only by their toxicity, but also by a significant change in the regime of nutrients and dissolved gases (oxygen, carbon dioxide).

The process of self-cleaning of water from phenol is relatively slow and its tracks can be carried by the river for long distances, so before discharge, phenol-containing effluents must be sufficiently purified.

Phenolic compounds are usually divided into two groups:

- Volatile steam phenols (phenol, cresols, xylenols, guaiacol, thymol)
- Non-volatile phenols (resorcinol, pyrocatechol, hydroquinone, pyrogallol and other polyhydric phenols) [2].

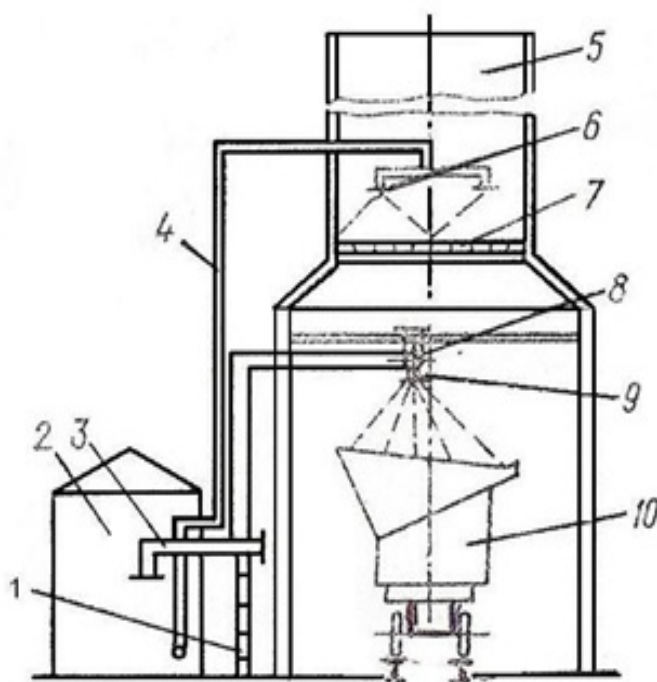


Figure 1. Scheme of installation for wet coke quenching, where 1. column with support under the pipeline; 2. pump extinguishing tower, 3. pipeline for supplying water for extinguishing, 4. pipeline for supplying water for washing nozzles of droplets from coke dust; 5. extinguishing reinforced concrete tower; 6. nozzles for washing nozzles of drop eliminators; 7. wooden nozzle of drop eliminators; 8. collector irrigation device; 9. nozzle of an irrigation device; 10. extinguishing car.

The biochemical installation is used for local treatment of phenolic wastewater of coke production from resins, oils, phenols, and thiocyanates. The biochemical installation includes a complex of mechanical and biological treatment facilities with a capacity of 65-85 m³ / hour. The complex of mechanical cleaning facilities includes: primary resin-sludge traps, flotators, tar and oil collectors;

Biological treatment: aerators, heat exchanger, aeration tanks, secondary sump, collections of treated water, activated sludge regenerator and nurseries.

In this work, the conditions of discharge of phenolic effluents into the reservoir were calculated.

Based on the calculation results, a table was made on the forecast of the sanitary state of the reservoir after the discharge of wastewater, comparing the concentration of the substance before the point of water use (Sp.p.v), and its maximum permissible concentration (MPC) (Table 1).

№	Substance	Sp.p.v, mg / l	MPC, mg / l
1	Phenol	71,15	0,001
2	Rhodanides	2,37	0,1
3	Cyanides	0,949	0,035
4	Ammonia total	83,01	2
5	Pitches	4,15	0,1

Table 1 - Analysis of the ratio of Sp.p.v. and MPC

Sp.p.v. significantly exceeds the MPC for all harmful substances. The status of the reservoir is unfavorable. Water must be thoroughly cleaned before discharging.

The most effective ways of purifying coke-oven sewage from contamination is to settle and treat the drainage of sedimentation tanks into oil separators by flotation.

The decisive factor in the stable operation of the oil separators of biochemical plants in which flotation is purified is the absence of sharp fluctuations in wastewater pollutants at the outlet of the oil separator. At present oil separators of biochemical installations of almost all coke-chemical plants of Ukraine are equipped with centrifugal aerators AM-350, which are morally outdated and do not meet the modern requirements for productivity.

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Design and development of software for industrial controllers based on state graphs

Introduction. In modern industry, systems of automatic control of technological processes and objects are widely used. They are used to ensure improved product quality, reduced resource losses, fulfilled labor protection requirements in hazardous areas, due to the removal of people. To date, these systems use electronic computing devices called industrial controllers. Industrial controllers include programmable logic controllers, decentralized control systems, and industrial computers. The main problem in the use of industrial controllers is the lack of basic and reliable principles for the design and development of software for control systems. This is due to the fact that controller manufacturers offer courses and supporting materials that describe the implementation of typical operations of all difficulty levels, but these solutions lack a systematic approach [1]. Each of these solutions is individual and requires substantial improvement. Thus, in the process of training, automation engineers study the development environment, features of programming languages and library functionality. However, the issues of presentation of control algorithms and the transition from them to software remain unexamined. In this regard, there is a gap between a clear and decentralized approach to the design and selection of hardware for control systems based on industrial controllers and the lack thereof for the design and development of their software. From this arises the task of creating a formal approach to the design and development of software for industrial controllers.

Materials and methods. Based on the goals and objectives of the study, the main materials are literature sources, technical requirements for control systems, technical specifications for control systems software, design documentation for control systems. The main research methods are analysis, decomposition, methods of the theory of digital machine, methods of the theory graph.

Results. A formal approach to designing software for control systems based on industrial controllers is proposed, which includes three stages: developing a verbal description of the control algorithm, moving from a verbal description to a state graph, developing software based on a state graph. A formal method of transition from a state graph to software in the Ladder Diagram language has been developed, which allows you to implement most of the typical tasks.

Discussion. The main requirements for a balanced device are: the possibility of functioning at any time during the day; the possibility of functioning for short periods of time; non-criticality to the number of switching on and off at which time intervals; lack of communication between the efficiency and continuity of the work object; the possibility to regulate power in a wide range, obtaining economic profit from the work of the object [2].

An analysis of existing materials showed that in the early stages of the development of automation of technological processes, systems were separately assigned tasks of discrete and continuous control. Discrete control problems were solved using the theory of digital machine based on relay contact logic. The development of semiconductor technology has allowed the transition to the implementation of machines using digital electronics, which has significantly increased the reliability of the systems due to the removal of mechanical contacts. With the whole process of modernization of essential systems, only parts of the hardware were cluttered, the logical structure was completely irreplaceable. The beginning of the use of electronic computers in the industry led to the transition from the hardware implementation of digital machines to software. To simplify this process, the Ladder Diagram programming language was developed, which allows you to get graphical software by simply repeating the relay contact circuits. Further development of electronic computers led to the appearance of programmable logic controllers, and later industrial controllers. However, this did not lead to the development of design and development of software for control systems based on the existing theory of machine. Today, this approach is used mainly in the development of control systems based on microcontroller technology using the C programming language, a very limited circle of specialists.

Based on the analysis of previously used approaches to the design of control systems and existing development tools, a formal approach is proposed that includes the following steps:

- writing a verbal description of the functioning algorithm of the technological process or control object;
- software design, including compiling tables of inputs, outputs and controlled parameters, highlighting the states of the control system and developing a state graph based on the Miles finite state machine [3];
- software development in IEC 61131-3 Ladder Diagram language.

The use of the programming language Ladder Diagram is due to the fact that it provides ease of perception of the logic of the functioning of the control system, ease of development and configuration of software, speed of search for impaired functioning of sensors and actuators. Ease of perception by specialists in engineering specialties, but not specialists in programming.

Based on the proposed approach, a formal method for the transition from state graphs to software in the Ladder Diagram programming language has been developed.

In the framework of this approach, the state of the control system is stored in a binary array (Fig. 1). The initial state is set in circuit 1 when no initial state is selected. Each arc of actions performed during the transition to a new state corresponds to three consecutive circuits. The first circuit 2 is responsible for determining the transition to a new state. The transition is performed in accordance with the current state and the conditions for the transition to a new state. The second circuit 3 is responsible for performing actions corresponding to the transition arc. The third circuit 4 is responsible for resetting the current state, which corresponds to the

completion of the transition arc. Each state of the control system can correspond to several arcs of steady states each arc corresponds to a separate circuit 5.

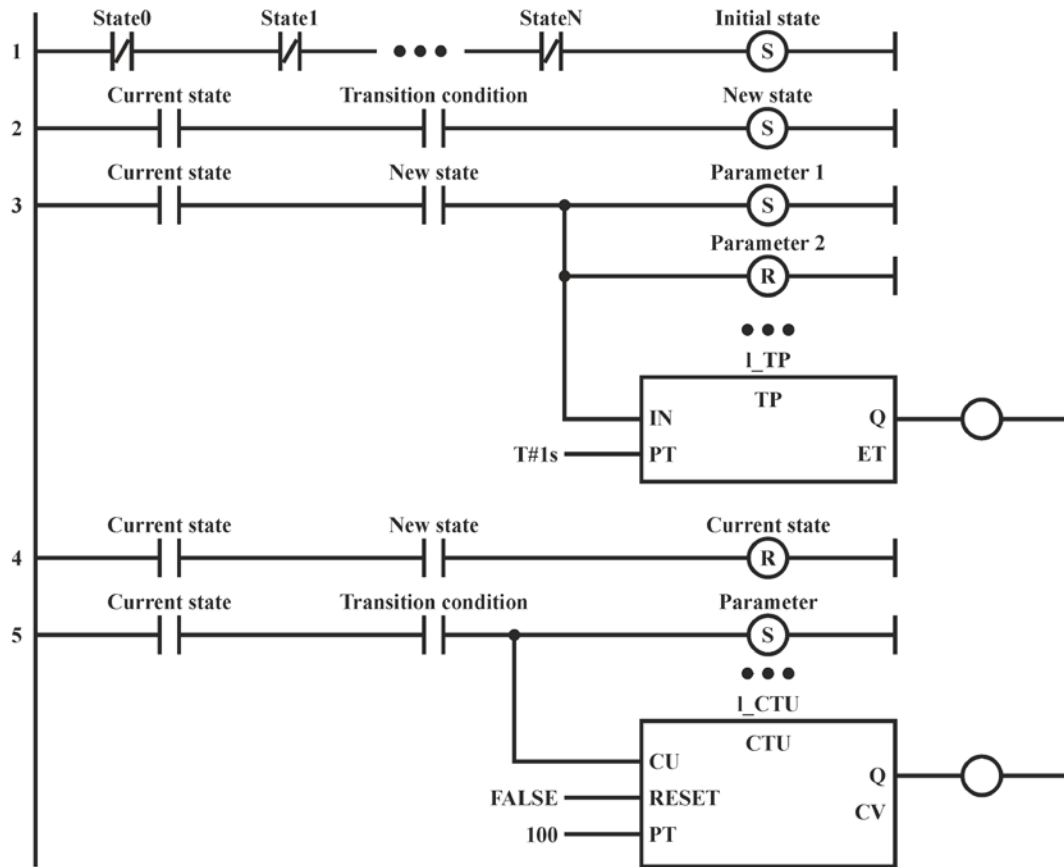


Fig. 1. Implementation of the basic elements of a state graph in a programming language Ladder Diagram

By conditions and actions we mean broader concepts than those used in the theory of digital machine. This is because the software implementation is not limited to logical operations. Conditions include checking bit values, calculating logical and mathematical expressions, comparison operations, and other types of operations that result in a logical result. In turn, actions include changing bit values for starting/stopping timers, increasing and decreasing counter values, calculating control actions, changing controller settings, and other types of operations.

Conclusions.

1. A formal approach to the design of control system software based on industrial controllers is proposed. The approach includes three stages: designing a verbal description of the control algorithm, designing a state graph and developing software in the Ladder Diagram programming language.

2. To develop control system software, a formal transition from the state graph to structures in the Ladder Diagram language is proposed. The approach involves the implementation of initialization of the state graph, arcs of transitions between states and arcs of a steady state.

3. Further development of the work involves the study of complex issues of design and software development with the goal of formalizing them. These include the initialization of the control system after a warm restart, the implementation of the hierarchical structure of the software, and others.

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The efficiency of gas engine waste heat recovery into cold using absorption refrigeration machines

Currently, gas engine JMS-620 from GE Jenbacher is used in Ukrainian mines. The plant produces 3035 kW of electric energy and 2920 kW of thermal energy in the form of hot water from the engine cooling system. The temperature of the water as a result of heat loss varies from 110 to 70 °C. As a consumer of heat, we consider a single-stage absorption lithium bromide chiller (LBAC), the circuit of which is shown in Figure 1 .

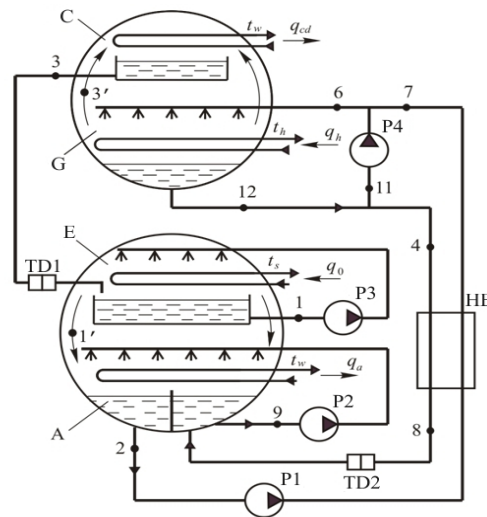


Fig. 1. Schematic diagram of LBAC, where A – absorber, E – evaporator, G – generator, C – condenser, HE – heat exchanger of solutions, P1, P2, P3, P4 – pumps, TD1 and TD2 – throttling devices; t_s , t_h , t_w , – temperature of the coolant, heating and cooling media, °C; q_0 , q_{cd} , q_a , q_h – specific refrigerating capacity and thermal loads of the condenser, absorber, generator, kJ/kg.

The digits indicate the numbers of the characteristic points of the flows of the working media.

The refrigerant is water vapor, and the absorbent is an aqueous solution of lithium bromide LiBr.

In the evaporator E, the liquid refrigerant due to the heat q_0 supplied from an external source (coolant of the air conditioning unit) is converted into steam, which enters the absorber A and is absorbed by the aqueous LiBr solution. The absorption heat q_a is removed by cooling water. A weak solution (with a low LiBr content) by

the P1 pump is fed to the generator G through the heat exchanger HE of the solutions. In the heat exchanger HE, it is heated by the heat received from the strong (with a high concentration of LiBr) solution coming from the generator G. In the generator G, due to the heat q_h obtained from the heating medium (hot water of the GE cooling system), the refrigerant is evaporated from the solution and sent to the condenser C. Since the boiling points of water and lithium bromide are very different, almost pure water vapor is evaporated in the generator G. In the condenser C, the refrigerant vapor gives off heat q_{cd} to the cooling water and condenses. Condensate is discharged through the throttling device TD1 into the evaporator E. A strong LiBr solution, passing through the heat exchanger HE of the solutions, is discharged into the absorber A through the throttling device TD2.

The absorber A and evaporator E are located in the lower drum, and the generator G and condenser C are in the upper drum. Absorber A and generator G are film type apparatuses. The use of such devices makes it possible to reduce the thermodynamic losses from incomplete evaporation of a solution during steam generation and incomplete saturation during absorption compared to flooded devices. To intensify heat and mass transfer processes, the scheme provides for the recirculation of solutions and refrigerant using pumps P2, P3 and P4.

Based on mathematical modeling of the thermal modes of a single-stage LBAC with a film generator, absorber and recirculation of the LiBr solution, the dependences of the coefficient of performance and the solution degassing zones on the temperatures of the heating and cooled media have been established. A scheme of the system of two LBACs operating under different temperature modes has been proposed, which allows to completely utilize the secondary heat of the JMS-620 gas-piston units, reducing the heat potential from 110 to 70 °C, and providing the necessary cooling medium for cooling unit from 17 to 7 °C. The coefficient of performance of the system is 0.733. The results of the study indicate the promise of practical implementation of the proposed technical solution.

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The Design of Induction Motors. Insulation. Wiring Diagrams

An induction motor is an AC motor that rotates due to the interaction of the alternating magnetic field of the stator and rotor. It got its name due to the fact that it never reaches the synchronous speed (3000 rpm for a 2-pole, 1500 rpm for a 4-pole 50 Hz network) of a rotating magnetic field, but as if catches up with it.

Depending on the method of performing the rotor winding of an induction motor, the latter are divided into two large groups: motors with a short-circuited winding on the rotor and motors with a phase winding on the rotor or motors with slip rings. Squirrel-cage motors on the rotor are cheaper to manufacture, reliable in operation, have a rigid mechanical characteristic, i.e., when the load changes from zero to the nominal speed, the machine rotates only 2-5% [1].

The induction electric motor has a stator - a fixed part, on which there is a winding that creates a rotating magnetic field, and a movable part - a rotor, in which an electromagnetic moment is created, which drives the rotor itself and the actuator. Cores for the stator and rotor are drawn from insulated sheets of electrical steel.

As the insulation of the stator sheets, varnish film is used, of the rotor - scale which is formed during the rolling process. In the sheets of the stator and rotor there are grooves in which the windings of both the stator and the rotor are placed. The short-circuited rotor winding is cast from aluminum alloy. In the process of casting, winding rods are formed, located in the grooves and shorting their rings, located outside the rotor core. In the rings there can be ventilation blades which serve to improve ventilation of the engine and heat removal from the rotor winding. There is no insulation on the rotor winding; this ensures good heat dissipation from the winding to the core [2].

As a rule, the winding of a two-cell engine is made of non-ferrous metals based on copper. The outer winding is made of brass or special bronze, which results in a large active resistance. This winding serves as a starter in an induction motor. The second winding of the rotor (internal) is made of copper with minimal active resistance. It performs the function of the main working winding of the motor. Of copper perform short-circuit end rings.

Induction motors with a phase rotor have half-closed grooves on the rotor, in which a three-phase winding with the same number of poles as the stator winding is laid. Before this, the insulated rods of this winding are wound from the end of the rotor. The phases of the rotor winding are usually connected to a star and lead to three contact rings located on the motor shaft and isolated from each other. Using contact rings, additional resistances can be connected to the winding circuit of the phase rotor and the brushes in contact with it. This is used to change the operating or starting

characteristics of the engines, if necessary. With the help of slip rings and brushes, the rotor winding can be short-circuited.

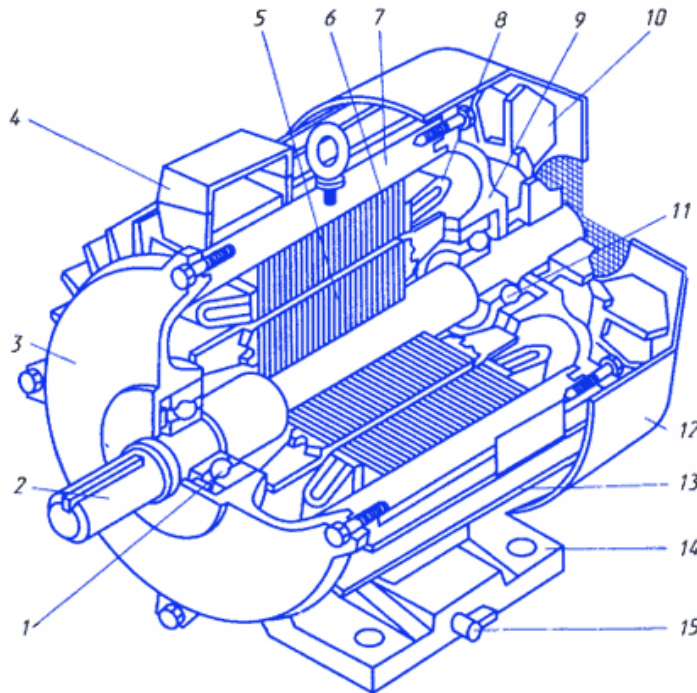


Figure 1. General view of an induction motor: bearings - 1 and 11, shaft - 2, bearing shields - 3 and 9, rotor - 5, stator - 6, fan - 10, hood - 12, ribs - 13, legs – 14 [1]

To reduce the wear of the brushes, special brush-lifting devices are sometimes used. Using these devices, at the end of engine start, the contact rings are short-circuited, and the brushes are lifted and do not participate in the work. There is an air gap between the rotor and the stator. The minimum air gap reduces the engine idle current and increases the power factor. For example, with a small air gap, the additional losses in the surface layer of the stator and rotor increase. With increasing losses, efficiency decreases. Because of this, the air gap in modern engines is chosen a little more than is required for mechanical reasons.

Winding Connection Diagrams. In induction motors (three-phase), there are two ways to connect the winding phases to each other: a star and a triangle. When connecting inside the machine - a fixed coupling and outside the engine - interchangeable jumpers on a special shield mounted on the machine body is generally used [2].

Supply voltage. Induction motors are usually available for operation on two voltages, as an example 127/220, 220/380 and 380/660 V. With the lower of each two voltages, the phases of the motor are connected in a triangle, and with a larger voltage - in a star. Some electric motors are produced at the same voltage, then the phases are connected to a star.

Electrotechnical Materials. For stator and rotor magnetic circuits of induction motors, cold-rolled low-alloyed electrical steels are used. For engines of the 4A series with a power of up to 15-20 kW, cold-rolled steel of grade 2013 (unalloyed) is used, and for machines of higher power - steel of grade 2212 (light alloy).

For insulation of current-carrying wires, insulating materials are used, located in one groove - coil insulation, interphase insulation - arrangement of wires of different phases between each other, housing insulation - the location of wires from grounded cores. The thickness of the insulation is determined by the operating voltage of the engine, the heat resistance class of the insulation, and the operating conditions of the engine. Depending on the temperature, insulating materials are divided into heat resistance classes. In turn, the heat resistance class of insulation and impregnating compounds determines the permissible temperature rises for other parts of the engine in accordance with GOST 183-74.

In accordance with GOST 8865-70, insulation materials are divided into such heat resistance classes as U, A, E, B, F, H, C. For insulation of general-purpose induction motors - E, B, F, H with permissible temperatures of the insulating material 120, 130, 155, 180 ° C. On wires with fiber insulation, the thickness of the insulating layer is 1.5-3 times higher than on wires with enamel insulation (enamel insulation, conducts heat better and is better in moisture resistance). Because of this, modern engines mainly use enamel-insulated wires of the PETV, PETVM brands (heat resistance class B) and PETV, PET 155 (class F). PETM and PETM wires are designed for mechanized laying of windings [3].

Groove and interphase isolation. In modern engine series, composite materials are widely used, which are a combination of polymer films with various flexible electrical insulation materials based on synthetic organic or inorganic fibers, and these components are interconnected by adhesive compositions. The film takes on the main electrical and mechanical loads, while other components perform the functions of a reinforcing material that provides the necessary technological properties of the composition - stiffness, elasticity, increased resistance to mechanical stress, etc.

The technical condition of electric motors in modern controlled electric drive systems is constantly monitored and diagnosed. To ensure reliable operation of the engine, a system of measures is used to ensure a standard service life. First of all, through the use of better materials, they improve the technical characteristics of the engine and its ability to withstand the action of factors that destroy insulation.

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Robots and artificial intelligence

The problem of artificial intelligence in the science of the 21st century has covered a wide range of studies related to the creation of an artificial analogue of human intelligence, the development of the so-called "superintelligence"; modeling of individual functions and structures of the psyche; robotics; the impact of existing and potentially possible artificial intelligence systems on the individual and society, etc. Research results in the fields of computing, cybernetics, synergetic, neurology, psychology, linguistics, biotechnology and nanotechnology make it possible to predict the future of the development of artificial intelligence and robotics as applied science engaged in the development of intelligent technical systems.

The effect of the spread of Artificial Intelligence (AI) on wages depends on both the form of aggregate production relationships and the elasticity of substitution between human and robotic labor. With a conventional production function involving labor, robots, and ordinary capital, an increase in robotic labor can have either a positive or a negative effect on wages. Alternatively, it is possible to estimate the aggregate production relationship without measuring capital or other fixed factors explicitly.

In the interaction of robotic technology with the surrounding objects there is a need for orientation systems in space. These systems are also required when the operator of any moving machine or device cannot reliably estimate the movement of a controlled object in space and its interaction with other objects. With the development of scientific and technological progress, this problem is becoming more urgent. Orienteering systems in space are increasingly penetrating our daily lives: from mobile phones (proximity sensors, GPS, accelerometer, and more) to cars (GPS, etc.). The introduction of these systems into the aerospace industry is an integral part of progress in this field. Therefore, research and development of space orientation systems is relevant.

An important element in the creation of robots is the research that consists in the development and dissemination of computer recognition and speech synthesis. The reason for attention to broadcasting and its application in automated technical systems is, first of all, its convenience, habit, accessibility and speed in communication between people, and therefore, speech becomes the most suitable means for communication between humans and machines. The main problem in "using" a language and speaking a computer is their variety and redundancy.

So, nowadays artificial intelligence systems (robotic technical complexes) are becoming more widespread. Therefore, for example, artificial intelligence systems are used by banks in insurance activities, when playing on the exchange, managing property. Pattern recognition techniques are widely used in optical and acoustic

recognition, medical diagnostics, for a number of national security tasks, and the like. The level of intellectual behavior, both biological and cybernetic systems, is determined primarily by the structure, architecture and overall organization of their control systems. A necessary element of their "intelligence" is the presence of artificial analogues of their functional components, processes of interaction with the outside world, mathematical models that correspond to the objects of this world.

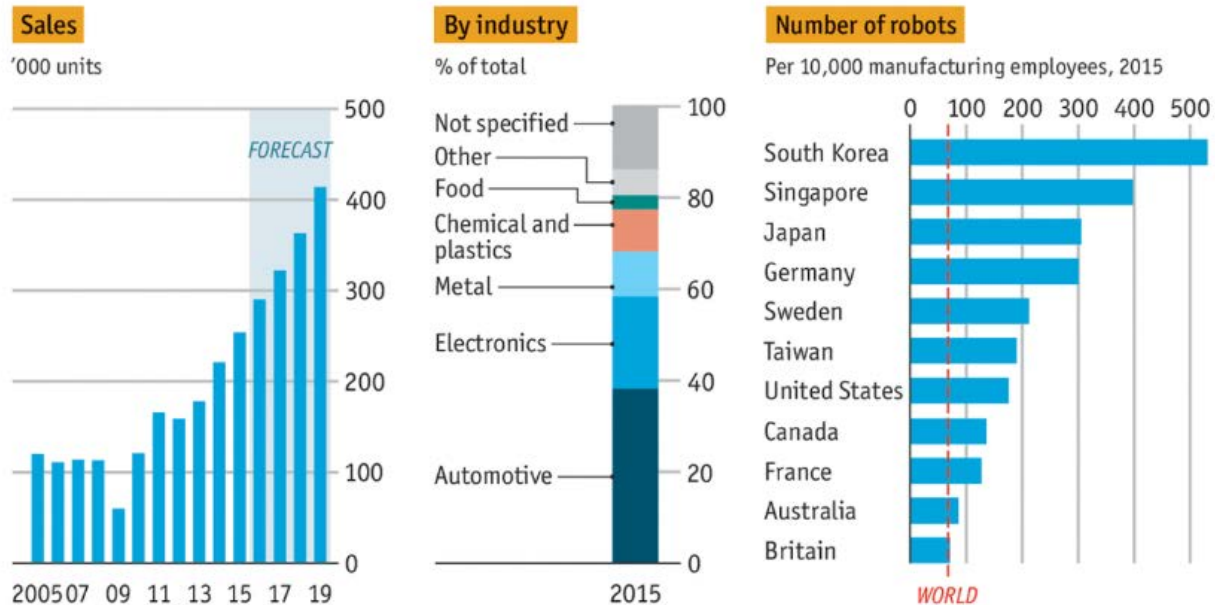


Fig. 1 Robot's part in global economic

FANUC is the world's largest maker of industrial robots. But the chances are that you own a product built by one of its 400,000 machines. Established in 1956, the Japanese company's automated workers build cars for Ford and Tesla, and metal iPhone cases for Apple.

FANUC is red-hot at the moment. Its shares have jumped 35% in the past six months, more than double the 14% return of Japan's benchmark Nikkei stock index. And the booming market for robots shows little sign of slowing. According to the International Federation of Robotics, unit sales of industrial robots grew 15% in 2015, while revenues increased 9% to \$11bn. In 2016, the turnover in North America rose by 14% up to \$1.8bn. ABI Research, a consultancy, reckons that the industry's sales will triple by 2025.

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Design Calculation of a Rotary Hearth Furnace, the Case Study of TPC-5, Open Joint-Stock Company “INTERPIPE NTRP”

Rotary hearth furnace - a methodical furnace in which the movement of the workpieces is due to the rotation of the annular hearth. Therefore, sometimes a rotary hearth furnace is called a rotary furnace or rotary kiln [1].

The scheme of the rotary furnace is shown in Figure 1.1 [1]. Furnace works like this. Workpieces are loaded into the furnace through a loading window using external mechanical devices. Further, due to the periodic movement of the hearth (10 - 12 degrees at each movement), the workpiece together with the hearth pass all the necessary heating zones and are issued through the unloading window also by external mechanisms. The heating time of the workpiece corresponds to the time of rotation of the hearth. The speed of rotation of the hearth may vary depending on the size of the workpiece and the steel grade.

Rotary furnaces, as a rule, are heated by natural gas through burners located in the outer and inner sidewalls, have up to 6 furnace adjustment zones and 1 non-heating zone (methodical). Gas temperature in welding zones reaches 1300 - 1350 ° C . At the end of the methodical zone, smoke with a temperature of 700 - 900 ° C is removed through the chimney and sent to a metal recuperator.

Suspended partitions are used to maintain certain temperature and hydraulic conditions in the furnace. Between the hearth and the partition there is a gap necessary for the free movement of the workpieces. Usually in the furnace there are from one to six partitions. Partitions isolate loading and unloading windows, and also shield high-temperature zones from low-temperature ones. With the help of partitions, the necessary hydraulic resistance is created, which directs the combustion products along the larger arc of the circle towards the rotation of the hearth.

The most important part of the furnace is the hearth. The hearth should be able to withstand abrasion when feeding and dispensing workpieces, and not interact with scale. To increase the stability of the hearth, its composition should contain a large percentage of Al_2O_3 [1].

The choice of methodology for design calculation.

The design calculation of the furnace can be carried out using analytical solutions, engineering, numerical and numerical-analytical methods.

Analytical solutions are quite accurate, but can only be applied under constant physical properties and boundary conditions. In real furnaces, boundary conditions are constantly changing, and physical properties are unstable.

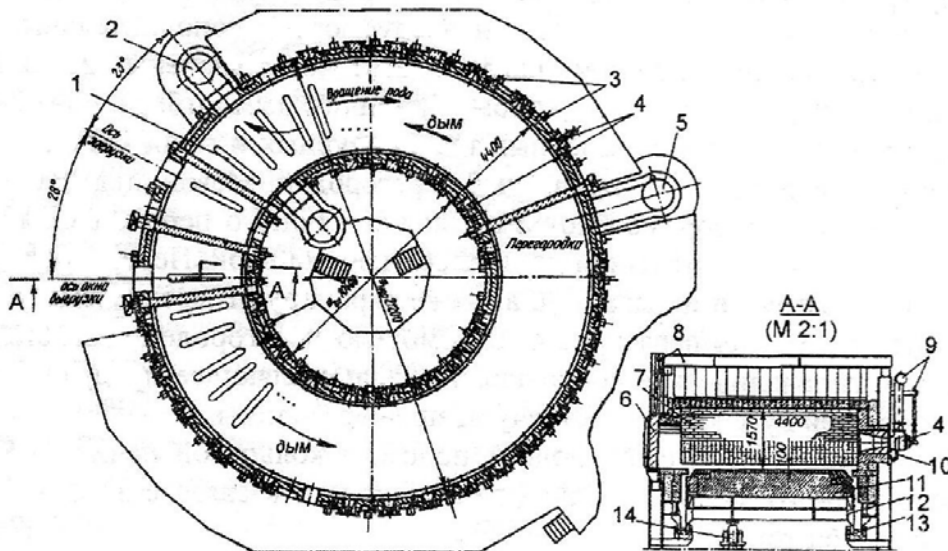


Figure 1. Schematic of the ring furnace: 1) billets; 2) smoke extraction; 3) upright of frames; 4) burners; 5) intermediate smoke; 6) damper; 7) a partition; 8) a frame; 9) air and gas pipelines; 10) water-cooled pipes supporting the partition; 11) a rotating unit; 12) support frame of the hearth; 13) water shutter; 14) a mechanism for moving the bottom.

Numerical and numerical analytical methods are accurate only at infinitely small heating intervals, which complicates the calculation in a real furnace.

The method of the heat diagram in which the heat time is determined from the heat balance, and then for the continuous operation furnaces, its dimensions and the required power, is the easiest way and is used in engineering solutions, but cannot be used in the design of small sections of the furnace.

The approximate-analytical method is the most versatile, since on the one hand it is based on an analytical solution, and on the other - it does not require a large number of heating intervals. It solves the problem of heating simple bodies under boundary conditions of the second kind [2].

Mathematical model of calculation.

When modeling the process of metal heating in any fuel heating furnace, 4 blocks must be calculated:

- a) calculation of fuel combustion;
- b) calculation of heat transfer in the working space of the furnace;
- c) calculation of metal heating;
- d) heat balance and determination of fuel consumption by zones of the furnace.

The calculation of fuel combustion includes theoretical and actual fuel consumption, the total amount and composition of combustion products, the amount of smoke from 1 m³ of fuel, and the composition of combustion products.

The calculation of heat transfer in the working space of the furnace include the geometrical parameters of the working space of the furnace and the workpieces, the angular and reduced coefficients of radiation and the average effective length of the beam.

When calculating the heating of the metal, an analytical method is used. It is assumed that each zone of the furnace is divided into a number of sections – intervals

Articles of arrival (chemical heat of combustion of fuel and physical heat of components of combustion) and losses (heat absorbed by the metal, losses through masonry and with flue gases) are calculated in the heat balance. Fuel consumption is also determined.

At “INTERPIPE NTRP”, TPC №5 has a rotary furnace, which heats the workpieces before flashing. The rotary furnace has a maximum capacity of 70 t / h. A design calculation of the rotary furnace was performed to reduce the natural gas consumption.

As a result of the calculations, a temperature and thermal diagram was constructed (Table 2.3).

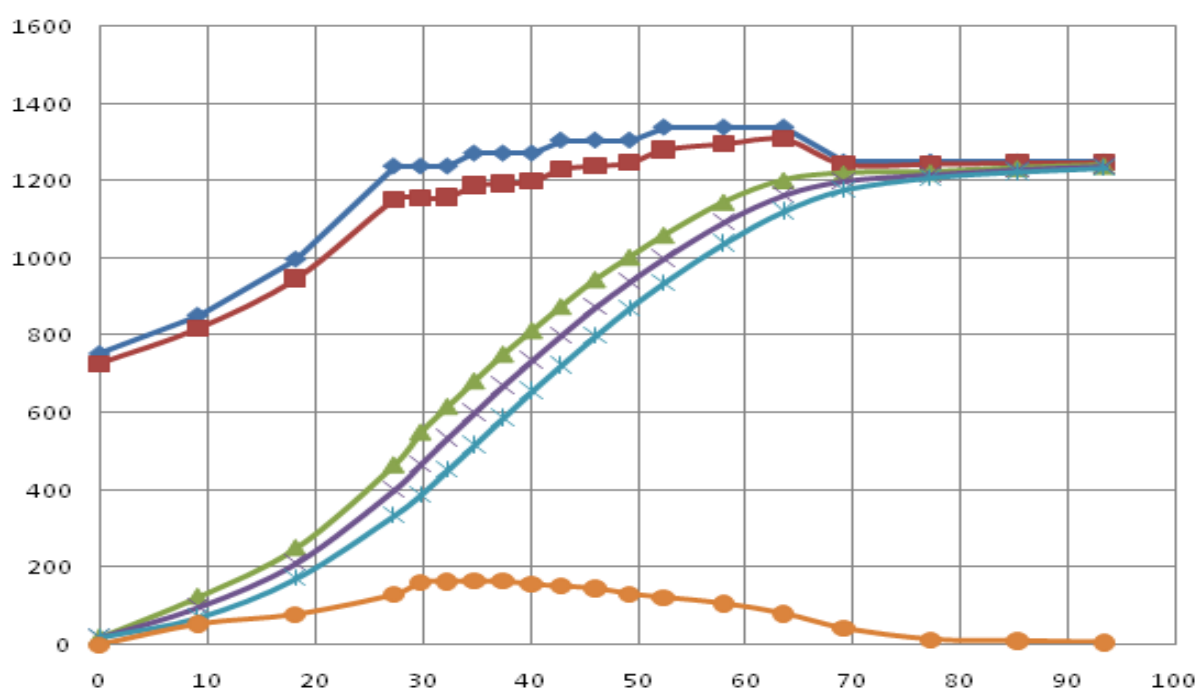


Figure 2. Temperature and thermal diagrams of metal heating in a circular furnace

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Use of balance consumer for redistribution of alternative electric power

Human activity leads to a reduction in global energy reserves. This increases the complexity of their production, labour protection costs and environmental standards. All this leads to an increase in the cost of their production and advances interest in alternative energy sources. Thus, there is a process of the gradual reduction in the use of traditional energy sources: coal, oil and gas.

Nowadays, the end product of alternative energy is electricity. Its production raises a wide range of problems. The main problems are the uneven generation of electricity during the day and the lack of physical ability to accumulate large amounts of energy [1]. These problems lead to a moment of excess electricity in the local household network. This is solved by transferring excess energy to the external electric network. As a result, part of the energy is wasted on conversion and transportation.

The analysis of literary sources showed that losses on the conversion and transportation of electrical energy were for more than 60% [2]. The volume of losses can be reduced due to the redistribution of energy in the local network, which will increase energy efficiency and profit.

The obvious solution to this problem is the use of excess energy by consumers of the local electrical network. For this, a number of authors suggest adding an additional consumer of electric energy to the local network. This object must implement the balanced consumption of surplus electricity. Most studies on the balancing of electric energy consider medium voltage networks.

Based on this, the problem arises of choosing a balanced consumer for a local electric network and how to control power distribution. These are the main issues addressed in this study.

It should be noted that as a balanced device, a charging station for electric vehicles can be used. This solution allows for the regulation of electricity consumption over a wide range. It is advisable to control the distribution of electricity consumption using a distributed control system.

The main requirements for a balanced device are: the possibility of functioning at any time during the day; the possibility of functioning for short periods of time; non-criticality to the number of switching on and off at which time intervals; lack of communication between the efficiency and continuity of the work object; the possibility to regulate power in a wide range, obtaining economic profit from the work of the object.

Limitations associated with the operating time of the equipment exclude the use of machines and mechanisms with the inductive load as balanced consumers. This is due to the fact that during the operation of power electric devices, frequent operations

of turning on and off the equipment are not allowed. In addition, the consumption of electric motors at the time of start-up significantly exceeds their consumption in the steady-state. This also eliminates the use of power consumers who do not have a soft start system. The use of machines and mechanisms without inductive load or with secondary converters is excluded due to the lack of the possibility to control power in a wide range.

Thus, only consumers of the active component of electric power which do not perform mechanical operations remain for consideration. Such consumers include stoves, a heating system and a hot water system. Technological processes carried out in electric furnaces cannot be suspended, which excludes the possibility of their use as balanced consumers. Electric heating can act as a balanced consumer only in the cold season. Electric water supply, in turn, operates throughout the year.

Based on the foregoing, systems of electric heating and hot water supply can act as a balanced consumer. At the same time, heating systems are limited by the period of operation during the year and a source of alternative energy. In winter, the generation of solar energy is much lower compared to the summer period or wind electricity [3]. The major disadvantage of using alternative electricity in hot water systems is their significantly lower efficiency compared to using solar collectors.

In general, typical consumers of electric energy can hardly be used as balancing ones. However, with small excesses of electric energy in the local network, it can be spent on heating water in water supply and heating systems. This solution does not incur significant costs in the case of using an indirect water heating system by means of a boiler.

An alternative solution to the problem under consideration is to use a balanced consumer of active electric power, which is new for the electric grid. According to the results of the analysis, the authors propose using a charging station for electric vehicles [4, 5] as such a consumer (Fig. 1). This solution has such advantages as the absence of time limits, a wide range of energy consumption regulation and maximum efficiency of the use of generated electricity.

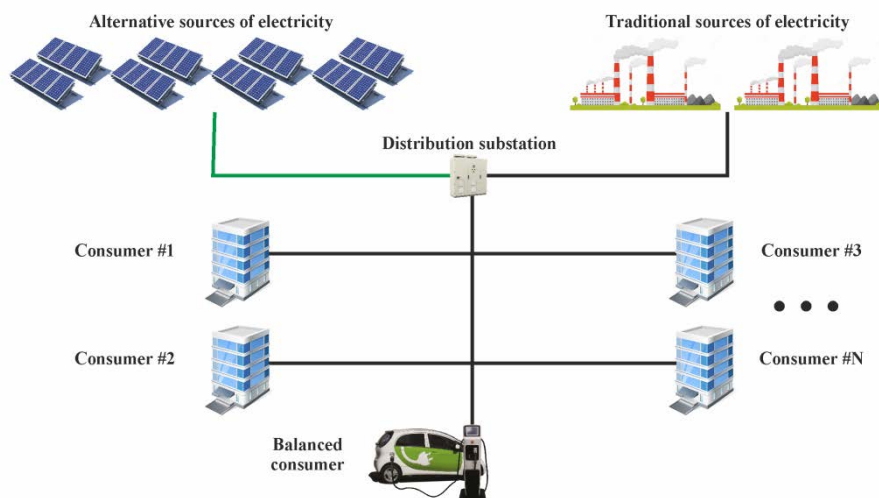


Fig. 1. The structure of the local grid with a balanced consumer

In the proposed structure at the station, several consumers can simultaneously be located; as a result, the problem of the distribution of electricity between them arises.

This problem can be solved using the classical control approach or decentralized. The main features of the functioning of such a charging station are to take into account the amount of available power, the number of consumers, the actual power consumption, and the scalability of the system to an indefinite number of consumers. Based on this, a separate decision should be made for each individual consumer, taking into account a wide range of external factors. Given the above requirements, as well as the need to implement scalability of the control system, the development of a decentralized control system is more promising.

Summarizing we can conclude the followings:

1. Only an active power consumer can be used as a balanced consumer of electricity in a local network. Since only this type of consumer provides: the possibility to work at any time of the day; the possibility of functioning for short periods of time; non-criticality to the number of switching on and off at which time intervals; lack of communication between the efficiency and continuity of the work object; the possibility to regulate power in a wide range.

2. Small surpluses of electric power can be used for heating hot water in heating and water supply systems. Thus, these objects can act as balanced energy consumers of electric energy.

3. The most promising is the use, as a balanced consumer, a charging station for electric vehicles. Given the additional functions assigned to the station, there is a need to develop a new control system. The development of such a control system is advisable to use a decentralized approach.

4. The main directions of further development of this work are the development of the control system structure, an analytical description of the control algorithm, the development of models for object and control device, the development of prognostic models of electric energy consumption.

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Innovative Designs of Industrial Pump Units for a Deep Water Mining of Ferromanganese Nodules

The upgraded deep-water pumping hydro-reservoir transporting heterogeneous mixtures is based on progressive non-equilibrium multiphase models, taking into account mass transfer desorption processes caused by significant pressure gradients.

Improving the pumping hydraulic lift involves reducing the energy consumption of transporting material using the airlift effect and increasing the reliability and durability of installations by developing special designs that exclude the interaction of solid material with the impeller blades of pumping units.

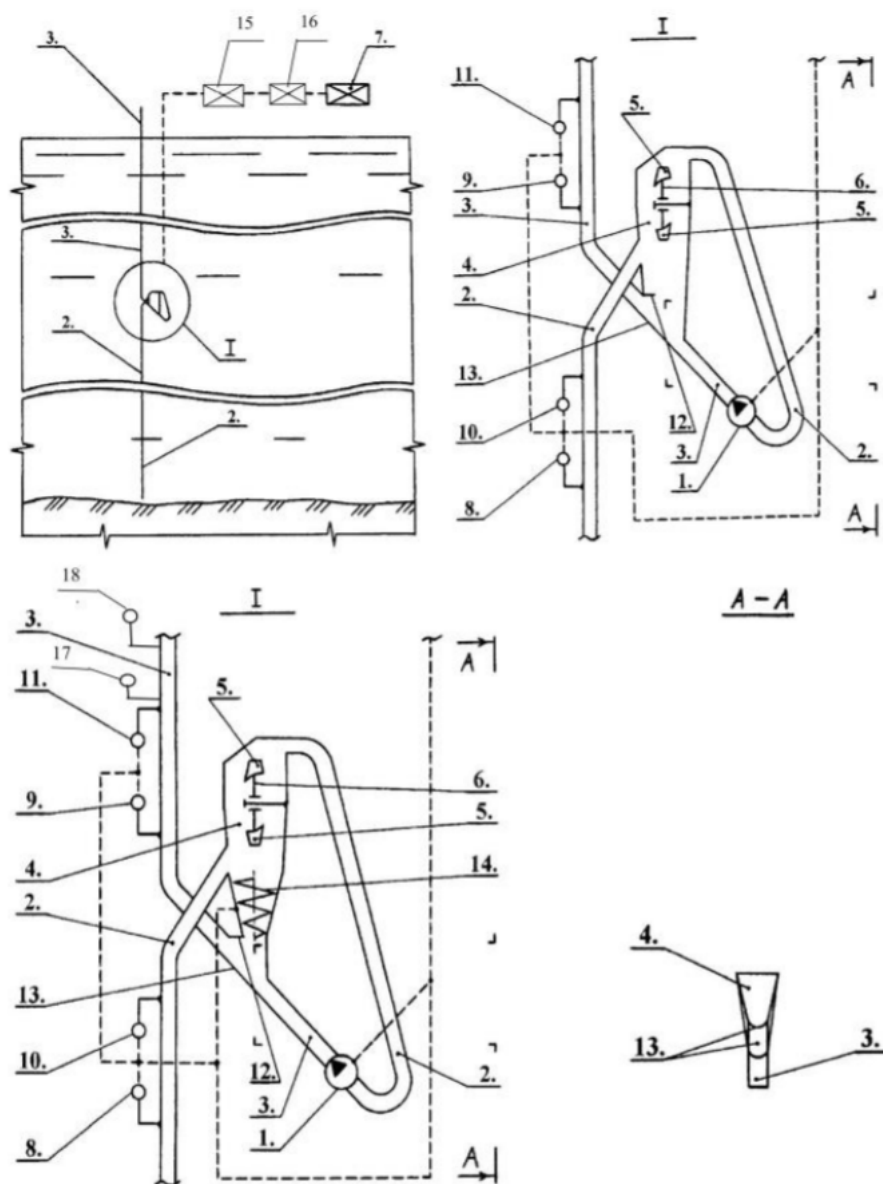


Fig. 1 Hydraulic transport system

The hydraulic transport system Shown in Fig. 1 functions as follows.

Control unit 7 starts the pump 1 filled with sea water and runs pumping out the water concentrated in battery 4. When pumping water out of the battery, a stream of hydro-mixture containing mineral raw materials begins to flow into it under the action of static pressure. An ejection effect occurs, while passing the flow formed by the pump of discharge pipeline 3 through the battery, thanks to tip 12. This effect ensures that the seawater concentrated in accumulator 4 is supplied together with the high-pressure flow formed by the pump.

On receiving a flow of hydraulic mixture from the pool communicated with the ocean area of suction pipe 2 into the battery, the speed of the slurry reduces. Thus, under the influence of gravity the process of continuous deposition of solid particles from the suction pipe occurs in the battery. During the deposition process, the solid material enters the lower part of the accumulator, where it enters the ejection zone and is transported as part of the flow section of the discharge pipeline. Tip design provides the reduction of its cross-sectional area along the hydraulic mixture course. It prevents high-pressure flow from the discharge pipeline section to the suction pipeline section, via the accumulator. Thus, it is possible to continuously lift the mineral raw material in the hydro mixture, excluding the interaction of solid particles with the blades of the pump working stages.

To ensure a high performance of hydraulic transport, the battery has a screw feeder. The levels of connection zones communicated with the ocean basin and pump sections of the suction pipeline to the battery are higher than the level of screw feeder 14. In this version of the system, the control unit starts the screw feeder after the pump reaches its operating characteristics. The screw feeder ensures that the entire volume of solid material is supplied into the discharge pipeline flow.

The tip design described above also ensures effective integration of the discharge pipeline flow, after entering solid particles.

The trajectory of the suction pipeline flow through blades 5 of impeller 6 ensures its rotation, which contributes to mineral raw deposition, as well as prevents solid material agglomeration in the battery and its plugging.

The entire area of the bottom of the accumulator – inclined chute 13 is washed with a discharge pipeline flow, to avoid hydraulic transport system plugging.

After starting the pump, the control unit uses liquid flow sensor 8 and consistometer 10 to monitor the mass flow rate of solid material in the suction pipeline flow before removing solid particles from its composition. With the help of liquid flow sensor 9 and consistometer 11, the control unit also monitors the value of the mass flow of mineral raw materials in the flow of the discharge pipeline after including solid particles removed from the flow of the hydraulic mixture of the suction pipeline in its composition. Next, the controlled values are compared and their compliance is achieved by adjusting the pump flow rate.

If necessary, the control unit increases pump flow to enhance the value of the mass flow rate of solid component in the flow of slurry discharge line after the inclusion in its composition derived from a stream of slurry suction pipe of solid

particles. Immediately before stopping the system, the control unit pauses the pump and the screw feeder.

The re-launch of the hydraulic transport system is performed according to the above algorithm. It is the combination of a unique method of hydraulic lifting and an innovative pumping unit including a number of original designs, which provides reducing the energy intensity of transporting the heavy abrasive pulps, while increasing the system reliability. It is considered as the know-how of this technology. In order to increase the transportation efficiency of a three-phase soil and liquid mixture in the upper part of the transport pipeline, structural and functional changes have been proposed. Three-phase mixture flow control unit 15, intelligent hydraulic lift control unit 16 for the entire transport pipeline (lower and upper parts), three-phase mixture flow sensor 17, and three-phase mixture consistency sensor 18 have been additionally included. Additionally included is a three-phase mixture flow control unit 15, an intelligent hydraulic lift control unit 16 for the entire transport pipeline (lower and upper parts), a three-phase mixture flow sensor 17, and a three-phase mixture consistency sensor 18. Moreover, pump types 1 have been changed in the upper part of the transport pipeline.

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Scientific activity of undergraduate students in the study of the discipline of “Structural and operational materials in the automotive industry”

The most important category of the modern scientific and educational process of higher education is the competence of undergraduate students, which includes the ability to successfully master conceptual knowledge, critically interpret the basic theories, principles and methods, collect and logically interpret information, and solve scientific and technical problems with appropriate methods and tools. One of the areas of scientific research of undergraduate students in the discipline of “Structural and operational materials in the automotive industry”, students in the specialty 274 Automobile Transport, is nanomaterial science.

Historically, nanomaterials have begun to be studied relatively recently. In 1985, N. Kroto, R. Kerlu, R. Smalley discovered new allotropic forms of carbon — clusters C_{60} и C_{70} [1]. And already in 1995, research works on the study of nanostructures and nanomaterials began to determine the main direction of science and technology in industrialized countries. Intensive research and development in the field of nanomaterials has led to dramatic changes in industrial production and has been widely used in the automotive industry.

Today, nanomaterials are a wide interdisciplinary area, however, issues related to the automotive industry and the use of nanomaterials in vehicles are not fully reflected. Therefore, the aim of the activities of undergraduate students is to generalize and systematize numerous fundamental and applied knowledge on nanomaterials used in automobile transport.

The objectives of the discipline “Structural and operational materials in the automotive industry” are the mastery of theoretical knowledge, practical skills and competencies in determining the quality of modern automotive structural and operational materials, ensuring the rational use of materials and organizing measures to save them, increase the efficiency of cars and engines.

Relatively new structural and operational materials in the automotive industry are nanomaterials. The rapid development of the science of nanomaterials does not allow a sufficiently accurate definition of the terms “nanoscience” and “nanomaterials”. It is believed that the prefix “nano” is not just a characteristic of the length of a structural object (within 1 ... 100 nm), but a generalized reflection of the objects of study, phenomena, effects and methods of studying them [2].

It is proposed to classify nanomaterials used in automobile transport into structural nanomaterials, paint and varnish nanomaterials, nanoparticles to automotive fuels, nanoparticles to automobile oils, nanomaterials for in-place repair and restoration of tribological conjugation of automobile units.

Nanopolymers are widely used as construction materials, from which fuel pipelines, coatings of external body parts, glass (using titanium dioxide) are made, as well as optical microswitches. Nanomaterials are successfully used for the production of car tires, solar panels, electronic components of automobiles. The use of structural nanomaterials allows to increase the strength and durability of cars while reducing their weight [3].

The leaders in the development of automotive coatings are Daimler-Crysler and Du-Pont, which use varnishes with ceramic nanoparticles (20 nm in size) when painting car bodies [3]. Distinctive features of paint nanocoatings are high strength, durability, wear resistance, adhesion, intense gloss, environmental safety.

A promising direction in the development of paints and varnishes of nanomaterials is the creation of protective coatings that can change their color depending on the voltage applied to them.

An actual direction is the creation of pollution-resistant and self-cleaning nanomaterials with the "lotus effect" [4]. As an example, we can cite nanomaterials based on montmorillonite nanoparticles with silver for applying bactericidal coatings to various elements of the car's interior - fabrics, plastic, glass, rugs. Duales System Deutschland A G., BMW, developed a new car paint for automobiles that create self-cleaning surfaces, and AUDI uses nanopowders to create durable mirrors and reflectors that are resistant to scratches.

The effect of self-cleaning surfaces is provided by special polishes. The universal Lucky Bee Nanocrystal Wax auto-polish containing wax, silicones and nanodiamonds provides protection, restoration of color and gloss of any paintwork, creates the Skinlight effect. The all-season Lycky Bee Carnauba & Nanowax auto polish containing a combination of synthetic and natural waxes, surfactants and the Bentowax nanocomponent provides effective surface protection over a wide temperature range.

Improving the operational properties of various types of automotive fuel can be achieved by using metal nanoparticles containing salts of magnesium, calcium, manganese, copper or aluminum [5].

Effective ways to reduce the particulate matter content of exhaust gases generated by diesel engines are to use anti-smoke additives containing manganese and copper ions with carbolic and dicarboxylic acids or nanosized particles of cerium oxide. Corresponding Fuel Borne Nanocatalyst technology was developed by Oxonica, an English company at Oxford University. The Envirox nanoparticle is an organic-based nanosized particles of cerium oxide and provides more complete combustion of hydrocarbons, fuel savings of up to 10 ... 15%, reduction of harmful emissions, including a sharp decrease in the content of nitrogen oxides.

Many European manufacturers (including Daimler Chrysler AG, BASF AG, Iveco S.p.A., Total SA, Renault Trucks, Volvo Trucks) participate in the Selective Catalytic Reduction (SCR) project for selective catalytic exhaust gas treatment. The action of AdBlue nano-additives is based on the conversion of nitrogen oxides to nitrogen and water vapor.

The content of harmful impurities in the exhaust gas reduces the use of FaberOx, which contains urea derivatives with nanosized particles of cerium dioxide. The new Urea & NanoCatalyst in Fuel technology does not require changes in the design of the fuel equipment of the internal combustion engine and the method of refueling at gas stations. Special nanomaterials Fenom NanoTuning, Fenom Street Racing and Fenom Cetane-Number Booster help increase power, reduce fuel consumption and exhaust toxicity.

Today, the efforts of such world-renowned companies as Mobil, Shell, Castrol, British Petroleum, Neste, Comma, Total [6] are directed at the development of nanosubstances for automotive oils.

A promising oil additive is NanoVit Motor Renovator, which contains nanosized powders (14 nm in size) of silicon dioxide SiO₂, aluminum trioxide Al₂O₃ and graphite. The concentration of the additive in engine oil (for example, SAE 10W-40) is 0.001 ... 0.002%.

Lubricating nanomaterials are widely used in CIP repair and restoration of tribological conjugations using Smart self technology [6], [7]. All nano-additives for repair can be divided into groups: nano-additives based on nanopowders of ductile metals Cu, Cr, Al, Sn, Zn, Fe; nanosized polytetrafluoroethylene powders; mixtures of nanoscale complexes of natural and synthetic cermet compounds, rare-earth catalysts and graphite.

Examples of the practical use of nanomaterials in automobile transport are Fenom Engine Nanoguard and Traitement Pour Moteurs (for motor oils), Fenom Gear Nanoguard (for gear oils), Hi-Speed Litium (G 100) and Hi-Temp Synthetic Complex (G 200) nanopreparations for transmissions, suspension components and car steering), Super Dura Lube (for turbines of jet engines and units and mechanisms operating in difficult conditions).

This article presents some results of the scientific work of undergraduate students, carried out in accordance with the curriculum of training in specialty 274 Automobile transport.

The use of research work elements in the learning process forms for undergraduate students a creative approach to solving scientific and technical problems, increases the level of training, gives practical experience in the scientific team and well-reasoned discussions, promotes the development of independence and creative initiative.

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Section 04 Computer Science and Solutions in IT

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Developing a fuzzy model of an expert system for decision-making on recruitment

Nowadays, learning English is an integral part of being successful in business activity. Therefore, the relevance of good English schools is inevitable. But in most cases the success of an English school is determined by the professionalism of its teaching staff. So, many English language centers face the problem of finding and selecting the best candidates with a high language proficiency level as well as a proper level of personal qualities.

Recruitment in most companies is a responsibility of an HR manager whose final decision on the right candidate could bring success or failure to the language business. However, in the modern era of computerization and artificial intelligence some relevant expert systems, which think faster and not worse than humans, can provide additional automated support in recruitment.

Expert systems are software complexes that gather special knowledge in specific subject areas and pass them on to counseling less qualified users. Expert systems are considered intelligent because they do not only search the database for knowledge, but also process it for new information. Such systems have already been successfully used in medicine, technology, economics and other areas. Today they are also starting to find their place in the recruitment process making it faster and more automated.

The architecture of an expert system looks like this:

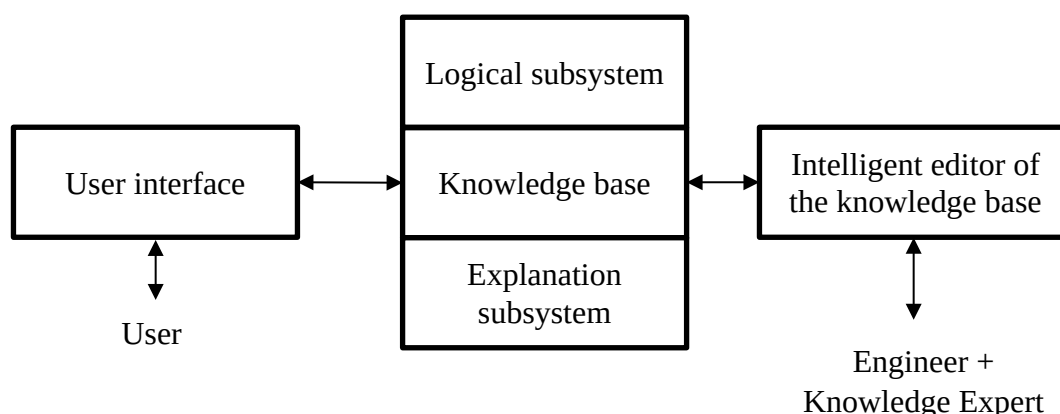


Figure 1 – Architecture of a typical expert system

In this case, the inference system is called the Mamdani-Zade system. In such a system, the rules are intuitive.

The purpose of this study is to build an expert system that will facilitate the recruitment process of the English language school. The object of the study is the

Friends Club English Language Center, which provides course and one-to-one English classes as well as speaking clubs and additional testing.

The study method includes analyzing resume database, identifying the ways of solving urgent problems, such as selecting the most relevant qualities for the best candidate, searching for candidates, introducing automation and selecting rules for the expert system.

Establishing a fuzzy expert recruitment system

To make a decision about a candidate, it is necessary to analyse the following information:

- 1) professional education, philological or pedagogical, which is not required (in case of native speakers), but desirable. In order to obtain a specialist degree, higher education is obligatory; otherwise the person will be called a teacher, not a specialist;
- 2) level of English must be not lower than B2 (Upper-Intermediate) or C1 (Advanced) for higher qualification levels;
- 3) teaching experience;
- 4) the desire for self-development – it provides more opportunities for obtaining higher qualification;
- 5) stress resistance - depends on qualification;
- 6) ability to work in a team - to create further training plans with other members of the team;
- 7) communication skills are obviously a must, since teachers have to work with students individually or in groups;
- 8) responsibility;
- 9) creativity.

Now it is necessary to evaluate each parameter. Personal qualities, which comprise items 4-9, are fuzzy parameters because we cannot estimate them accurately. Therefore, they will be assessed as "low", "below average", "medium", "above average" and "high", or H, NA, C, BC and B respectively. Other options can be clearly estimated.

For the knowledge background, real data from the CVs, which are freely available on the site work.ua, was taken. The knowledge data is presented as an Excel table of the candidate names and the estimated level of the skill they have.

The following input linguistic variables were introduced to construct the fuzzy inference system: desire for self-development, ability to work in a team, stress resistance, communication skills, responsibility, creativity, teaching experience, level of English, education degree, type of education. Output linguistic variables included the following information: a teacher, a specialist, a specialist of category II; a specialist of category I, a specialist of the highest category.

An example of an input linguistic variable:

№	Parameter	Meaning	Membership function	Numbers
		low		0-40
		below		5-55
		medium		25-75
		above		45-95

		medium		
		high		60-100

Figure 2 - Input linguistic variable "desire of professional development"

An example of an output linguistic variable:

No	Parameter	Meaning	Membership function
		low	
		medium	
		high	

Figure 3 - Output linguistic variable "specialist"

The rules for the knowledge base are built according to the following example:

If the level of English is "B2", then belonging to the "specialist" category is "high", "specialist of category II" is "medium", "specialist of category I" is "low", "specialist of the highest category" is "low", "teacher" is "low".

If the professional development desire is "above medium" and education is "completed", then belonging to the "specialist" category is "high", "specialist of category II" is "high", "specialist of category I" is "high", "specialist of the highest category" is "medium", "teacher" is "high".

The rule dialog is shown in Figure 4.

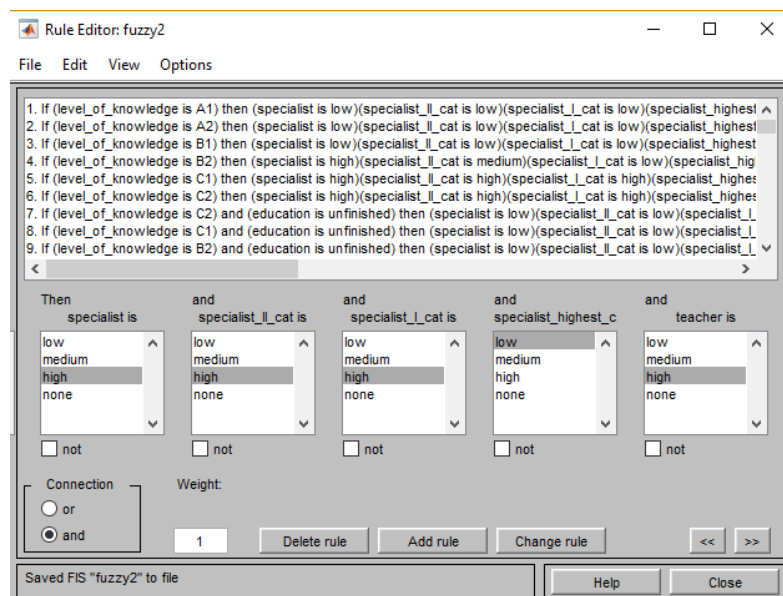


Figure 4 - Rule Input Dialog

The output of the program results is shown in Figure 5. The program shows whether the candidate matches the certain professional degree or not. The first column shows the number of a candidate in the table, columns 2-6 show the level of the position for each candidate. If the level is 0.5 or lower, the candidate is not suitable for the position. The higher the level, the better the result is. For example, the

best fit for the position of a "specialist of category II" is the candidate number 7 with the level 0.8344 (column 3), for the "teacher" position is the candidate number 2 with the level 0.8597 (column 6).

```
output =
```

1.0000	0.5000	0.5000	0.5000	0.5000	0.6123
2.0000	0.8597	0.5263	0.5273	0.5265	0.8597
3.0000	0.7974	0.5000	0.5000	0.5000	0.7974
4.0000	0.2025	0.1971	0.1301	0.1301	0.5000
5.0000	0.5000	0.5000	0.5000	0.5000	0.6124
6.0000	0.5010	0.5000	0.5000	0.5000	0.6084
7.0000	0.8344	0.8344	0.5027	0.5016	0.8363
8.0000	0.7942	0.5010	0.5000	0.5000	0.7866
9.0000	0.5000	0.5000	0.5000	0.5000	0.6120
10.0000	0.5000	0.5000	0.5000	0.5000	0.6122
11.0000	0.5106	0.5000	0.5000	0.5000	0.5106
12.0000	0.5000	0.5000	0.5000	0.5000	0.5001
13.0000	0.8344	0.5000	0.5000	0.5000	0.8344
14.0000	0.8234	0.5272	0.5157	0.5006	0.8234
15.0000	0.8100	0.5171	0.5003	0.5003	0.8134
16.0000	0.6357	0.5106	0.5096	0.5062	0.6356
17.0000	0.7331	0.5000	0.5000	0.5000	0.7330
18.0000	0.5000	0.3948	0.2025	0.2025	0.6052
19.0000	0.5773	0.5034	0.5034	0.5000	0.6598
20.0000	0.2025	0.1971	0.1301	0.1301	0.5000

Figure 5 - Output of the program calculation results

As a result, a fuzzy logic expert system with a knowledge base and other components of the expert system, such as membership functions and a rule base, was created and tested. Thus, two ideal candidates were found. However, the results of the expert fuzzy system are approximate.

The given system contains 100 rules, but more rules can be added, if necessary, that will allow using this system on a commercial basis.

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Placement of electric vehicle charging stations in the city of Dnipro

The sustainable development of the region requires a harmonious combination of economic, social and environmental development of the social infrastructure, which involves upgrading regional infrastructure to meet the needs of the industrial region. One of the priority directions of minimizing the risks of socio-economic development, and therefore, the promotion of the Dnipropetrovsk region towards the implementation of the sustainable development goals of the Dnipro-2030 in the environmental subsystem, is to reduce emissions of harmful substances into the air. The development of new energy vehicles has become an important strategy to combat climate change and the energy crisis. But construction of a highly efficient power supply network is a prerequisite for the commercialization and industrialization of electric vehicles. Therefore, the study of the deployment of electric vehicle stations is of great practical importance.

In this work, first of all, the problem of the optimal number of charging stations that should be placed in Dnipro to meet the needs at the lowest possible cost from downtime of technological equipment is solved. Second, under the assumption that chargers should be equipped primarily with the parking areas for vehicles, we found those where the distance from any of them to the nearest charging station is minimal.

Determining the optimal number of charging stations in Dnipro, which provides the minimum total losses from idle posts and service failures, was carried out by using the models and methods of the queuing theory. It is supposed that the flow of service requests is stationary, i.e. its probabilistic characteristics do not depend on time. The flow of requests for electric vehicle charging has no aftereffect, since the events that form the flow appear independently of each other, and each event has its own reasons. We also assume that this random process is Markov's, i.e. one for which the background can be ignored. At the same time, the analysis of such parameters of the queuing system as the flow of requests and possible performance of channels using the formulas were specified in Table 1.

For calculations, we will use the following notations: μ -the service intensity, which is calculated as $1/(\text{the service time of one electric vehicle})$, λ -the flow rate of cars, which is calculated as $1/(\text{the time of operation of the station/the number of cars that are charged in one day})$, π - the load of one charging station, equal to λ/μ .

The implementation of the Queuing system is done in the C++ programming language in RStudio environment using the Rcpp library with the following source data:

- you can get a full battery charge after four hours of continuous charging;

- an electric car needs to be charged on average every three days;
- a station will provide charging services 24 hours a day. This will allow drivers to save on electricity by using the night rate and charging the car after 11p.m.

The number of electric vehicles in Dnipro was taken from the IRS Group website [1].

Table 1. - The parameters of the queuing system

The marginal probability	$p_0 = \left(\sum_{k=0}^N \frac{\rho^k}{k!} + \frac{\rho^{n+1}}{n!(n-\rho)} \right)^{-1} \quad p_k = \frac{\rho^k}{k!} \cdot p_0$
Absolute capacity	$A = \lambda Q$
Relative capacity	$Q = 1 - P_{fail}$
Probability of failure	$P_{fail} = \frac{\rho^n}{n!} \cdot P_0$
Average number of charged EV	$\bar{k} = \frac{A}{\mu}$
Average number of unused charging stations	$M = n - \bar{k}$
Income (mind.monetary unit)	$W = Q - M$

Table 2 shows calculations for finding the optimal number of charging pistols for stations that will be located in Dnipro.

Table 2. - The performance of a queuing system

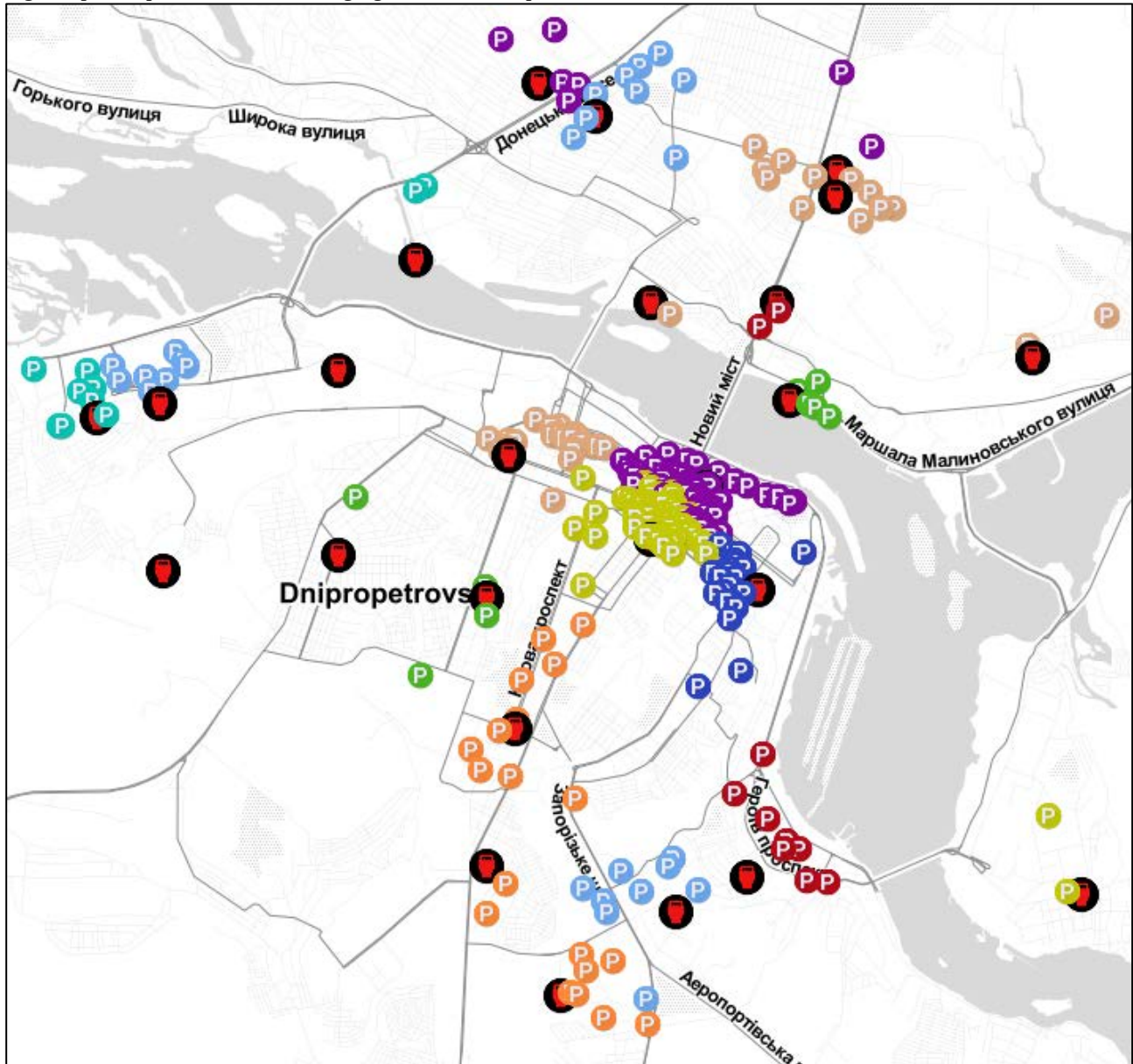
Number of charging pistols	Absolute capacity	Relative capacity	Probability of failure	Average number of charged EV	Average number of unused charging stations	Income (mind. monetary unit)
1	0.247	0.014	0.986	0.986	0.014	0.973
2	0.493	0.027	0.973	1.972	0.028	1.945
...	...	...	...	...	...	...
75	16.849	0.934	0.066	67.395	7.605	59.789
76	16.976	0.941	0.059	67.903	8.097	59.806
77	17.095	0.948	0.052	68.380	8.620	59.761

The analysis of the calculations shows that the more charging pistols, the more owners of electric vehicles can use car charging services. However, with a significant increase in the number of devices, the number of those that are forced to stand idle increases, and consequently, the unproductive costs of maintaining them increase. The optimal number of charging pistols for stations is 76. With this number of chargers, 94% of electric car owners, who require charging, will be able to get the appropriate service.

The problem of finding optimal locations of charging stations is a combinatorial optimization problem (the problem of coverage on a graph). To solve

this problem, an artificial immune system algorithm is implemented using the R and C++ programming languages. Using the shiny and leaflet libraries, the results were visualized and plotted on an interactive map of Dnipro. The input information for the task is a matrix of the closest distances between each pair of sites, which is built using the Google API service. If we assume that the charging stations have three charging pistols, that is, each queuing system channel has three posts, then, based on the results obtained, there should be 25 such stations in Dnipro. Figure 1 shows their optimal placement.

Fig 1. Optimal placement of 25 charging stations in Dnipro



The methods and models of the queuing theory defined the performance indicators and, using the statistical data on the number of functioning electric vehicle charging stations and charging stations in Dnipro, the number of chargers sufficient to meet the needs of such stations at the lowest possible costs were evaluated.

Every month, the number of electric cars and hybrids increases in the city, as well as throughout Ukraine. The demand for cars that have batteries instead of an

internal combustion engine is growing rapidly, because these cars are safer for the environment, and much cheaper to charge than cars with organic fuel. The expansion of electric transport usage is relevant now, and it will continue growing in the future, because these are advanced technologies that are favorable both for humanity and for the ecosystem of the entire planet.

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CSS Flexbox Layout and CSS Grid Layout technologies

As we already know, the problem of displaying information on the Web is rather crucial and can be solved by applying modern technologies. Web development is mainly divided into two large parts. Such as the front end and the back end. The front end is a part of website development that is responsible for displaying information on a web page. The web developer creates exactly that part of the program that interacts with the user. At the same time, the backend creates the content of the page internally. That's all another way of saying, the part of the program that is "hidden" from the eyes of users.

CSS Flexbox and CSS Grid are technologies that are part of the frontend development. They help the layout designer whose responsibility is creating the structures of a hypertext document (HTML) so that the design elements look similar to the layout, deals with responsive sites. These are sites that can change the appearance depending on the size of the screen on which this site is open. According to the statistics about 4 billion people access the Internet precisely from mobile devices, while from a PC about 4.5 billion people. This data looks impressive. It can be concluded that almost half of all Internet users use a mobile phone to surf the Internet and this statistics demonstrates that most sites must look great on both a wide computer screen and a narrow phone screen. In this regard, the need to create exactly adaptive sites is growing, and these technologies greatly simplify the process.

Let's consider the most commonly used technologies to solve this problem. The first technology to be mentioned is CSS Flexbox that provides tools for quickly creating complex, flexible layouts, and features that were complicated in traditional CSS methods. This technology was firstly introduced in 2009 with further modifications taken place in 2011 and 2012. Modifications of 2012 are used until today. It is a very convenient tool for creating HTML layouts that came to replace tags such as "position: ..." and "float: ..." in CSS. At the moment, "position: ..." and "float: ..." are used very little and only for some narrow tasks. The main advantages of Flexbox can be listed as following: a very convenient content alignment system, intuitiveness, the ability to change the order of elements only through CSS without changing anything in the HTML.

Properties in Flexbox are divided into two groups. The first group deals with the Properties for the Parent (flex container):

- flex display (a definition of a flex container)
- flex-direction: row | column(sets the main-axis)
- flex-wrap: wrap | nowrap (by default, flex items are fit onto one line). You can change that and allow the items to wrap as needed with this property.

- justify-content: flex-start | flex-end | space-between | space-around | etcetera; That is the definition of the alignment along the main axis.

- align-items: stretch | flex-start | flex-end | center | etcetera; This defines the default behavior for how flex items are laid out along the **cross axis** on the current line.

The second group deals with the Properties for the Children (flex item):

- order: <integer>; By default, flex items are laid out in the source order. However, the order property controls the order in which they appear in the flex container.

- flex-grow: <number>; This defines the ability for a flex item to grow if necessary.

- flex-shrink: <number>; This defines the ability for a flex item to shrink if necessary.

It should be mentioned that this technology has many other properties, but considered above these are the most important ones.

Now let's consider such issue as CSS Grid Layout technology. It came into operation after updating browsers only in March 2017. This is a relatively young technology. Experts say that this is the best innovation in the last 5 years. Grid has replaced technology such as “<table> ... </table>” in HTML and can boost such advantages as easy adaptation, the ability to change the layout without changing the code in HTML, breaking the screen into equal parts without using accurate calculation, and much more. But I would like to highlight just the ability to change the appearance of the page without changing the HTML source code, that is, only using CSS.

The most important properties of grid technology can be listed as following:

- display: grid; This defines a grid container.

- grid-template-areas: “name of the first area”, “name of the second area”; This property works with names of grid-areas. Put elements in the right place.

- grid-area: <name of the area>”. You can name any part of your HTML code to work with this name by property “grid-template-areas”.

- grid-gap: <size of gap>; This defines the ability for a grid container to make gaps between any elements.

This was the list of some of the properties that must be distinguished. There are a lot of other ones that are also useful but not so important.

In conclusion, the comparison of these two technologies is provided. Speaking about common features we should include the following ones: user-friendly properties, continuous improvement and upgrading, a convenient and clear system of element arrangement.

As for differences, here is the list of considered ones:

- CSS Flexbox Layout can work only with one axis. It may be vertical or horizontal axis;

- CSS Grid Layout can work with two axes at the same time. This means that CSS Grid Layout creates something like a table;

But it should be emphasized that replacement of one technology by another does not solve the problem if it arises. Of course, you can use only CSS Flexbox, but it is not very convenient. Or if you better know CCS Grid Layout you can use only this skill. My recommendations are to apply both technologies because you can mix them and take out the best tool for page making.

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Game technology can completely change the future of filmmaking

Once in several decades a new technical revolution comes to the cinema industry. And one of the plausible modern developments is connected with the usage of game engines for filmmaking. First of all, it is UnrealEngine 4, which has already been used in the Marvel's blockbusters, such as new "Star Wars" and "The Mandalorian" series.

The Unreal Engine 4 technology can become a technological advancement that will reduce the amount of time and money spent on film production.

Historically, Unreal Engine 4 was developed by Epic Games for creating first-person shooters. In the latest versions it was improved and became more universal. These improvements allowed this engine to be used for dealing with a wide variety of tasks. What is more, using the Blueprint's visual programming system functionality, Unreal Engine 4 became applicable beyond the game industry, for example, for interior design or even filmmaking.

The difference between Unreal Engine 4 and its competitors is in photorealistic graphics. The engine allows professionals to create a well-defined and detailed background, which cannot be distinguished from the reality. And as it makes a filmmaking process fast productive, this engine has been adopted by various film studios. They are mainly using it in pre-production and for creating special effects in real time.

"Sequenser" is another additional sequencing instrument that solves tasks in real time, moves the fragments of the stage, picks suitable lenses, configures lighting and sets out focusing. Due to this tool, Unreal Engine 4 has started to be widely used in making realistic backgrounds during filming. This technology can be used as a chromakey in real time and substantially reduce the production time.

Unreal Engine's template, called "nDisplay", is used in creating backgrounds as well. It allows an image to be projected on several screens or surfaces simultaneously. Generated backgrounds are displayed on huge LED-screens and create an effect of the actors being inside this space.

One more useful instrument for the cinema industry is the "Stagecraft" technology that creates and edits realistic surroundings right on the filming stage.

Unreal Engine 4 is also used by filmmakers in preliminary visualization which is broadcast right in the actor and film crew's VR-glasses. It relieves the production team from the constant need to move green screens and consider rendering details. Wearing VR glasses, an actor can interact with the generated environment in real time what helps to plan his exact movements while shooting.

The biggest supporter and promoter of Unreal Engine 4 in filmmaking industry is the director of "Iron Man", the "Jungle Book" and the "Lion King". His name is

Jon Favreau, and he is the one who has the biggest experience in using game engines for shooting.

Unreal Engine 4 preliminary visualization technology became a foundation for making a photorealistic remake of the “Lion King”. Before filming, the scenes were created in virtual reality. Actually, the film was originally created in VR to help the film crew. They counted not on the storyboards, but on the animation with already rendered lighting, color correction, operator techniques and so on.

In “The Mandalorian” series Favreau used the same strategy with pre-visualization as in the “Lion King”. Also, chromakey was completely replaced by LED-screens with the projections of the backgrounds created in Unreal Engine 4. “Stagecraft” technology was used for rendering not only exotic landscapes, but also for creating the spaceship’s parts, what helped to save on a prop. Due to these advancements, designers painted objects, changed the time of the day and added necessary details in real time. All changes were projected on the LED walls. Owing to the function of these walls to produce enough interactive light, there was no big need in configuring the lighting on the stage.

These technologies were also adopted by other studios. For example, the same methods, which Favreau applied in his films, were used for creating the “Guardians of the Galaxy 2” and “Thor: Ragnarok” by Marvel Studios. Or, Fox Film Corporation used this technology in its franchise the “Planet of the Apes”.

Unreal Engine 4 is also a successful instrument for creating animation. Using it, animators drew a scene in the cartoon “Searching Dory”.

Jon Favreau and other directors, who used this technology, think that Unreal engine 4 can possibly have a large impact on the future of filmmaking. As the engine is more functional in rendering, it will help make high quality effects without unnecessary overspending. Another obvious impact of Unreal Engine 4 is disappearing of the green screen (chromakey) in filmmaking.

However, the expected negative consequences can include the reduction of the payment for the work of operators and editors. And, as any other revolutionary technology, it may be replaced by a new one – more useful and cheaper in production.

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IT technology in marine industry

New information technologies affect all industries with great scientific and technological potential. The marine industry in this sense is no exception. In 2020, the Ukrainian Navy will be replenished with at least five new domestic production vessels equipped with the most advanced navigation equipment. IT-technologies play a very important role in the modern marine industry, and their role and importance is constantly increasing.

At first glance, we might wonder why Cyber Savings is on the ship. Could it be hacked? And yes, that's right. Ships are under constant cyber attack. In 2017, cyberattacks showed vulnerability in navigation and other information systems on ships and in ports. For example: there was interference with electronic map systems, jamming of GPS and manipulation of cargo and ship control systems, including through the introduction of malware and viruses. Now let's talk about how to fight these cyber attacks. THESIS (Transas Harmonized Eco System of Integrated Solutions) is to ensure the reliable, sustainable and secure exchange of information between the various actors involved in maritime navigation. The idea of the platform is to provide access to information to all actors in the industry, including different services that have historically operated largely in isolation from one another. A-Suite The platform is designed to provide access to information to all participants in the industry, including various services that have historically operated largely in isolation. In February 2018 Transas presented to the market for the first time its new development - A-Suite application package based on THESIS. This solution is the first in the marine industry to offer the market a set of real navigation tools based on artificial intelligence. The algorithms detect anomalies in operator behavior at any point in the chain of command and raise alarms before the selected course of action or short-term lack of attention leads to irreversible consequences. Three main A-Suite modules are currently available: Advanced Intelligent Maneuvering (AIM), Advanced Intelligent Diagnostics (AID) and Advanced Intelligent Routing (AIR). **AIM** is a system for predicting trajectories and preventing collisions. It can improve situational awareness on board, preventing the risk of inattention and making the wrong decision leading to an incident. The system uses previously collected data on the actions and behaviour of ship personnel travelling along the same route, the ship's hydrodynamic model, and collision avoidance software abstraction.

AID is an anomaly detection and decision support module that operates both in real time and during methodological analysis after the voyage. Its function is to track speed and turnaround, unplanned deviations in fuel consumption and a number of other parameters to detect excessive or unusual maneuvering. The module receives

data from standard equipment and environmental sensors, recording the nature and time of the operators' interaction with the ship's controls in real time.

AIR is a route planning and optimization system based on a wide range of parameters. The real-time application analyzes hydrometeorological conditions and hazards, takes into account the hydrodynamic characteristics of the vessel and takes into account the impact of known and expected ship traffic along the route. Thanks to cloud technology, A-Suite applications are available both onboard and onshore. Since connection disruptions may occur at sea, the shipboard installation has an integrated pre-processing management server: this ensures continuity of system operation without a permanent connection to the cloud. The information security of data transmission in the THESIS network architecture is ensured by encrypted data delivery channels. Among the achievements in the field of cyber-systems and digitization in the marine industry, autonomous maritime surface ships are of particular interest. Like autonomous technologies in other industries, automated ships can provide increased safety and cost savings by removing the human factor from certain operations. However, the concepts of "autonomous vessel" and "unmanned vessel" are not identical, since the former can operate to varying degrees independently, including as partially autonomous, i.e. with human participation, and fully autonomous, i.e. without any human intervention. Automated ships can be used in a wide range of operations, including: rescue, oil spill response, passenger ferry services, towing and cargo transportation. At present, however, they are mainly used for marine scientific research and various maritime defence operations. The first remotely operated or fully automated commercial cargo ship can be put into operation by 2020. Thus, a fully automated container ship with zero emissions will be able to conduct short voyages in remote control mode or in a fully autonomous mode. Ocean autonomous and fully automatic vessels will appear only in 2030. Electronic navigation systems and instruments have been improved, but the human factor still plays a key role. According to some studies, between 75% and 96% of emergency marine incidents are due to human error. Almost 15,000 marine accident liability insurance cases, which is equivalent to more than \$1.6 billion (within 5 years), have been caused by human error.

Although there are a number of advantages of IT technologies, there are still problems in their implementation, which include, in particular, the following features: cybersecurity, safety associated with the absence of a crew on board, the impact on the profession of a sailor and freight rates. Nevertheless, in the long term, the beneficial impact of IT technologies on all spheres of public life is evident. This topic is important because both merchant ships and military vessels provide us both with the import of goods and our protection.

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Modern methods processing natural language in machine learning

Introduction. The purpose of this work is to review modern methods of natural language processing in machine learning and to find the optimal method for modeling native-language interfaces using artificial intelligence. Firstly, we need to define the term natural language. The explanatory dictionary will give the following definition: "language (natural language), a complex system of rules stored in the human mind, according to which speech activity occurs, i.e., the generation and understanding of texts. Every text is a (material) object that conveys a (non-material) meaning" [1]. From the definition, the task that appears before the developer becomes immediately clear. Natural language processing refers to the creation of systems that understand and process languages in order to perform certain tasks. The traditional approach to NLP (Natural Language Processing) requires deep knowledge in the field of linguistics. The task of the system Creator is to give the system an understanding of what information consists of. This is necessary in order for the network to understand the difference between "box" and "unbox".

Natural language processing belongs to the category of artificial intelligence. The main applied tasks of natural language processing are the following:

- Machine translation;
- 2. Dialogue system;
- 3. Language analysis and synthesis;
- 4. Information retrieval;
- 5. Extracting information from texts;
- 6. Search for similar texts;
- 7. Text quality analysis;
- 8. Analysis of the " mood " of texts.

This paper covers only a few items from this list, namely: machine translation, dialog systems, speech analysis, and synthesis.

Machine learning is a set of algorithms, functions, and mathematical models. There are many neural network architectures, but they are all related to mathematics. Regardless of the architecture, the math is still inside, only the internal variables change. The class of these methods has a characteristic feature, which consists not in direct problem solving, but in training in the process of applying solutions to many similar problems.

The relevance of natural language processing in our time, oddly enough, at the height. In everyday life, AI (Artificial Intelligence) surrounds a person everywhere. For example, natural speech generation systems they are used in various business sectors and other language generation systems for converting from one type of information to another.

Machine translation refers to fully automatic software. MT (Machine Translation) is designed to translate source content from one natural language to another specific natural language, as MT is able to work without human intervention.

In [2], the authors propose a new approach to MT involving neural networks. (Neural Machine Translation (NMT)). Neural networks are an alternative substitute for established statistical machine translation. Neural machine translation aims to build a unified neural network to improve translation accuracy. The models used in these articles belong to the encoder-decoder family. But the authors [3] introduced a mechanism of attention that increases the accuracy of the translation. Dialog systems are part of computer linguistics, as is a machine translation.

The extraordinary amount of information in our century gives a stable basis for the development of dialog systems (chatbots, virtual assistants). There are dialog-based question-and-answer systems, dialog-based problem-solving systems, and connected text processing systems. These systems have a natural-language interface and the order in which the source information is provided is very important. In the above-mentioned systems, there is no building a dialogue, as between a person and a person, they clearly work according to a given model. They are able to analyze input information and divide it into its component parts, as well as to conduct morphological analysis. In the article [7] highlights the following approaches for morphological analysis of the text: clear morphology, fuzzy morphology, probabilistic approach, and morphemic analysis, the original word "is divided" into prefix, root, suffix, and ending.

The article [4] presented a formal DS (Dialogue System) with an argument-counterargument Protocol based on the theory of argumentation. But this system is limited to only two participants, namely, the "initiator" and the "opponent". To implement DS, natural language analysis and synthesis models are required.

The main task of natural speech synthesis is to generate targeted natural speech in accordance with the morphological and syntactic features of natural speech. The process of synthesis is called lunacy. In machine translation, visualization has a special place. Its task is to analyze the source information and interpret it into the target natural language, taking into account the full understanding and comprehension of the output information by the native speaker. Researchers distinguish three levels of text processing: morphological, syntactic, and semantic.

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1. Semantic level-words are linked by meaning;
2. Syntactic level-defines the relationship of sentences;
3. Morphological level-words and sentences are associated with grammatical rules;

Analyzing the natural language on these three levels gives us the possibility of voice translation. The machine automatically parses and searches for similar syntactic and semantic structures in the target language.

This work covers only a few applied problems of natural language processing in machine learning that exist in our time. But we can safely conclude that almost all of them are related. In recent years, self-learning neural networks are gaining popularity, because a dozen years ago, due to the lack of data for training, they were almost unnecessary. In our time, there is a rapid expansion of space on the Internet. Many information and technical resources allow you to teach the machine to recognize objects or natural languages. Development is ongoing in DS of an algorithm for building a logically correct human-machine dialogue in natural language, not only in the form of a question-and-answer model but also in colloquial, even to conduct an argument. As technological capabilities grow, so does the need for machine learning. Natural language processing allows you to create voice assistants, chatbots, and voice translation. This opens up the possibility of creating an AI that could conduct a conversation with a person completely "naturally". Understand and generate natural language.

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Smart home security: simple fraud protection rules

In the modern world of the 21st century, there are many devices invented by man to simplify our life. Some of them help us in our work or entertain us, some simply register information about us, thereby replacing old and outdated devices (for example, a thermometer, blood pressure monitor, etc.). Every day in modern society the idea of a new device is born to facilitate our lives.

Nevertheless, all devices created by man for more than 20 years, one way or another, had security problems. First of all, it is about the security of your data. To prevent any unwanted actions from outside in relation to the device, various types of security models were developed, as physical and software security measures that, in accordance with their time, successfully or unsuccessfully fought with hacker attacks, computer viruses, unauthorized access, etc.

In this thesis, we will talk about a complex device that consists of many devices connected to a single system. But its complexity does not make it boring, on the contrary, the complexity of the device of the entire system makes it a very interesting object for researching.

According to Wikipedia, home automation or domotics is building automation for a home, called a smart home or smart house. [1] A home automation system will control lighting, climate, entertainment systems, and appliances. It may also include home security such as access control and alarm systems. When connected with the Internet, home devices are an important constituent of the Internet of Things ("IoT")

Home automation can perform a variety of household functions independently, for example, if you have a robotic vacuum cleaner you can connect it to the system and set the parameters for cleaning the house while you are at work, or another example, in the morning after the clock alarm rings, the automated system can prepare you coffee.

These systems exist in various forms and representations. Some special systems are designed by engineers (example: for a large house, a working office, or for an individual order), there are ready-made systems for quite trivial tasks, there are also simplified systems with voice control for less significant impact on household appliances, for example Alexa, Siri, Portal, and Google Assistant.

Home automation systems are controlled through various types of interaction. There are systems like fully programmed and freely controlled systems, namely control using with voice commands, special control modules, control panels, smartphones, program commands, motion sensors, pressure sensors, humidity sensors, etc.

Any of the above systems is self-sufficient and can perform the functions of any other. But if you compare these systems according to safety criteria, then they differ significantly. Namely, they are distinguished by security systems that are created from scratch, and which are designed for private companies. The thing is that, home automation is created according to the criteria proposed by the buyer, which means that the buyer may wish to create the most secure system, but this is one of the factors that affects the security of the system. Home automation system is protected mostly by its uniqueness, because individually designed home automation is very difficult for attackers to understand, and therefore not easy to crack. As well as protection against Internet intruders by their uniqueness and requirements, home automation systems of individual development effectively inform the owner about incidents of property intrusion and prevent the incidents by themselves in some cases.

What about ready-made systems on the market? Such systems are complex and have good levels of protection. Among them are encrypted data transfer, special applications on a smartphone to control the system, etc. Hacking such a home automation system without preparation and careful analysis of protective measures is difficult. When using such systems, the buyer basically does not have problems.

Simplified systems with voice control such as Alexa, Siri, Portal, and Google Assistant are unreliable devices for creating a smart home, because if a user makes a mistake in tuning-up the whole system, these systems may be vulnerable to attacks by hackers or thieves. These systems have good cyber protection factors, but if the user neglects the protection of the device for the convenience of use, then the protection against cybercrime of such devices is recommended.

How to protect your smart home from cybercriminals and thieves?

Protecting yourself from cybercriminals is quite simple by observing Internet safety rules.

For instance:

1) Do not send confidential information (bank card number, PIN code, passport data) through social network messengers.

2) Remember: banks, services and shops never send letters asking them to follow the link, change their password, enter a bank card number and a secret confirmation code or provide other personal data

3) Enter several email addresses: personal, work and entertainment (for subscriptions and services).

4) Come up with a complex password, for each mailbox is different

5) Install and update antivirus software.

6) Click on links that came in messages from strangers - a sure way to fall for the bait of cyber fraudsters

7) Do not run unknown files, especially with the .exe extension

8) Carefully check the addresses of links, logos, text and sender of messages.

9) Do not download dubious applications and do not try to do this through unknown links.

Protecting yourself from thieves is a difficult task for an ordinary home. If you have a smart home, all the data about the state of your place will most likely be

transferred to your smartphone, which means that all you need to do is call the police and notify them of illegal actions in your home. However, criminals keep up with the time as fast as we do, and your defense against thieves also depends on your cyber defense and your attitude to online security.

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Security of IOT

What is IOT? Internet of Things (Internet of Things) is a network of physical objects that have built-in technologies that allow you to interact with the outside environment, to transmit information about their condition and receive data from outside. In Ukraine it is just beginning to spread, but in the near future it will become as widespread as the Internet network.

Elements common for IoT: sensors and controllers, missing user interface, programmable intelligence, connectivity, automation.

Home automation. To unlock the power of home IoTs, not only do devices need to be able to communicate with cloud services and management applications, but with each other too, to form a coordinated smart home system.

Vulnerability factors: "Smart Home" is an open system. Moreover, despite the development of these platforms, the implementation of IoT in the home is usually done by non-specialists, without long-term planning, resulting in an eclectic system with components and architecture of different manufacturers and the lack of a unified security policy.

The focus is on the functionality of the devices and the system as a whole. Given the desire to minimize the cost of devices, this often leads to a lack of attention to safety issues.

More and more things surrounding us use the Internet for expansion of the functionality. The scale of IoT devices being implemented is significant. Moreover, the similarity of these devices greatly enhances the effect of detecting a vulnerability in one of them.

Many sensors collect highly sensitive data that provides information about our habits, behavior, location, can listen to our conversations and make video recordings. How well protected is this data and who has access to it?

System components: "Smart" device - Devices IoT considerably differ both in the functionality, and on accessible resources - from the specialised computer to the miniature sensor or the controller.

The first category of devices is the most attractive for botnet recruiters due to the following properties: wide functionality and significant computing capabilities, direct connection to the home network and the Internet with a wide bandwidth, work in a mode of constant inclusion and absence of interaction with the user.

For the second category specialized operating systems (RIOT OS, Tizen, Windows 10 for IoT, Mbed OS) are used. Compromised devices in this category can be used to attack the owner himself - to collect data, change functionality, as well as to attack other devices on the network.

Along with poor software quality of some devices, especially in the field of security, the main problems are insufficient access protection and lack of an automatic software update mechanism.

Communication protocols. By definition, IoT devices are directly or indirectly (e.g., through gateways) connected to the Internet. It makes sense to distinguish wireless communication as a separate component.

Wireless communication. Radio communications can be a vulnerability when an attacker is a short distance away from devices. It can be a denial of service attack by jamming the signal or a Man-in-the-middle (MITM) attack if the attacker is able to connect to the wireless network.

Top-level protocols (transport and application). Inadequate protection at this level, such as lack of secure authentication and data protection, can be used for a MITM attack, with all its attendant consequences.

The most vulnerable points of communication protocols are the lack of secure authentication and data encryption.

Gateway or hub. Allows communication between devices that use different protocols, such as ZigBee and Bluetooth, provides a mediated connection for these devices to the Internet and access to cloud services.

In some architectural solutions, a gateway also takes over advanced features such as data collection, analysis and storage, automation software, and provides remote access to home IoT features. The gateway also often provides protection for devices connected to it.

Cloud services. Because most smart objects have limited capabilities, computing resources to support automation and device management, data collection and storage, and remote access are provided by remote servers most typically hosted in the cloud.

Platform software. The cloud platform provides creation and management of IoT devices. After registering a device, the platform creates a virtual image of a physical IoT object, providing computing resources and memory necessary for its operation and automation.

The platform plays a critical role in providing security, just as the mobile OS defines the level of security for a smartphone. If an application can gain more privileges than declared, it can have a significant impact on the security of IoT system owners themselves.

Custom cloud applications. Just like in the world of smartphones, users can install applications from different developers to manage their smart devices. As with smartphones, there is a risk of installing malicious applications.

Remote access applications. These applications provide a user interface to interact with cloud-based user applications to manage IoT objects. The most common is the use of webAPI. The client is an application installed on a smartphone or tablet, and the service part is served by the cloud application.

Looking for solutions. Let's start with the actual IoT devices - with smart locks, thermostats, bulbs, video cameras, etc. Few general recommendations can be formulated.

Security of IoT devices.

A reliable access and authentication system based on cryptography.

Cryptographic security of software (software).

Software updates throughout the device lifecycle.

Protection of transmitted data and communication infrastructure:

Cryptographic data protection.

Lack of critical connectivity dependencies

System protection. From a 'systems' perspective, two major areas that play a significant role in security are the IoT LAN and the cloud platform. It should be noted that in some cases application services are provided by the local hub. In this case, the recommendations for the platform apply to it.

LAN protection. Create an additional device specification detailing the required security policy for a particular device - port forwarding, acceptable traffic sources and characteristics. This specification can be used to implement this policy on security devices or home routers.

The safety of the system is not a binary state, the safety degree is a wide range. How well your system is protected also depends on the nature of the threat. All these factors change over time. Let's hope that as this industry develops in Ukraine, IoT security will be provided at an appropriate level.

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Data security in cloud computing

Data security has consistently been a major issue in information technology. In the cloud computing environment, it becomes particularly serious because the data is located in different places even in all the globe. Data security and privacy protection are the two main factors of user's concerns about the cloud technology. Though many techniques on the topics in cloud computing have been investigated in both academics and industries, data security and privacy protection are becoming more important for the future development of cloud computing technology in government, industry, and business. Data security and privacy protection issues are relevant to both hardware and software in the cloud architecture.[4]

Cloud computing is the delivery of on-demand computing services -- from applications to storage and processing power -- typically over the internet and on a pay-as-you-go basis.[1] Here are some examples:

The first example is cloud storage and hosting. Keeping essential documents in a central online storage location makes it easier for everyone to access them. Cloud storage is vital for businesses with employees whom all need to obtain the same information to do their work. It increases collaboration and efficiency among organizations.[2]

Cloud storage is also handy for personal use as you can keep your necessary documents on a web server to access later. Just look at Google Docs or OneDrive. You no longer need to carry around a flash drive to edit your spreadsheets or read your files.[2]

The second example is cloud backup. Backing up files in the cloud is by far the most efficient way to ensure their availability. Cloud backup solutions create multiple copies of files and store data in different locations. This way, you do not have to worry that your files will be lost in case one of your or your provider's cloud server goes down.[2]

The third example is e-mail. Millions of newsletters, greetings, and reminders make their way into people's inboxes across the world. None of this would be possible without the cloud infrastructure.[2]

Migrating to a cloud computing platform means your responsibility for data security goes up considerably. Data with various levels of sensitivity is moving out of the confines of your firewall. You no longer have control – your data could reside anywhere in the world, depending on which cloud company you use.[3]

First concept -- privacy protection. Your data should be protected from unauthorized access regardless of your cloud decisions, which includes data encryption and controlling who sees and can access what. There may also situations where you want to make data available to certain personnel under certain circumstances.[3]

The first step is something you should have done already: identify the sensitive data types and define them. Discover where the sensitive data resides, classify and define the data types, and create policies based on where the data is and which data types can go into the cloud and which cannot.[3]

Another one -- data availability. Downtime is a fact of life and all you can do is minimize the impact. That's of considerable importance with cloud storage providers because your data is on someone else's servers. This is where the service-level agreement (SLA) is vital and paying a close eye to details really matters.[3]

Make sure your SLA allows you to specify where the data is stored. Some providers, allow you to dictate in what region data is stored. This can be important for issues of compliance and response time/latency.[3]

The last one -- data privacy. A huge raft of privacy laws, national and international, have forced more than a few companies to say no to the cloud because they can't make heads or tails of the law or it's too burdensome. And it's not hard to see why.

Many providers may store data on servers not physically located in a region as the data owner and the laws may be different. This is a problem for firms under strict data residency laws. Not to mention that the cloud service provider will likely absolve themselves of any responsibility in the SLA. That leaves the customers with full liability in the event of a breach.[3]

All of these protect the interest of the data owner, so it is in your best interest to know them and know how well your provider complies with them.[3]

If you are online you are under threat of attack, that is a fact of life. Cloud service providers have a variety of security tools and policies in place but problems still happen, usually originating in human error.[3]

First one is data breaches: This can happen any number of ways, from the usual means – a hacked account or a lost password/laptop – to means unique to the cloud. For example, it is possible for a user on one virtual machine to listen for the signal that an encryption key has arrived on another VM on the same host. It's called the "side channel timing exposure," and it means the victim's security credentials in the hands of someone else.[3]

The second - data loss: While the chance of data loss is minimal short of someone logging in and erasing everything, it is possible. You can mitigate this by insuring your applications and data are distributed across several zones and you backup your data using off-site storage.[3]

Third one is hijacked accounts: All it takes is one lost notebook for someone to get into your cloud provider. Secure, tough passwords and two-factor authentication can prevent this. It also helps to have policies that look for and alert to unusual activity, like copying mass amounts of data or deleting it.[3]

The last one is cryptojacking: Cryptojacking is the act of surreptitiously taking over a computer to farm cryptocurrency, which is a very compute-intensive process. Cryptojacking spiked in 2017 and 2018 and the cloud was a popular target because there is more compute resources available. Monitoring for unusual compute activity is the key way to stop this.[3]

Cloud computing is a promising and emerging technology for the next generation of IT applications. The barrier and hurdles toward the rapid growth of cloud computing are data security and privacy issues. Reducing data storage and processing cost is a mandatory requirement of any organization, while analysis of data and information is always the most important tasks in all the organizations for decision making. So no organizations will transfer their data or information to the cloud until the trust is built between the cloud service providers and consumers. A number of techniques have been proposed by researchers for data protection and to attain highest level of data security in the cloud. However, there are still many gaps to be filled by making these techniques more effective. More work is required in the area of cloud computing to make it acceptable by the cloud service consumers. [4]

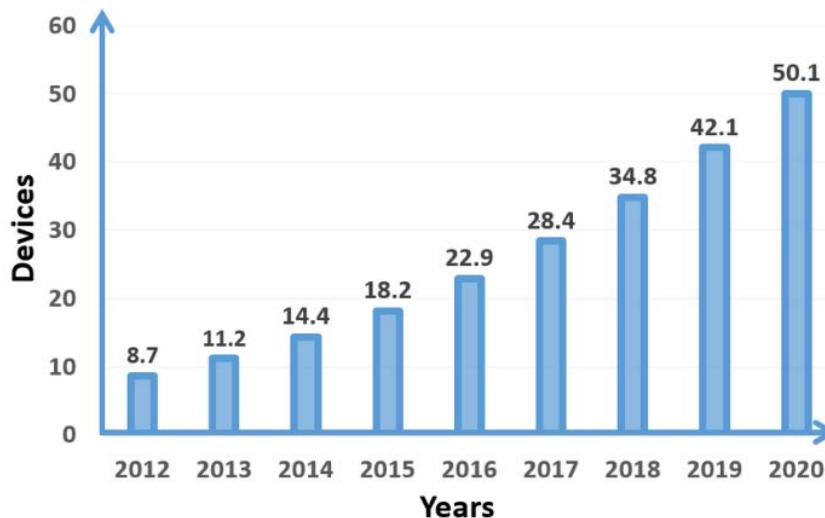
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Why IoT security is important

The internet of things (IoT) is a technology that allows devices to connect and exchange data with each other over the Internet. The devices could be anything from a smoke alarm to a smart lock or smart plug. The IoT concept began as an unfinished idea at the end of the 20th century, but now it has become the future of our existence. The main reason is the newest technological advances and extremely fast growing demand for those goods.

The infographic published on Researchgate.net reveals that the number of connected IoT devices stood at 23 billion in the year 2016. Due to the support from government organizations and major network providers such as Google and Amazon, this number is guaranteed to grow to 50 billion devices by the year 2020 [1].



IoT devices usage has a very huge potential. IoT is going to increase work productivity and efficiency and also reduce accidents resulting from human errors. However, the success of IoT introduction globally is under the threat from the breach of privacy and data security. So, here are some key reasons why IoT security is important.

Data Is More Valuable Than Anything Else

This phrase is almost similar to the phrase “Knowledge is power”, but IoT devices brought its meaning to the new level. IoT technology has been successfully used in different aspects of our life. For example, governments use IoT devices to carry out scouting while medical institutions use IoT devices to identify early cancer symptoms or to control patient’s glucose level and remind him to take the insulin.

These IoT devices are designed to exchange such data with other devices in different areas. Let us look at the smart car business. Smart car manufacturers create them with the ability to capture data from cars and this brings an opportunity to get car-to-car communication used for traffic compliance and smart parking services. Car

insurance companies may also be interested in such data while determining whether the policy holder can claim compensation in the event of an accident.

The huge amount of valuable data exchanged between different IoT devices makes them a sweet target for hackers and fraudsters. This data can compromise entire companies and government agencies, if it falls into wrong hands.

IoT Device Vulnerabilities

IoT tech is still in its developing stages. Take the development of a baby monitor, for example. Companies still face problems such as lack of adequate hardware, which is powerful enough to analyze and encrypt data, but yet small enough to fit inside the limited space. Hackers can monitor your house through such unsecured devices simply connecting to your home WI-FI.

Also, IoT manufacturers base their programming protocols on their host's ecosystem such as Google, Apple and Amazon. And due to the lack of synchronization between platforms. it is very hard to create universal security protocols. As a result, hackers have multiple platforms from which they can breach the devices and steal data worth billions.

Difficult to Encrypt

IoT devices are basically single-purpose computers built without a lot of memory or processing power that run on weak hardware. Due to that, their encrypting is very hard. That makes IoT devices an easy target for different kinds of attacks. In fact, a recent research found that of 56 million tracked IoT devices, 91.5% of data transmission was unencrypted [2].

Nobody can now deny the fact that the IoT will become an important part of our lives very soon. So, its security needs serious attention and needs to be addressed with the active participation of the entire global technology community. Companies, governments, healthcare institutions should follow the best possible security measures and should instill confidence in customers that their data is in safe hands.

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Machine learning. The Curse of dimensionality

Neural networks (NN) are artificial intelligence where phenomena similar to those occurring in the neurons of living things are used to process signals. The main functions of the NN can be listed as following:

- approximation to solve problems of modeling, identification and signal processing;
- classification and pattern recognition to solve problems of diagnosing object state;
- forecasting to assess the future behavior of the system by existing sequence of its previous states;
- identification and evaluation to solve problems of controlling dynamic processes;
- associative management.

Nowadays over 300 well-known international firms are involved in this field, and their number is constantly increasing. Among them such big corporations as Intel, Amazon, IBM, Motorola and others should be mentioned.

But in order to make the neural network work, it must be trained and this process is called machine learning. In this case, a number of difficulties arise and **curse of dimensionality** is one of them. This problem is associated with an exponential increase in the amount of data due to an increase in the dimension of space.

To substantiate this phenomenon let's consider the unit interval $[0,1]$. 100 evenly distributed points will be enough to cover this interval with a frequency of at least 0.01. In the case of 10-dimensional cube 1020 points are required to achieve the same degree of coverage. That is, in comparison with one-dimensional space, exceeds the size by 1018 points.

The curse of dimensionality is especially evident when working with complex systems described by a large number of parameters. This entails the following difficulties: the complexity of computing and necessity to store a huge amount of data. In linear classifiers, an increase in the number of features leads to the problems of multicollinearity and retraining. This problem can be solved by reducing the dimension of space, namely, by projecting data onto a subspace of lower dimension.

Reducing dimensionality in machine learning involves a reduction in the number of attributes of a data set. Its presence can be a sign of redundant, uninformative, or poorly informative efficiency reduction of the model, and after such a conversion it becomes simpler, and accordingly, the size of the data set in memory is decreased and the operation of the algorithms on it is accelerated. Dimension reduction can be carried out by the methods of feature selection or feature projection.

Feature selection

Feature selection methods fall into three categories: filter methods, wrapper methods, and embedded methods. Filter methods are based on statistical methods and, as a rule, consider each feature independently. They allow you to evaluate and rank features by significance, for which is taken the degree of interconnection of this feature with the target variable. As an example let's consider an information gain:

Y is a random input variable, X is a known random variable. The difference in conditional entropy with the usual entropy of feature Y shows whether there is an interconnection between the values of X and Y, and how large it is. This is evidenced by the value of information gain, which is found by the formula:

$$IG(Y|X) = H(Y) - H(Y|X)$$

Where $H(Y)$ is specific conditional entropy and $H(Y|X)$ is conditional entropy.

The larger the IG parameter, the stronger is the interconnection. Thus, we can easily calculate the information gain for all features and throw out those that weakly affect on the target variable. As a result, we reduce the calculation time of the model and retraining risk.

Wrapper methods

The essence of this category of methods is that the classifier is launched on different subsets of the features of the original training set. After that, a subset of features with the best parameters on the training set is selected. And then it is tested on a test set (test set is not involved in the process of choosing the optimal subset). Recursive feature elimination being an algorithm that gradually eliminates features from the total can be used as an example. This method requires choosing a classifier with which features will be evaluated, for example, linear regression.

Although the exclusion method tracks the interconnection between features better, it requires much more computation than filtering methods. In addition, in the case of a large number of features and a small training set, these methods have the risk of retraining.

Embedded methods

The main idea of the embedded methods is an opportunity not to separate the selection of features and the training of the classifier, but to make a selection within the process of calculating the model. The main method from this category is regularization. There are several varieties of it, but the basic principle is general. If we consider the work of the classifier without regularization, it consists in constructing a model that would be best tuned to predict all points of the training set.

For example, if the classification algorithm is a linear regression, then the coefficients of the polynomial are selected thus approximating the dependence between the features and the target variable. The root mean square error acts as an assessment of the quality of the selected coefficients

So the idea of regularization is to build an algorithm that minimizes not only the error, but also the number of variables in use.

As an example Tikhonov regularization method can be applied. If in the test set a matrix of features A and a vector of the target variable b are given, then we are

looking for a solution in the form $Ax = b$. During the operation of the algorithm, the following expression is minimized:

$$\|Ax - y\|^2 + \alpha \|x\|^2$$

Where the first term is just the root mean square error, and the second is the regularizing operator (the sum of the squares of all coefficients multiplied by alpha). During the operation of the algorithm, the sizes of the coefficients will be proportional to the importance of the corresponding variables, and those that give the least contribution to eliminating the error will become near-zero.

The alpha parameter allows you to adjust the contribution of the regularizing operator to the total amount. With it, we can specify the priority - the accuracy of the model or the minimum number of variables in use.

The projection of features converts data from a high-dimensional space to a small-dimensional space. The data transformation can be linear, as in the principal component method (PCA), but there are a large number of non-linear dimensional reduction techniques, in example singular value decomposition (SVD).

Principal component analysis

The principal component method projects data into a smaller space while maximizing data dispersion in a small space. In calculations, the covariance matrix is constructed and the eigenvectors of this matrix are also found. Eigenvectors that correspond to the largest eigenvalues (main components) are used to obtain a part of variance of the source data. The total source space is reduced while losing some of the data leaving more important.

Singular value decomposition

Any matrix (real or complex) is represented as the product of three matrices:

$$X = U\Sigma V^*$$

Where U is a unitary matrix of order m ; Σ is a matrix of size $m \times n$, on the main diagonal of which there are non-negative numbers called singular (elements outside the main diagonal are equal to zero - such matrices are sometimes called rectangular diagonal matrices); V^* is a conjugate transpose to V matrix of order n .

For the task of reducing the number of measurements we just use the matrix Σ , whose elements, being raised to the second degree, can be interpreted as the variance that each component “puts” into the common cause in descending order.

It should be concluded that the curse of dimension is a very serious problem in machine learning and without knowing its solution, further deep learning will be very difficult or even impossible due to the technical limitations of modern computers. But fortunately, there are a lot of solution methods already integrated into the development environment from which the user can choose the best method for him or use them manually, for example, the methods of feature selection or feature projection.

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Choosing a supplier by the method of hierarchy analysis

The purpose of the research work is to make the best choice of a supplier for the construction company, taking into account all the advantages according to the given criteria [2].

The urgency of the task is determined by the need to create and maintain rational and stable relationships with suppliers in the market economy. The object of this study is LLC "UKRSITSTROY", which provides services in construction, design, engineering research, technical supervision and wholesale.

1. System analysis of LLC "UKRSITISTROY" activity

During the analysis of the enterprise, the objectives of the model, the functional activities of each of the enterprise units and the functional interactions between them were identified. Fig. 1 shows information flows within and between units, external objects and external informational influence, as well as normative and reference documentation, automation tools and data available at the enterprise [1].

The next step included the decomposition of the top-level diagram that contains four processes: acceptance of orders (tenders), the choice of the work type, the selection of staff and the work performance.

As a result of the analysis, the problem of the proper sand supplier selection was defined. This problem is a part of the "Work performance" block.

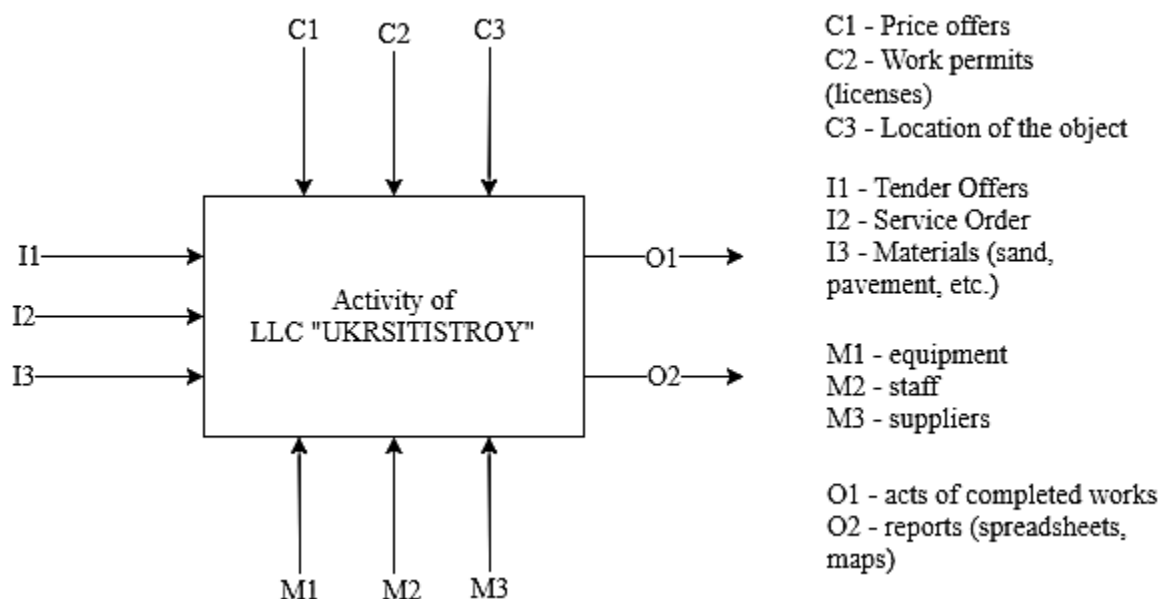


Fig. 1 The model of LLC "UKRSITISTROY" activity

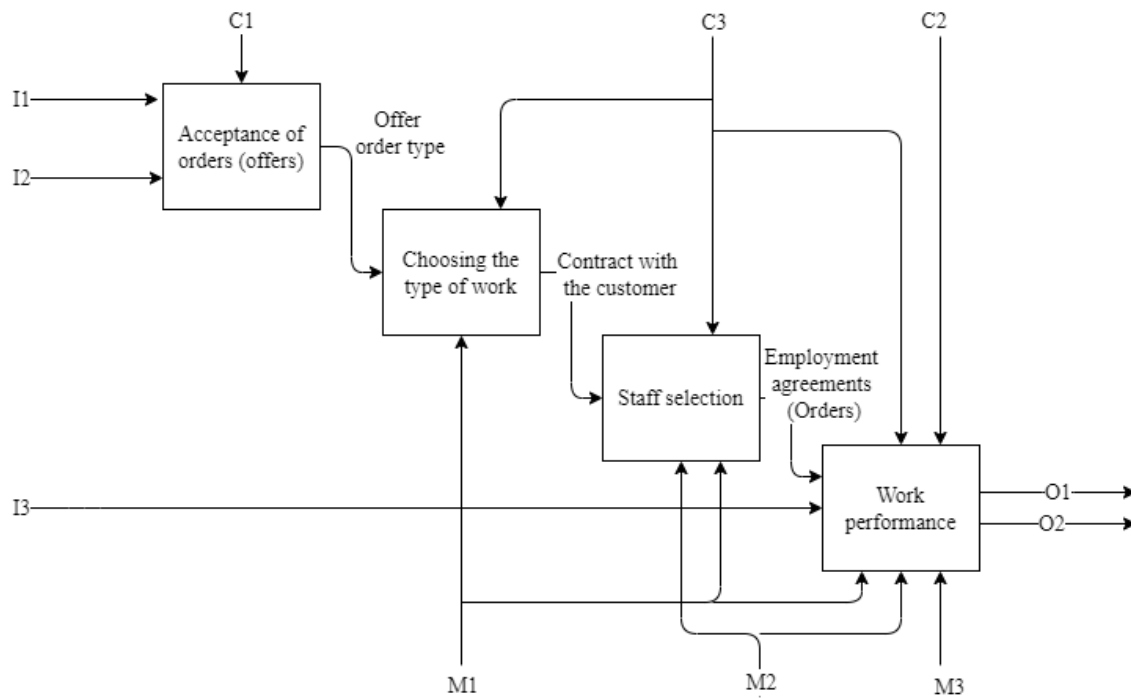


Figure 2. Decomposition of the model

2. Making the optimal solution by the method of hierarchy analysis

The company is tasked with selecting the best sand supplier for construction work. The following criteria are used to evaluate the bids of the bidders: the quality of production, cost and reliability of deliveries, financial conditions of the enterprise, and the level of service.

Supplier estimates for each criterion are known. It is necessary to make a rating of suppliers and to choose the best variant. Six enterprises (P1, P2, P3, P4, P5, P6) have been considered: P1 - Phoenix Construction Base, P2 - Stroydostavka LLC, P3 - Wholesale and Retail Warehouse Stroy, P4 - IE Kuznetsov A.N., P5 - PE "Vtorchermet", P6 - LLC "Epicenter".

The quantitative measurement of the potential supplier performance is summarized in Table 1.

Table 1 Quantitative characteristics of the supplier selection criteria

Sand supplier	Unit cost, UAH	Shipping cost, UAH	Delivery time, days
P1	20,8	73	3
P2	17	68	1
P3	16,8	72	2
P4	16	66	2,5
P5	16,5	70	4,5
P6	18	75	2

Let us accept the following hypotheses:

- ⤴ the object of modelling is the selection of the best alternative;
- ⤴ the supplier selection committee pre-selected six alternative suppliers - P1, P2, P3, P4, P5, P6 from several possible variants;
- ⤴ three main criteria that influence the decision on the selection of the site for construction were identified: K1 - cost per unit of production, K2 - cost of delivery, K3 - delivery time.
- ⤴ estimates are based on experimental measurements of w_i , $i=\overline{1,6}$, where the weights of the elements are calculated according to the following formula $a_{ij} = w_i/w_j$ [3].

Based on these hypotheses, the following benefit hierarchy has been developed [3] (Fig.3).

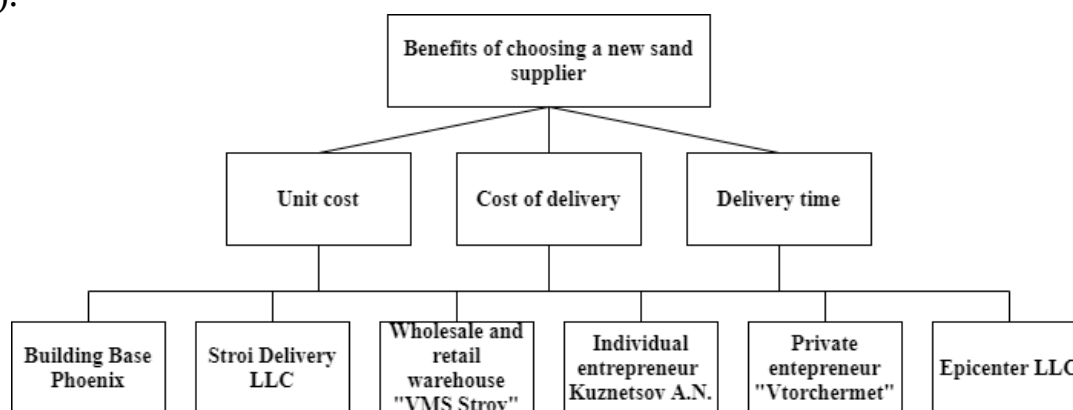


Fig. 3. Benefit hierarchy

The calculation results were obtained using the hierarchy analysis method [2]. Mathematical analysis of the three benefit hierarchy criteria (Fig. 3) allowed choosing the best supplier for UKRSITISTROY company (Table 2).

Table 2 Results of calculations

	P1	P2	P3	P4	P5	P6
Benefits	0,046	0,277	0,125	0,343	0,130	0,079

Thus, the algorithm of the method of hierarchy analysis identifies the P4 provider as the best choice, as it corresponds to the highest value of the components of the general priority vector. So, the method of hierarchy analysis has proved its efficiency in business data analysis and can be used to make managerial decisions in any business area.

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Artificial Intelligence in art

The first patterns of art originated from the very beginning of human civilization, when the first goal of people was surviving. Cave paintings can serve as the example of this kind of art. However, even these patterns could not be achieved without the cognitive qualities developed in the process of survival in the wild: memory, language, understanding, reasoning, learning, expression, and pattern recognition. And precisely these qualities are tried to be developed in artificial intelligence.

One of the techniques that artificial intelligence now being taught is called style transfer. This program determines the style of the picture and applies it to another image. Several paintings can be chosen from the main style and further the algorithm creates its own style and applies it to the picture. With the help of such programs, for example, a program developed by Google AI, you can create new interesting paintings with unique styles.

A similar algorithm can also be applied to music. Some programs allow a person to control the process of mixing styles, for example Beat Blender from Google Project Magenta. They created an interactive demo that you can use to create two-dimensional drum rhythm palettes and compose new music. There are also programs that allow you to edit the time of day, time of the year and even the weather in the photo. As an example such programme as Nvidia can be given.

However, artificial intelligence cannot be applied only for editing photos, but it can help humans create something new as well. Such programs already exist and allow the developer to control such issues as what instruments should be applied to compose the melody, the rhythm and style in order to generate new music. Some sounds can be achieved only when working with similar programs. The musicians can feel themselves as composers by simple finger swipe across the touchscreen. Thus, AI becomes a full-fledged partner of a person in the process of creating art.

Artificial intelligence as a creator is still an unknown field for us, yet some researchers tried to teach the AI to create something new that can be considered as art. To create artificial intelligence, artists write algorithms not to follow a set of rules, but to “study” a certain aesthetic by analyzing thousands of images. The algorithm then tries to generate new images in accordance with the aesthetics that he has studied.

To begin with, the artist selects a collection of images for presentation according to the algorithm. Most AI jobs over the past few years have used a class of algorithms called generative adversarial networks (GANs). First introduced by computer specialist Ian Goodfellow in 2014, these algorithms are called “adversarial” because they have two sides. GAN learns to generate images through a work of

discriminator and generator. Discriminator has access to a collection of training images, and generator generates random images. The discriminator tries to identify real images among the images that were generated by generator, while the generator tries to generate images that would make the discriminator think they are real. For example, an artist could use portraits of the last 500 years in the generative AI algorithm. Algorithms then try to simulate this input, creating a range of output images. The artist must sift through the output images and select the ones that he wants to use.

The proposed GAN systems were successful in imitating the process of learning. But GAN systems were not motivated to create something new. The generator just creates images that look like already existing art. Nothing pushes the generator to explore and create something unique and new.

The second system, like GANs, has two opposing networks, a discriminator and a generator. The discriminator has access to the library of art related to different styles, like renaissance, baroque, impressionism, expressionism, etc. and using these images it learns to define styles. The generator does not have access to any art. It generates random art and it receives two signals from the discriminator for any work that it generates. The first signal defines whether the generated image can be considered as a piece of art. The second signal measures the confusion of the discriminator when it is trying to identify the style of the generated art as one of the known styles. The generator uses this information for learning to generate art styles. It tries to trick the discriminator make the created work be considered as art and be attributed to some particular art style. Researchers trained the proposed model on 80,000 images of Western paintings from the 15th to 20th century. The AI succeeded in creating art that was considered something new. The generated images had strange form that could not be seen previously in existing art shapes, genres, styles or objects. The model learned to generate objects that looked like art.

Furthermore, some kind of statistical data was obtained by making survey to define either the art was created by human or by AI. The purpose of the research was to evaluate the AI ability to create new arts, and the result was obtained by comparing new arts with existing ones without any particular art style. This was substantiated by necessity to define the ability of the AI for generating paintings that look similar to other styles of paintings.

Two sets of art created by human artists have been chosen. The first set is a collection of masters of abstract expressionism and the second one is a collection of paintings shown at Art Basel 2016. According to obtained data, people believed that the created images were drawn by a human in 75% of cases, (85% for the first set and 48% for the second).

In another experiment, some participants were asked to find works of art having a visual structure, being communicative and inspirational. The goal was to judge whether created images could be considered as art. And, surprisingly, people rated the images generated by the system higher than the images drawn by real artists in both sets. Based on the test results, we can conclude that images generated by AI are assumed as the pieces of art.

But can these works be actually called “art”? According to Sean Dorrens Kelly, a professor of philosophy at Harvard, the answer is a definite “no”. And he wrote about it in his new MIT technology review. So, Kelly argues that AI may be able to reproduce Bach’s cantata well or play a game well, but AI will never be an “autonomous creative agent” like a free-thinking person. The answer lies in creativity and depends on human’s assessment. However, thanks to new technology, we begin to value creativity much less. Kelly believes that AI will never reach the human level of creativity. We run the risk of replacing our own creativity with "machine."

“Human creative achievements, thanks to their social significance, are not inferior to new developers in the field of artificial intelligence,” the philosopher writes. “To say the opposite means to not understand what our creativity means.”

A new report from Adobe found that the majority of creative professionals like artists, designers, and illustrators do not worry about being replaced by AI. And most of them believe that AI will help them be more creative and can free them from some parts of the routine processes. An illustrator, instead of shading the background of an image, might develop a new concept for a character. A designer, instead of labeling hundreds of different Photoshop files, might get home a little sooner.

According to Andreas Pfeiffer, the lead author of the Adobe report, machines and technologies like AI can enhance human creativity and manage tedious tasks, but fortunately a human’s creative spark can be replaced.

And most of the artists think similar as there is still something human in the process of creating art. Christoph Gey, a freelance art director in Germany outlines that personal creativity cannot be imitated by technology only by applying designer tools. People from the report believe that AI will help them get rid of useless work and increase the productivity. However, AI can already produce the final product, which makes sense considering the fact that their livelihoods depend on not just making art, but also pitching and selling it. Factually, machines are already producing and selling art. AI-made music is getting thousands of views on Spotife, paintings generated by AI are now can be seen in art galleries.

Creativity is, indeed, an abstract sence. But is should be empasized that our thoughts and opinios about creativity might be changed with each passing year with sustainable automation development. It is too early to say something definite and unambiguous. Philosophers and art industry workers believe that there are still many years to this point and it can easily happen with a paradigm shift.

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SVD algorithm as a development tool for a recommendation system

Every day millions of people search the Internet in order to find the information they need. And their requests are processed and satisfied accurately due to the use of machine learning algorithms in search engines. What is more, modern algorithms are constantly adapting and transforming in the course of their work. Therefore, it allows them to better understand the user and even offer products or services, which, in more than 50% of cases, will be relevant to the specific user needs.

One popular category of Internet searches includes movies and music. Therefore, creating a recommended film search system within a well-known database can be demanded.

A recommendation system is a set of algorithms, programs and services aimed at predicting which products or services will be interesting for a user. This prediction is based on the information from the user profiles or other data. Such systems are conventionally divided into four types: collaborative filtering, content-based systems, knowledge-based systems, and hybrid systems that integrate the basic principles of the first three types in one way or another. The present study deals with the recommendation system based on the collaborative filtering method, which analyses the ratings given by both the target user and other users as well.

The subject matter of this study is a set of films and users, as well as film ratings provided by these users. To bring more convenience to the study, the data are presented as a matrix of users and movies with the film ratings at the intersection:

	A	B	C	D	E	F	G	H	I
1		La-La-Land	The Notebook	500 Days of	Pride & Prejudice	Ocean's 8	Now You See Me	King Arthur	Troy
2	George	7				9	9	6	
3	William		7			8	7	6	9
4	Michael	8				1	9	8	
5	Annis							8	
6	Ashlynn	10		6	7	8	7	9	
7	Shona		7	5		8			
8	Oliver	2	3			10	10		5
9	Peter	1	2			7	8	5	
10	Elizabeth	10	10	9		8			1

Fig. 1. Example of data input

However, it often happens that a rating matrix is high dimensional and sparse: it means that it has many zero elements due to the lack of ratings from many users for

a big number of content units. In this case, it is recommended to reduce the rating matrix dimension so as to retain as much useful information as possible.

The next step involved defining the concept of Data Mining and its tasks. After that the classification of recommendation systems, their scope and work principles, as well as the concept of collaborative filtration, its types and methods were considered.

Recently, matrix decompositions have become the mainstay of numerical methods in linear algebra and they are used for solving many problems. From the multiple matrix decompositions, a singular value (SVD - singular value decomposition) takes a particular place. It is a factorization of the matrix A into the product

$$A = U\Sigma V^T,$$

where U and V are unitary matrices, and Σ is a diagonal matrix.

Singular decomposition is used to solve a variety of problems - from the least square approximation and equation systems to image compression and recognition, as well as in many other areas such as text mining, signal processing and images, etc. So, the geometric interpretation of this algorithm and its various types were described.

As a result of the research, the optimal algorithm of the recommended film production system was chosen - the economical type of the algorithm of the singular decomposition:

$$A_{m \times n} = U_{m \times r} \Sigma_{r \times r} (V^T)_{r \times n}$$

Fig. 2. Economical type of SVD

Using this algorithm and a modified Gauss algorithm, so-called "noises" were removed from the original data. Noises are uninformative data that minimally affects the quality of recommendations.

Similarity estimates of two randomly selected users were calculated. In addition, for each of them the users closest in preferences were found. The two types of recommendations were compared: those based on all users and movies and on data that discarded insignificant elements.

After the removal of users with insignificant data, the estimates of user similarity, as well as recommendations changed slightly, proving that it was the "noise" that had been previously removed, not the relevant information. Otherwise, the exclusion of important data would have greatly altered the results of the studies.

Thus, the chosen method of discarding insignificant information works properly and can be used in a variety of areas, including financial analysis, online shopping, marketing research, shopping habits, etc.

The development of the software that automates the recommendation-making process, thereby reducing staff costs and reducing the time required to complete operations, will increase the cost effectiveness.

The practical value of the project lies in the development of software that can compare recommendations based on complete and concise data, determine the feasibility and effectiveness of using a particular type of data.

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Applying artificial intelligence in medical area

The implementation of artificial intelligence (AI) systems in medicine is a very important aspect of modern healthcare. Today, AI technology is used in the areas of diagnostics, drug development, and medical imaging. AI-based devices can learn, process large amounts of data, and make decisions on their own. Such technologies are seriously changing the health care system, which allows changing the diagnostic system, developing new drugs, and improving the quality of medical staff services, reducing the costs of medical facilities.

Let's consider such aspect as AI diagnoses. AI algorithms are already in full use in medical practice, helping doctors identify diseases and prescribe treatment. IBM's Watson Health platform is used by clinics in such countries as the USA, India, and Thailand. A program based on it can diagnose cancer or heart problems of patients. The development of TeleMD also provides the diagnosis of complex oncological diseases, and assesses the risks of their development as well. DeepMind's health team has recently joined the Google Health family and operates in a British ophthalmology clinic, diagnoses certain eye diseases and recommends treatment.

BIDMC microbiologists have developed a smart microscope that uses AI to detect fatal blood diseases. Its neural network has studied 100 thousand images with harmful bacteria and is now able to sort them by visible signs with an accuracy of 93%.

AI tracks

Based on AI, developers release programs to monitor the condition of patients. Doctors examine the results and then conduct experiments. The professors from Duke University have created Autism & Beyond and mPower apps that track the symptoms of autism and Parkinson's disease, allowing them to improve their diagnostic methods. Later, Apple developed the Health Records API based on Autism & Beyond so that users can share data with medical researchers even through third-party applications.

Scientists from the Massachusetts Institute of Technology, together with specialists from the Central Hospital from the same state, created an AI system for monitoring sleep. It tracks radio signals reflected from a person, analyzes the pulse, respiration rate and it is able to distinguish deviations from the norm. The development will help doctors remotely monitor patients' sleep and, if necessary, adjust it.

AI predicts

In 2018, the American medical journal Anesthesiology published the results of an AI study. Such issue as a machine learning algorithm for predicting low blood pressure during surgery is considered. AI is reported to process data of more than a

thousand patients, who spent a total of almost 10,000 hours on the operating table. This algorithm learned to predict anomalies 15 minutes before they occurred with 84% accuracy, with the same accuracy - in 10 minutes, and from 87% - in 5 minutes.

Qventus is a system of interviews for hospitals from a startup of the same name. It monitors the actions of clients from recording in the registry to discharge, predicts the deterioration of patients' well-being and analyze their conditions. Also, with the help of this system, the Mercy Clinic reduced the number of unnecessary tests by 40% over 4 months based on similar customer complaints.

Jvion's machine-learning solution identifies patients at risk of re-admission to the hospital within a month of discharge. In addition, it provides advice on health care and disease prevention.

AI discovers

Large pharmaceutical companies like Sanofi or Novartis are turning to medical technology startups to create new drugs. Biochemicals manufacturer Roche bought Flatiron Health, a company that uses machine learning to analyze data.

Since 2012, Atomwise startup has been using AI to search for more effective drug formulas. His AtomNet training system checks 10 million chemical formulas every day, predicting which ones will interact best. A similar program is used by the biopharmaceutical company Berg Health.

The compounds found can be effective in combating the cause of the disease, but there is no guarantee that a person will not be allergic to them. NorthShore Medical Center deals with pharmacogenomics studying the effects of drugs on individuals as part of the MedClueRx project. The program determines which drugs are suitable for a particular patient with various diseases.

The scientific journal Nature Microbiology has published the results dealing with the VarQuest algorithm. According to their research different antibiotic options can be found as much as 10 times fast than before it was found for all the time of similar requests.

AI assists

Programmers use AI technology to create smart assistants for widespread use: from personal doctors to robotic surgeons.

Woebot is a chatbot to fight depression from Stanford University psychologists in collaboration with AI experts. It works on the basis of cognitive-behavioral therapy, which can change patterns of behavior and destructive stereotypes. A similar application is developing a startup Wyse.

The "DOC + Mobile Clinic" from a Russian startup allows you to remotely consult a doctor, call a specialist at home, and reserve medicines in pharmacies nearby. The program also creates an individual electronic medical record, available only to the user, which can be shared with the doctor. Da Vinci is a well-known robot surgeon with AI, working in more than one hundred clinics around the world. SenEnthance from TransEnterix successfully conducts simple operations.

Medical Futurist Bertalan Mesco once said that AI is a 21st century stethoscope. He implied that at first the medical community did not want to recognize such a simple instrument as a stethoscope. It took several decades for doctors to start

using it. The same thing is happening with AI: someone uses it to the extent possible, while someone is afraid of it. However, the technologies of AI, machine learning and neural networks greatly simplify the lives of doctors and their wards. Innovations in medicine make it possible to more accurately diagnose diseases, find medicines faster, and monitor the condition of patients. And this is only a small part of the capabilities that AI has brought to the field of health.

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Research on actual vectors of attacks on the Internet of Things and the main mechanisms of protection

The Internet of Things (IoT) is growing rapidly due to the proliferation of information and telecommunications technologies, the availability of devices and computing systems. IoT security is a concern for the protection of the IoT hardware and networks. However, since the idea of network devices is still relatively new, currently not enough attention is given to the safety of these devices.

The examples of the existing IoT systems are self-driving vehicles (SDVs) for automated automotive systems, microgrids for distributed energy systems, and Smart City Drones for surveillance systems. A cyber-physical system is a microgrid that connects all distributed energy resources (DERs) together to provide a comprehensive energy solution for the local geographic region. The IoT microarray system uses the Supervisory Control and Data Acquisition (SCADA) system. Integration of the physical and cyber domain increases the possibility of attacks: cyberattacks can target SCADA control and paralyze the physical domain, or physical devices can be tampered with or compromised by affecting the control system. At present, the drone market is moving towards the introduction of automation techniques and can be integrated into firefighting, police, smart city surveillance and emergency response. As municipalities and citizens begin to rely on such a system, it will be critically important to keep the system dependable and reliable.

Nowadays, academic research on the power supply of the confidentiality and safety of the IoT systems has reached positive infringements. At present, the best practices are based on the most common methods of network security. However, the use of security mechanisms in the IoT system is more difficult than in the traditional network, due to the heterogeneity of devices and protocols, as well as the scale and number of nodes in the system. The problems of improving IoT security, that are related to physical communication, heterogeneity, resource constraints, privacy, large scale, trust management, and security preparedness, are explained in detail [1].

The studies [2], [3], [4] assess the potential threats to the IoT systems according to TCP / IP stack layers and describe available countermeasures. A key factor in the rapid progress of IoT security research is the availability of a tool for modeling the IoT networks. A comprehensive list of simulators used in current research is presented by Chernyshev [4]. Due to the use of the simulation of the IoT networks and the security mechanisms an adequate assessment of the IoT security, an identification, and a study of major attack vectors become possible.

The IoT security issues are relevant at all major layers of the TCP / IP stack. For example, the lack of "transport" encryption refers to unsecured communication

between a device and a Cloud Storage, a device and a gateway, a device and a mobile application, a device and another device.

A popular vector for accessing IoT devices is possible due to inadequate authentication and authorization procedures. MQTT, DDS, Zigbee, and Zwave are the protocols that support authentication in current IoT systems. However, even if the developer provides the authentication tools needed to communicate on the Internet, there are still opportunities to steal the connection. The dangerous network services can expose the threat of the probating and spreading the network.

An insufficient security configuration is explained by the built-in privileges commonly used on IoT devices. This makes the user's credentials being easily compromised by using the same password across multiple devices. Bad physical security is another vector of the attack caused by a hardware vulnerability. The main obstacle in device encryption is explained by the simplicity of the sensors.

Dangerous web- and cloud- interfaces are vulnerabilities that can be exploited to create an attack on a software level in the IoT system. Therefore, cloud gateways must be equipped with security mechanisms to limit the possibility of unauthorized users (intruders) from changing configurations. One of the best security mechanisms at the software level is the use of biometrics and multi-level authentication for access control. Because of the rapidly changing trends in security threats current security issues are researched according to the level and possible countermeasures [2]. Some current problems and proposed countermeasures are discussed in [3].

The development of current IoT security mechanisms is in constant improvement. The main protection mechanisms are described below:

- Authentication. The process including the identifying of users and devices on a network and providing access to authorized persons. This is one of the ways to mitigate attacks on IoT systems (Man in the Middle, Sybil). Authentication is currently the most popular method of gaining access to the system by the user at the application layer, as well as providing access to the device on the IoT network.
- Encryption. The nodes are encrypted when reaching the target security. In case the IoT encryption aims to achieve efficient low-energy interaction, symmetric and asymmetric IoT algorithms are designed to satisfy the necessary requirements [5].
- Trust management. The purpose of the IoT trust management is to identify and eliminate malicious nodes and to provide secure access control. Automated and dynamic trust calculations to validate the trust values of IoT nodes are the most up-to-date in trust management research. However, nowadays most research is focused on identifying malicious nodes.
- Safe routing. Scalability, autonomy, and energy efficiency are important for any routing solution. Due to the large scale of IoT networks, the IP addresses of these devices are IPv6 based, that provides a more robust and improved packet routing model.
- New technologies. There are two basic types of new technologies. Software-defined network (SDN) and blockchain are some of the most popular new

technologies that combine perfectly with IoT security solutions. The main idea of SDN is to separate network control and data management (both centralized management and dynamic network management are possible to solve problems in the IoT environment, such as resource allocation on IoT devices). Blockchain is the basis of cryptocurrency. The IoT applications use secure and private transactions as well as decentralize communications and processes. Blockchain implementation is very successful in financial applications.

The result of this study is an overview of current trends in IoT security research. Various information sources on IoT security to identify major vectors of attacks and IoT security issues have been reviewed. The basic mechanisms for protecting IoT security, their bases and features of operation have been established.

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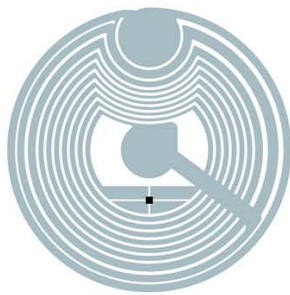
NFC Technology Security

The active use of NFC has become a commonplace when it comes to paying for goods and services. In terms of marketing, it is easier to pay and reduce the time spent on this process, from the financial side it is a universal means of password-free payment. It also means the use of the latest technologies in everyday life. The security of use is a key issue in the consideration of common NFC technology.

NFC (Near Field Communication) is a short-range wireless high-frequency communication system that allows data to be exchanged between devices within 10 cm [1]. This means that NFC gadgets can be used to pay for purchases and non-contact services, get more product information etc.

The principle of NFC action is similar to Bluetooth. However, when connecting to another NFC device, it is not necessary to spend a lot of time for identification, the connection is established almost instantly (for the tenth fractions of a second). For data transmission, NFC uses encoding with different modulation rates depending on data transmission speed. At the same time, NFC devices are able to both receive and transmit data. Thus, they can control the radio-frequency field and reveal discrepancy, if the received signal does not match the transmitted one.

Three types of NFC technology are used in Ukraine (Fig. 1).



in the form of a tag



in the form of a card



in the form of
the mobile device

Fig. 1 Types of NFC technology in Ukraine

The NFC in the form of a tag is activated when an active NFC reader is brought to it, while it is transferring all the information to it. Such tags are used for reading only.

The NFC in the form of a card works using the same principle as for the tag. It is used in the bank payment cards, as well as subway travel cards.

The NFC in the form of the mobile device means that the mobile device itself supports NFC technology, which allows you to:

- transmit data using the NFC chip and Bluetooth (or Wi-Fi);
- read NFC tags for additional information (used in modern museums and in the European cities instead of commemorative tablets);
- emulate virtual cards to pay for goods and services [2].

Currently, there are two electronic payment systems in Ukraine: Google Pay (for mobile devices running Android) and Apple Pay (for mobile devices running iOS/iPadOS/WatchOS).

Successful use of NFC technology leads to its widespread use, for example:

- to control access to the rooms or to the territory (large objects - the plants, hotels, hostels, aquaparks, public events - concerts, exhibitions, the summits, information security events, ski resorts, the Olympic Games and other sporting events);
- to control access to cars and their subsequent management;
- to manage smart houses;
- to make payments in the transport (transport cards, e-tickets);
- to track goods;
- to identity cards.

To display the dynamics and popularity of the contactless payment, Mastercard Ukraine conducted a study and estimated the number of payments using NFC technology in the Kyiv metro [3]. The data can be presented as follows (Fig.2).

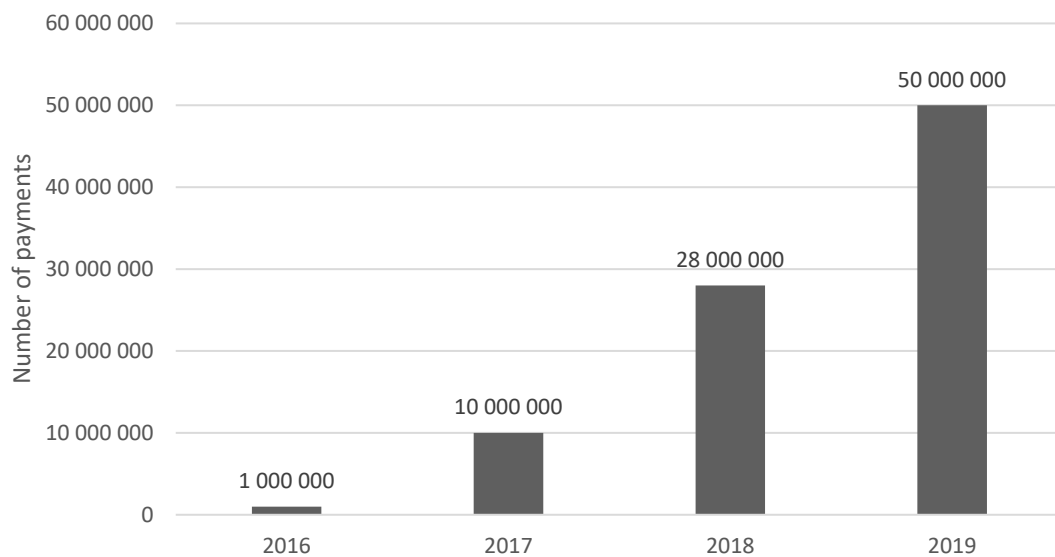


Fig. 2 Contactless payment dynamics in the Kyiv metro

The bar chart illustrates the dynamics of contactless payment in the Kyiv metro from 2016 to 2019.

In 2016, when the contactless payment system in the subway was just introduced, Kyivans made about 1 million payments. In 2017, this indicator rapidly increased 10 times and already totaled 10 million payments. Compared to 2017, contactless payment usage soared by 18 million payments in 2018. In 2019, the studied indicator stopped at a record value in the history of Ukraine and came to 50 million contactless payments in the subway.

Analyzing previous years and taking into account the interest of the current government in digitalization, it is possible to predict that in 2020 the number of contactless payments in the Kyiv metro will reach a new peak.

The widespread use of NFC technology offers a wide range of criminal capabilities. In terms of information security, the main weaknesses and disadvantages of NFC are connected with the fact that the stack of the NFC protocols does not provide cryptography by transfer. The standards for storing data in tags and cards, and also their emulation do not provide cryptographic protection at storage. A lot of cards, smart cards, and their emulation weak cryptographic algorithms are applied.

NFC services use excessive trust in the information stored on cards and tags, as a result of which data are not filtered. Earlier, when devices for reading and data recording were not so extended to cards, it could be understood. Now, on NFC-enabled smartphones, it is easier to create card emulation and record arbitrary data (SQL injections, service-side commands etc.).

The most widespread attacks on NFC are:

- listening to information transmitted by NFC;
- unauthorized reading of information from NFC devices;
- Lock Attack (transfer of the emulated card (tag) to read-only mode and locking of information recording by the reader);
- Time Attack (in case the card or services expire, the card can be replaced);
- Reply Attack (interception of information and its repeated attacks allowing access to services, goods on behalf of another person);
- Clone Attack (cloning NFC devices);
- Relay Attack (the attacker uses two NFC devices, one of which reads data from the victim's device, transmits the data to the second device, and the other device outputs the received data to the reader and receives the service on behalf of the victim);
- Classical attacks on a server and infrastructure part of NFC services.

The use of NFC technology has become a daily business in the life of the modern person. Today, the use of contactless payment terminals can be seen anywhere: in household appliances stores, supermarkets, boutiques, restaurants, hotels, at gas stations and car washes etc. In this regard, Ukrainian banks are also trying to keep up and offer their customers only the best, namely bank cards with an NFC chip, which can easily be added to smartphones with NFC technology and can be paid for without physical use of the card. However, with the development of technologies and their use in the IoT (the Internet of things) network, NFC device and service developers put the issue of security of data services at the forefront and do not return to it at all. Indeed, the easy use of NFC technology requires high security from theft of funds, personal and sensitive data. The listed types of NFC module attacks will be helpful to developers of NFC devices to address vulnerabilities, and provide organizations using such devices with the up-to-date information on the issue.

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Nanotubes as a new step in the development of computer engineering

Crystals are the main components of any processor. Typically, semiconductors and silicon are used for their mass production. However, at the moment, scientists are faced with the fact that the above-mentioned materials ran their course and are no longer able to move technological progress (in any case, for a reasonable price).

“Every 24 months, the number of transistors placed on an integrated circuit chip doubles”, no longer works. Installing an unlimited number of transistors to infinity is impossible. The reason is the atomic origin of the substance.

It was apparent even to the naked eye that the two leading chip makers AMD and Intel during the last few years have clearly slowed the speed of development of processors. The accuracy of the process has grown to just a few nanometers, but it is impossible to place more and more transistors.

Leading companies and scientists have to look for a substitution for semiconductors in chips to ensure the development of technology. Graphene turned out to be a promising material. However, taking into account the specific structure of graphene, scientists could not find a relatively cheap way of its factory production.

Then, one of the most promising areas became the using carbon nanotubes with their incredible electrical properties and small size (up to 2 nm in diameter).

In transistors made of carbon nanotubes mobility of charge carriers significantly exceeds mobility in traditional silicon transistors.

The first nanotube transistors were created and demonstrated by scientists even in 1998, and in 2013 a group of scientists from Stanford University assembled a full-capacity processor from this material. However, in fact, it solved arithmetic operations even more slowly than a human. This processor consisted of only 178 transistors, and its frequency was only 1 kHz, because at that time, scientists were not able to grow individual nanotubes in the right place (between the gates of the transistor), with the correct orientation (from one gate to another) and in the right quantities (one tube per transistor).

But the importance of this discovery is clear. It laid the foundation for a new prospective direction in the development of technology, since the old ones have obviously become obsolete.

All these problems were solved by the developers of Sky Water together with Analog Devices. Based on transistors made of carbon nanotubes, they developed a technology for manufacturing multilayer microcircuits. Thanks to this, during the DARPA conference in June 2019, the head of Sky Water and MIT employee Max Shulaker showed the first silicon wafer with carbon nanotube processors.

A technological process that can be implemented on modern CMOS chip manufacturing was created. On a crystal, by the usual methods of projection and

etching, metal contacts are created in the form of gates and conductors for signals and power. Then an array of carbon nanotubes is deposited on the crystal, onto which a special material is applied, which has a role of a photoresist. This material links nanotubes and then, with using an ultrasonic treatment, is removed in those places where they are not needed. Places where the tubes are needed (between the gates as transistor channels), the photoresist is additionally processed by washing out a significant part of the extra nanotubes. What remains works as n- or p-type channels.

Conductivity (channel type) is determined by depositing an additional oxide layer on top of the nanotubes. This is similar to doping of semiconductors, since it is impossible to add additional impurities to the nanotubes themselves.

There remains a problem with the purity of the material. For semiconductors, purity is important, but this requirement is not as strong as in the case of nanotubes. Among carbon nanotubes, metallic ones can come across. If there is even one metal nanotube in the gate of the transistor out of hundreds of thousands, then it will significantly change the characteristics of the transistor. It is currently impossible to overcome this problem, but we can use it. The developers have learned to use such "defective" transistors when designing the chip and they work normally in the logic of the circuit.

So, what is the result? Based on transistors made with carbon nanotubes, Max Shulaker's group, using the open RISC-V instruction set, created a 32-bit processor with 16-bit memory addressing. The processor contains 14, 702 operational transistors, which is confirmed by the execution of all 31 instructions from the RV32E instruction set, as well as by running the program with the output of the phrase "Hello, world! I am RV16XNano, made from CNTs". The processor fulfills the usual 32-bit RISC-V instructions without any modifications.

Of course, this is not the most modern processor, but it is a start in a new direction in the development of processors and computer engineering in general.

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Why Developers Should Have a Pet Project

To understand the concept being discussed, it is necessary to clarify what the “pet” part means here. Pet project is a project someone is personally interested in. It is not something a person has to do, but something he actually wants to do. Something he is really passionate about.

When looking for the first job, a lot of beginning software engineers encounter a problem of having nothing to show on their interviews. They may have completed some courses, graduated from the university, but it does not really say anything about their skills if they have nothing of their own to show.

And it is just the first reason why it is recommended to have a pet project. Having a pet project means that a job applicant can talk about it, make references to it when asked about the implementation of some technologies, and it just makes him stand out. It tells the interviewer that this candidate is passionate about what he does. Also, if the project is open-source, it is a good way to keep the GitHub profile active. In this case, it will be a good idea to put the link to this profile into the resume so that the interviewer can check it out before starting the talk.

Let us say some people are just getting started and not ready to get their first job yet. While courses and tutorials are great, they give more theoretical knowledge than practice, and on completion, students often just do not know what to do next. In this case, it is their own project that can guide them from there! When a person has a pet project, he is constantly encountering new problems, and by solving those problems, he learns something new.

If a person is employed, it does not mean that he does not need a pet project. For example, you may not be that excited about the project you are working on at your job, and you have an idea of your own project that you really like, or you just want to learn some cool new technology. You can still build something of your own in your free time. The thing about your own projects is that only you can decide how much time you are ready to spend on them.

Having a side project is not only a good way to learn a new skill, but also to master the existing one. If that skill is transferable to one’s day job, he will see a multiplying effect in his advancement.

And if we analyze some statistics, we can find out that, according to DOU.ua [1], every third developer in Ukraine has some idea for a side project, and every fourth has already brought the idea into life. So, one day, pet project may become an additional or even main source of income. That is how a lot of successful companies like Twitter, GitHub, Unsplash, Udemy, etc. started.

Although it is not a very good idea to think about a pet project as just another way to get some money. It is better to think about money as a nice addition to the project.

What makes a pet project interesting and what keeps a person working on it is that he does not feel any pressure about it, so even if it fails, it is ok. When money steps into the game, the pressure around the project starts building up and it may lose its “pet” part, becoming something actually financially important to the person, so failure will be much more disappointing. A good solution here is not to build a project to earn money, but to see if it can be monetized when some core functionality is already built.

Also, there is no need for the project to be perfect from the very first day. Do not overcomplicate it. Test it and prove that the idea can work first. Doing that will also provide feedback to see what should be improved or reworked. That does not mean, though, that every piece of criticism should be taken into account. Do not let people discourage you just because they cannot see the opportunity where you can.

A lot of people find it hard not to start a project, but to keep working on it. Sometimes the amount of work that needs to be done seems enormous. To prevent that from discouraging you, break it into smaller chunks, sort them from the most complicated to the least and do one at a time. Take the easy ones if you do not feel motivated enough and just start working on it.

It is important though to do it regularly, for example, every Tuesday and Wednesday. Eventually, it will turn into a habit and what some time ago was like something you did not want to do, will now be a part of your daily routine.

Share your work. If people use your project, ask them to share their ideas on how it can be improved, some of them may even contribute to it themselves. Finally, do not hold on to the project if you completely lost interest in it, especially if there is a community large enough to maintain it and a person you trust to manage it. There is no shame in moving on to another project.

There are a lot of reasons to have a side project. Probably the only situation where you might not profit from it is if you have a really interesting job that puts your skills to test where you get to work with technologies you like and you are just enjoying your life as it is.

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Top image classification accuracy through hyperparameter search

Artificial neural networks have revolutionized the field of computer vision. Scholars have showed an enormous number of architectures with hyperparameters to tune. That comes with a tough start to new researches or AI developers. The aim of this work is train top modern deep convolutional neural network architectures and to provide supervision on selecting optimal hyperparameters for practical use and to guide how to select them to achieve best accuracy for the given problem.

In recent years we have seen a major shift from algorithms that were fully based on hand-crafted features in early 2010s to neural-network based approaches. Why? For instance, to us the difference between an elephant and a mouse is obvious, but it's hard to formalize that knowledge in a computer world, where all you get is three matrices of numbers (pixels): one for each of red, green and blue colors. Instead of manual feature engineering neural networks propose a self-learning approach, where a computer tries to learn directly from data.

Yet applying neural networks on practice is still complicated, there are many types, and each type has hyper-parameters to tune. Selecting them wrong might lead to either not-high-enough accuracy or to a model that doesn't learn at all, furthermore one neural network training session can take hours. Here we present an extensive comparison of hyper-parameters used in modern neural networks and show performance comparison on a widely-used academic dataset.

For the neural-network hyperparameter comparison 3 key metrics will be considered: 1) classification accuracy; 2) training time; 3) model complexity.

To cover the widest possible range of the metrics described above, we have selected 2 models. One is AlexNet [1] International ImageNet [2] competition winner in 2012, offers a reasonably small and fast neural network algorithm. Another is ResNet [3] ImageNet winner in 2015, this network is large and quite slow to train, but it's also highly tunable, so it might be possible to achieve a high classification accuracy with low-enough training time for a practical use. Both networks are deep AlexNet has "only" 8 layers and ResNet offers basic building blocks that can be used to compose neural networks of 18, 34, 50 and 101 layers deep. Neural network depth is one of the parameters we will optimize and give guidance on.

The training procedure will be conducted as follows: each of the neural network blocks will be attached to a Dropout regularization module [4] and then to a classification head, outputting probabilities for each of the target classes.

Dropout is a regularization method that aims to hide pieces of image from the classification head module, so that neural network trains to find auxiliary features to correctly classify an image. Dropout probability should be in range $[0; 1)$, where zero means that no features will be dropped and one is that all features will be removed.

Lastly, we have selected Adaptive Momentum (or Adam) algorithm for training [5]. It has two main hyperparameters: learning rate and batch size. As for learning rate parameter, the same selection logic applies as for ordinary Stochastic Gradient Descent algorithm and can be found easily. We will use batch size as the third and final parameter we will provide a guidance on.

For training data, it has been decided to pick a complex dataset, which requires the network to learn fine-grained features that are hard to be manually characterized. A good pick for that matter is Oxford IIT Pets [6] academic dataset. It features examples of 25 different breeds of dogs and 12 cat breeds (37 classes in total).

The first experiment is to compare different neural network architectures based on Dropout regularization parameter. As is known, regularization is an important method to ensure that a complex neural network doesn't overfit, that is, it doesn't memorize training data and generalizes well to a validation dataset. As we found, AlexNet is the most dependent architecture on the Dropout parameter. This could be explained by the fact that AlexNet is a relatively simple neural network, which doesn't need much regularization and beyond that, excessive dropout damages its capability to train. Dropout as low as 0.25 should be used for AlexNet. All of the ResNet-like architectures from shallow to deep cluster closely around 0.94 accuracy point. Any regularization {0.25,0.5,0.75} provides good results, yet when the hyperparameter value set too high, specifically to 0.9, the training procedure doesn't feed enough meaningful information for the network to pick up any useful features.

Next, from quality vs model depth comparison we conclude that AlexNet with accuracy above 86% is still worth to be tried in many practical applications, for instance, when your dataset is small, target system is inexpensive and is low on computational resources or you just don't target state-of-the-art accuracy for your application as it's fast to train (30 minutes on GPU). If that's not enough, attempt training ResNet-18. On datasets of practical size, it is still relatively fast with 49 minutes of training and achieves much higher accuracy. The largest network considered, namely ResNet-101 is mostly impractical to use with its nearly 2-hour training time (table 1).

Table 1 – Generalized architecture comparison

Architecture	Depth	Train Loss	Validation Loss	Accuracy	Time to Train (s)
alexnet	8	0,6392	0,4643	0,8633	1679
resnet18	18	0,2021	0,1999	0,9398	2872
resnet34	34	0,2420	0,1742	0,9472	4300
resnet50	50	0,3219	0,2187	0,9337	6646
resnet101	101	0,1523	0,1901	0,9384	9194

Similarly to the first experiment, we tried investigating whether Batch Size has any effect on neural network training. We have discovered an interesting feature:

increasing batch size greatly improves training time (fig. 1). This contradicts to the classical optimization theory Stochastic Gradient Descent algorithm. At this point the fact that training is performed on GPU should be mentioned. GPU compute is inherently parallel, thus feeding more data allows for the GPU compute engine to distribute workload more evenly and overlap computation for different samples in a batch simple. That means that low Batch Sizes simple do not fully utilize available resources. Thus, from this section, the recommendation would be to use batch size around 16, as higher values don't give any performance benefits.

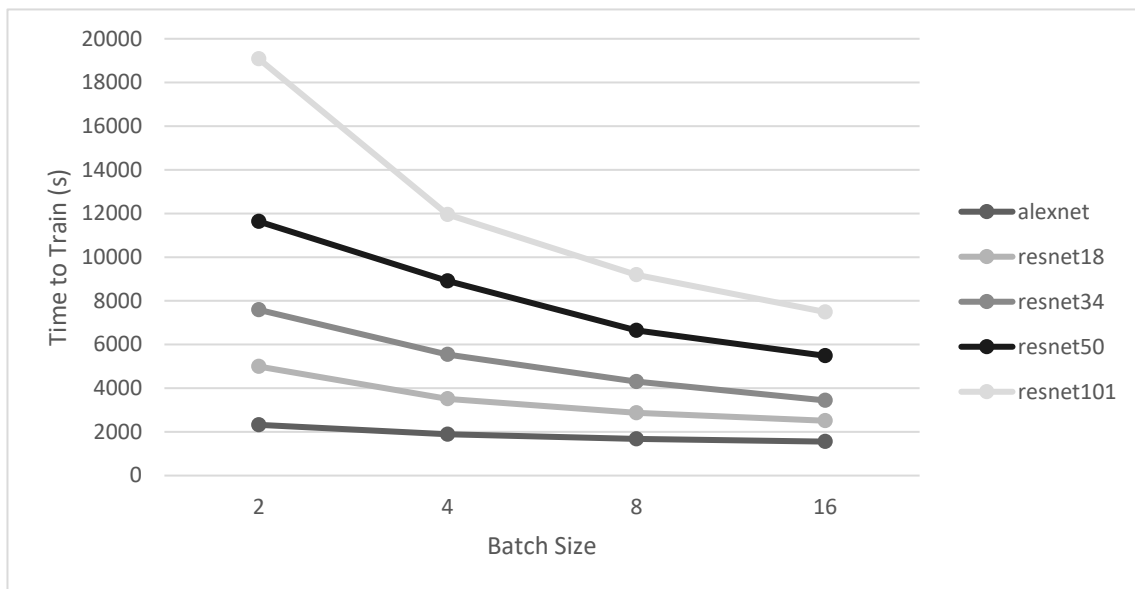


Figure 3 – Training time comparison by architecture and batch size.

Based on aforementioned observations, we have come up with recommendations for neural network architecture and key hyperparameters. As shown, AlexNet seems to be a good fit for small datasets and inexpensive systems with it's good-enough accuracy and low training time. ResNet-18 being 2.5 times deeper should be considered if AlexNet performance wasn't sufficient.

For Dropout, the general recommendation is the smaller the network the lower regularization should be. In the meantime, high values around 0.9 usually won't provide high accuracy, simpler neural network architecture should be considered instead.

Batch size, which has come with a surprise in its sleeve, specifically an improved performance on GPUs with batch size values up to 16, and higher classification accuracy with values up to 8. Also, neural networks with batch size of 2 fail to train.

A range of neural network architectures with their hyperparameters have been considered. Hyperparameters appear to have a crucial role for achieving state-of-the-art performance and to avoid a pitfall of getting a neural network architecture that fails to train. The ideas described in this paper can ease neural network usage for practitioners in different domains, providing a starting point to a successful enterprise application. While we focused on a single Oxford IIT Pets dataset, which provides a

complex problem for a computer of discriminating between different cat and dog species (in many cases similar and hard to distinguish for a non-expert human), further research could focus on providing guidance for a wider range of datasets.

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Oversaturation of the IT labor market: myth or reality

After finishing school many students have to think about their future, what they will study at the university or college. Many modern school leavers see themselves in IT. However, there is a widespread concern: what if there will be an IT employment crisis, as it happened with lawyers back in 2010s. Let us analyse the problem and find counterarguments to this opinion.

What is the “lawyer employment crisis”?

Before predicting future we need to look back to the past and see what happened there. The reason a lawyer employment catastrophe looks similar to the current situation in IT is that a lawyer was a very perspective job back in 2000s. Shortly, there were too many lawyers, much more than companies could hire. [1]

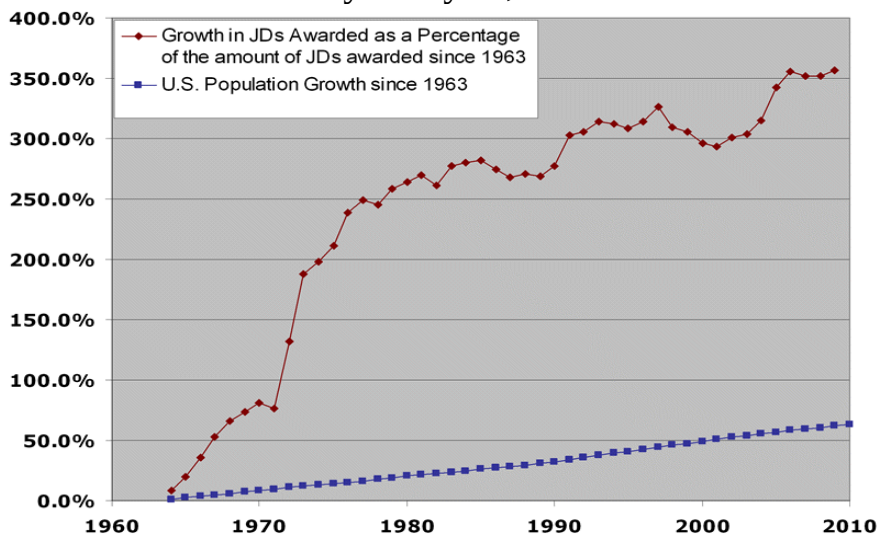


Fig. 1 Comparison of JD (The Juris Doctor degree) growth rate vs US population growth rate.

Fig. 1 shows how big the problem is in the USA and how long it took this bubble to burst. The whole situation started back in the middle 1960s and it took more than 40 years for it to collapse.

There were many myths about the huge amount of money the lawyers made and the relative easiness of this job. That is why it attracted so many school-leavers to law schools and colleges. However, after this problem had become obvious, people still continued applying for legal professions, even being aware of the situation.

Speaking of what happened in Europe and, in particular, in Ukraine, there is a chart showing the amount of lawyer-training institutions, certified lawyers and overall population in Poland, Germany, France, UK, and Ukraine by 2010, according to the research of the National University of Kyiv-Mohyla Academy and OSCE (Organization for Security and Co-operation in Europe) [4].

Country	Population (thousands)	Number of lawyer-training institutions	Annual number of law graduates	Number of law graduates per 1,000 population	Number of lawyers
Poland	38 441	28	6037	1.6	7,053 advocates 18,953 legal advisers
Germany	81 417	42	10696	1.3	151,057 advocates and solicitors 20,138 judges and prosecutors
France	65 312	43	30000	4.6	43 977
UK	62 698	90	13000	2.0	18,400 barristers 139,666 solicitors
Ukraine	45 134	87	34525	8.0	28,944 advocates 8,000 judges

Fig. 2 Comparison of the Population Size versus the Number of Law Schools and Their Graduates in Poland, France, United Kingdom, and Ukraine

According to the data of the Ministry of Education and Science of Ukraine, the surplus of lawyers reached 400% in Ukraine. In addition to this, only one in 12 law school graduates got a job in his professional field.

What about programming?

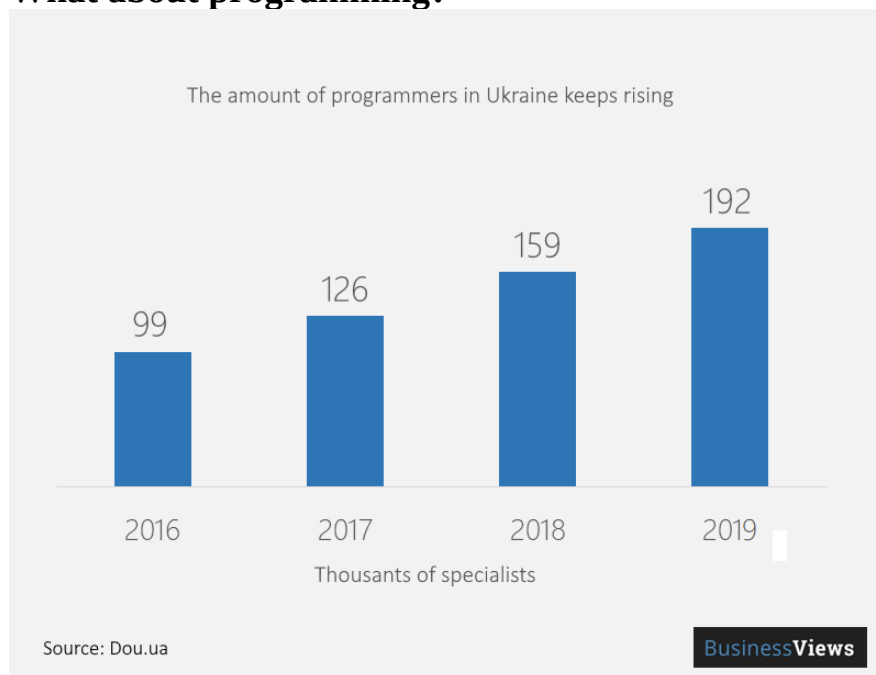


Fig.3 The amount of programmers in Ukraine per year.

Figure 3 shows that the amount of programmers in Ukraine keeps rising, leading to what might seem as a new “employee overproduction bubble”. However, Fig.4 below demonstrates that the labor market is ready to accept all these specialists and the situation does not seem as dangerous as it was 10 years ago [5].

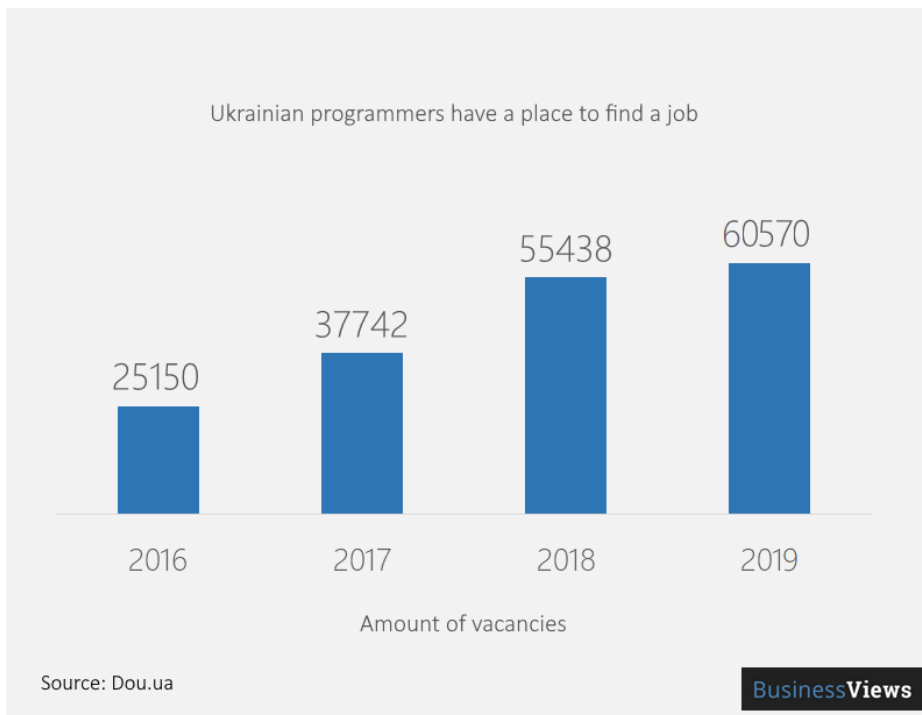


Fig.4 The amount of IT vacancies per year.

Nothing to worry about

So, is there any threat for those who are studying for computer programming degrees? The answer is no. A lawyer profession is very narrowly targeted. Most of those who did not find a stable lawyer job claim that they have not used their JD degree in their lives. In addition, lawyer is an old profession, which has reached its peak back in the days and now suffers from the technological advancement. For example, in some case it is possible to Google your problem and find the necessary legal advice or reference, but not to pay money for a consultation.

In contrast, software engineering is a broad field with various application areas. IT engineering includes Front End, PHP, Java, Python, C++, C#, Android developers as well as Project Managers, Designers, Analysts, Data Science and other specialists. So, it is possible use computer programming degree in many different areas, compared to the JD degree. In addition, programming does not only gain from progress, it also increases its speed and it has not reached its peak yet. Computers are starting to appear in most spheres of our life: medicine, military, education, agriculture, space exploration, game development, economics, analytics, machine building, engineering, general science and even art. And every computer requires its specialist.

General use of computer science

So, as more and more spheres of our life are becoming computerized, therefore, overall computer literacy becomes a useful skill in the 21st century. And it is not even about college/university degree. Online courses (even free ones) are enough for such a purpose. Having even some computer science knowledge is like knowing an extra language: it could help in need.

However, it is not as easy as it seems: being a professional programmer is a hard job. While programmer, as a job, benefits from technical and overall progress, an individual suffers from it. You need to invest a lot of time and money to hold up well in the IT industry, as it never is at a stop: new programming languages are being released, new software is being developed. There is always a place to grow, and you have no choice if you want to be a true professional who develops something truly useful, and, of course, makes some money.

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The problem of selecting banner printing equipment

Today, printing banners of different sizes for customers has become a need for some companies. Due to the high cost of the banner printing equipment, most businesses use the services of other companies that specialize in this. However, they often face the following difficulties:

- companies capable of printing banners larger than 5 meters are located only in Kyiv, which makes the process of obtaining a banner longer;
- the shipping cost of each banner is also large enough, which is a negative factor for printing the product on the side;
- some contracting companies do not care about the quality of the finished product and do not check the previous layouts for errors and shortcomings, which sometimes leads to product defects;

So, in order to avoid the mentioned above problems and expand their business, some companies consider purchasing their own printing equipment. This will also allow the company to enter the banner printing market and fulfill orders, which is quite relevant due to the small number of offers in the regions of Ukraine. But other businesses just decide to change the contracting printing companies. So, the question is which alternative is the most efficient.

Having considered all options for printing banners, four key solutions have been selected for further study: two types of own banner printing equipment and two companies providing printing services.

This problem of choosing the best alternative can be solved by the method of hierarchy analysis. The method of analyzing hierarchies includes decomposing the problem into smaller parts and further processing the sequence of judgments of the decision-maker by pairwise comparisons [1].

Let us consider the following alternatives:

- a small printer that is reasonably priced and can print banners no more than 5 meters long;
- a large printer that costs more and prints banners longer than 5 meters (allows you to accept orders);
- printing company # 1 with more expensive services than in the option 2
- contractor # 2 that offers a lower price but simply completes the order without communicating with the customer.

The next step is to divide all the criteria into economic and social. In result, two hierarchies were obtained - benefits and costs (Figures 1-2).

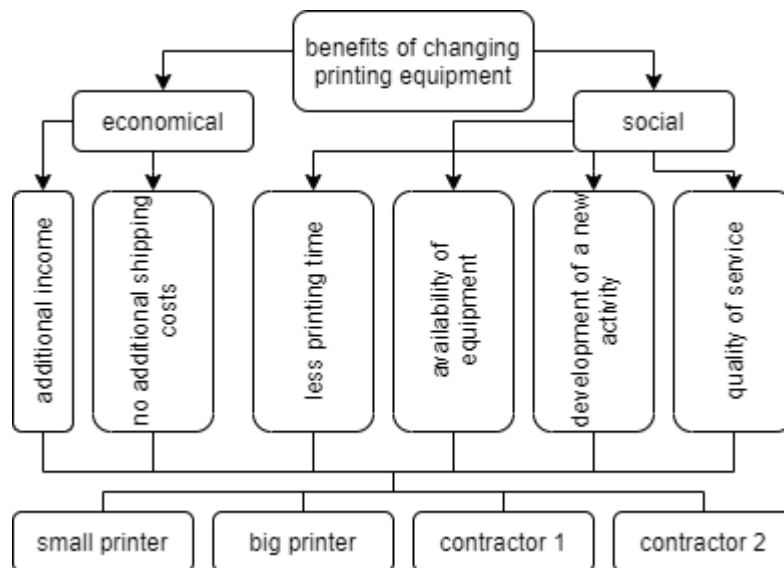


Fig. 1. The benefit hierarchy

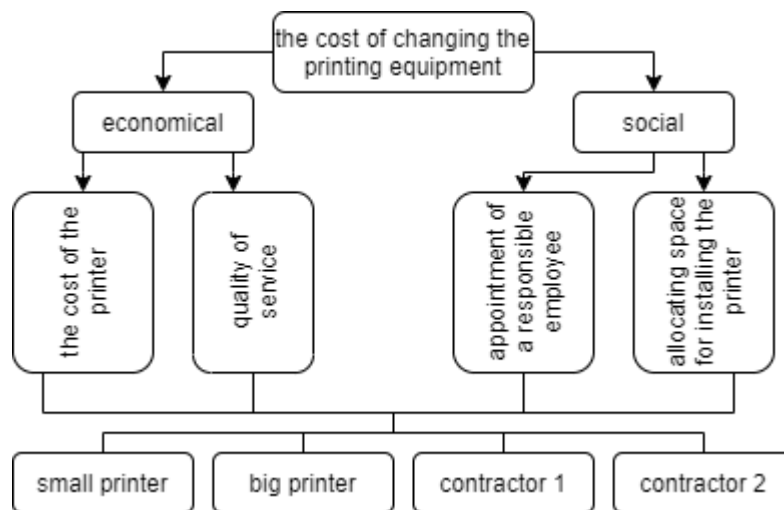


Fig. 2. The cost hierarchy

After creating the problem hierarchy, the matrix of paired comparisons was filled, the local priorities were calculated and the consistency of the matrix was confirmed (Table 1) [2].

Table 1

The matrix of paired comparisons

	economic benefits	technical benefits
economic benefits	1	3
technical benefits	0,33	1

After passing all the hierarchy levels and subtracting local priorities, global priorities of alternatives were calculated in terms of the benefits of changing the equipment (Table 2).

Table 2

Global priorities of benefit alternatives

3rd level criteria	global priorities	local priorities			
		small printer	big printer	contractor 1	contractor 2
price of printer	0,6	0,26	0,46	0,14	0,14
price of service	0,15	0,23	0,49	0,16	0,12
appointment of a responsible person	0,19	0,3	0,48	0,11	0,11
finding a place to install	0,06	0,23	0,49	0,14	0,14
global priorities of alternatives		0,26	0,47	0,14	0,13

Thus, for the sake of convenience, alternative projects has the following priorities: a small printer - 0.35; a large printer - 0.44; contractor # 1 - 0.10; contractor # 2 - 0.11.

Keeping these results in mind, then, with the highest priority, a large printer should be chosen as the best alternative.. But it will be more correct to take into account the costs of changing the equipment and then compare the results. That is, the above procedure was performed again, but at the expense of the company [3]. In result, a table of global priorities for cost alternatives was obtained (Table 3). The cost of alternative projects has the following priorities: a small printer - 0.26; a large printer - 0.47; contractor # 1 - 0.14; contractor # 2 - 0.13.

Table 3

Global priorities of cost alternatives

3rd level criteria	global priorities	local priorities			
		small printer	big printer	contractor 1	contractor 2
additional income	0,56	0,35	0,49	0,07	0,1
no additional shipping costs	0,19	0,38	0,38	0,13	0,13
smaller printing time	0,04	0,35	0,35	0,19	0,11
equipment availability	0,06	0,37	0,37	0,15	0,1
development of a new type of activity	0,14	0,33	0,43	0,12	0,11
service quality	0,02	0,2	0,3	0,43	0,18
global priorities of alternatives		0,35	0,44	0,1	0,11

After obtaining global alternatives for each hierarchy (benefits and costs), the available data is reduced to one indicator for each alternative (Table 4).

Table 4

The table of results

	small printer	big printer	contractor 1	contractor 2

				2
benefits	0,35	0,44	0,1	0,11
expenses	0,26	0,47	0,14	0,13
benefits/expenses	1,3255	0,9448	0,7426	0,8176

The optimal result, based on the solution obtained by the method of hierarchy analysis, is to buy a small printer. This will change the work of the company as follows:

- The company will need to pay a certain amount for this equipment but it will be less than buying a large printer.
- Diversification of business activities with banner printing services for other companies may generate additional revenue for the company in the future.
- The cost of each own printed banner will be lower as there will be no unnecessary spendings on the contractor services and shipping.
- The company needs to have an employee (or a separate department) to maintain the equipment and find a separate office space to place a small printer.

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Development of a decision support system for assessing the creditworthiness of individuals

The goal of the research is to develop a decision support system for banks that can help to decide whether it is safe to provide credits to an individual or not. The object of the research is the assessment of the individual's creditworthiness by the banking institution. The methods of the lending process description included game theory models and mathematical statistics.

Credits make up the largest share of profitable bank assets, which is the main part of the bank's revenue. At the expense of this source, most of the net profit is generated, which is sent to reserve funds and from which dividends are paid to shareholders. However, lending, in addition to high incomes, includes high risks. Due to the fact that credit activity is accompanied by high risk, lending remains the riskiest component of banking institution assets. If banks carry too risky credit policies, this could lead to their bankruptcy.

The table below represents the comparison of 7 algorithms: BAG-CART (Bagging and Random Forest algorithms combination), C45 (decision tree), MARS (Multivariate adaptive regression spline), RF (random forest), BAYES (naive bayes classifier), GBM (grade boosting machine), PART. Accuracy and speed of algorithms were compared. [1]

Table 1 Comparison of speed and accuracy of the algorithms.

<i>Algorithm Name</i>	<i>Accuracy</i>	<i>Speed</i>
<i>BAG-CART</i>	<i>0.735</i>	<i>0.2855187</i>
<i>C45</i>	<i>0.7</i>	<i>0.2731981</i>
<i>MARS</i>	<i>0.74</i>	<i>1.0000000</i>
<i>RF</i>	<i>0.745</i>	<i>0.2840448</i>
<i>BAYES</i>	<i>0.78</i>	<i>0.1949105</i>
<i>GBM</i>	<i>0.745</i>	<i>0.2726653</i>
<i>PART</i>	<i>0.735</i>	<i>0.8298587</i>

The diagrams below illustrate this comparison. It is clear that MARS is the fastest one. However, BAYES is the most accurate. As the main idea of the system development is to provide the most accurate forecast, so the BAYES algorithm has been chosen.

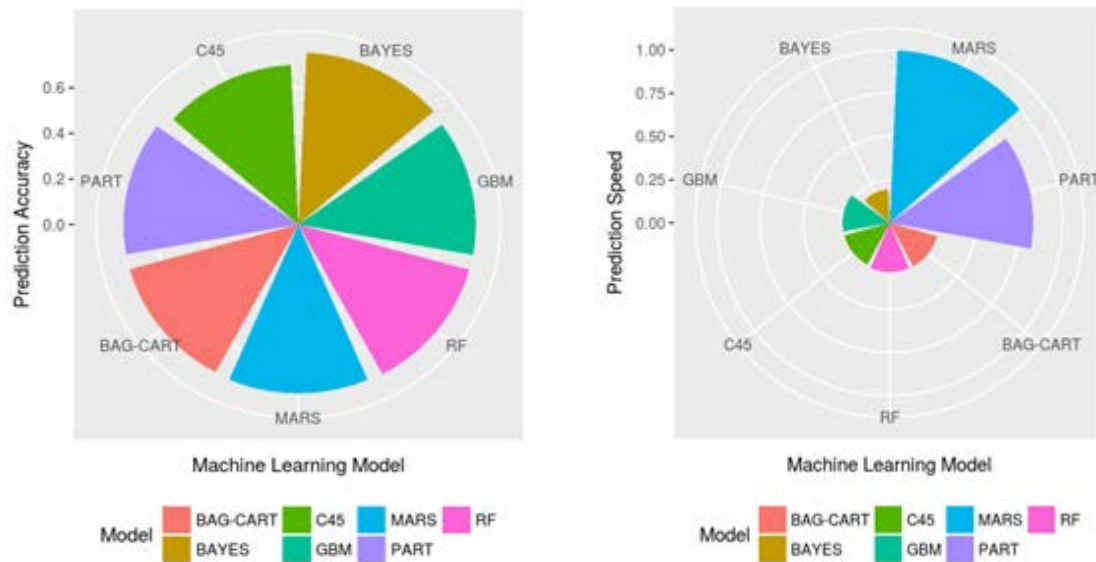


Fig.1 Comparison of speed and accuracy of algorithms.

To get the most accurate estimate of creditworthiness, a neural network was developed. In our particular case, the input layer consists of 12 neurons, the hidden layers consist of 124 neurons each and the source class consists of 2 neurons, each responsible for the creditworthiness class. Each neuron is connected to each in previous and next layers.

Next, a training set has been developed. It consists of 11 attributes: gender, education, income, income of a spouse/husband, sum of credit, credit period, credit history, area of residence, number of children, whether the individual is an entrepreneur.

The system itself will do the following:

1. Two .csv files are accepted for input: test and training samples. The file name is pre-specified in the code.
2. The program checks the integrity of files, the presence of empty values.
3. In the case of blank values, fill them.
4. Program training is in progress
5. The test sample is processed
6. The received forecast is saved to the new .csv file as follows: Record number - Do you give credit (N - no, Y - yes)

The aim to develop a decision making system was successfully completed. A naive Bayesian classifier was chosen to build the system, which, when analyzing the methods, gave a 78 percent prediction accuracy and 82 percent in result of the system development. For credit scoring, 82% is rather good result meaning that granting loans for a total of \$ 1,000,000, one can expect repayment of \$ 820,000.

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Building security through computer vision

Construction around the world is one of the most dangerous industries because people are susceptible to workplace accidents, injuries and even fatalities. In particular, more than 90% of accidents are related to dangerous behaviour and working conditions. So, it means that if we can mitigate dangerous behaviour and improve working conditions, then security productivity will naturally improve. The result is a rich collection of images of people's actions and working conditions that contribute to dangerous events. From an engineering point of view, computer vision is aimed at automating tasks that the human visual system is unable to complete.

The ability to automate tasks has been enhanced through deep learning (also known as deep structured learning or hierarchical learning). In particular, Convolutional Neural Networks (CNNs), a class of deep learning networks, were used to analyse visual images (such as image and video processing) and to overcome problems associated with manual surveillance and recording of hazards (i.e. potential sources of damage) at construction sites. Although attention was paid to the use of deep learning and computer vision to monitor behavioural safety and identify hazardous conditions at construction sites, no up-to-date review was conducted to examine its development and potential use in the future. A review is needed to identify the current limitations of deep learning and computer vision in construction.

In addition, there is a need to identify periodic issues encountered by researchers during its implementation for security management. Both manual inspection and digital technologies (i.e. deep learning and computer vision) were used to reduce the risks to construction safety to identify and monitor hazards. As a result, the data is recorded in various formats (such as security reports, videos, and photos) that researchers have used to monitor security. Although extraction of such factors provides us with knowledge of security issues, its assimilation to facilitate understanding of what is needed to reduce their occurrence is lacking because context is not provided. If we want to make some progress towards the effective use of AI and the realization of its benefits in construction, we need to create a context for knowledge and understanding to be combined.

Drawing on AI and IT developments that have merged different types of data (such as text) with images / videos to better understand the nature of the problem, we suggest using security reports, non-visual sensors in conjunction with deep learning and computer vision, provide an effective means of on-site safety monitoring. We can combine textual and graphic data to enable a deep learning model to justify and understand the nature of risk. Here, the combination of text reports and image data has two lines of inquiry:

1. Using reports to improve the detection of dangerous behaviour. To provide computer vision with accurate identification of image hazards, we can combine deep learning and computer vision to retrieve and code images from representations of images (i.e. important regions), and then use natural language processing techniques to obtain representations of images (such as words and semantic relations). Finally, hazards can be retrieved and identified by using image-sentence similarity; and

2. Automatic generation of safety reports from images. Prevailing on-site safety inspections predominately are dependent on pen and paper to record hazards that engineers observe, and then these handwritten records are transferred into a computer system to generate safety report. This manual process of transferring data, however, is a time-consuming and error-prone process. With advances being made in image caption algorithms we can develop semantic image captions that can enable hazard information to be automatically described. This approach can assist site managers to automatically generate risk reports rather than having to undertake site walks to identify potential hazards. Data from numerous sensors positioned on a construction site can be used to detect hazards. Different types of sensors have been used on construction sites to collate safety data. For example, location sensors (i.e., Radio Frequency Identification and Global Positioning Systems) can be used to identify those individuals entering dangerous work areas. Thus, we suggest that by fusing images obtained from multiple non-visual sensors we can extend the range of hazards.

Computer vision combined with deep learning provides the capability to automatically identify unsafe behaviour and conditions on construction sites and therefore can be used to improve safety performance. Nonetheless, there remain several challenges that need to be addressed before construction can directly benefit from technological developments being made within the field of computer vision.

In this paper, a review that examines the use of computer vision and deep learning for monitoring of unsafe behaviour and conditions is conducted to identify these challenges, which are a product of the dynamic and complex nature of construction and the difficulties associated with acquiring video surveillance data. More specifically, the **lack** of databases that can be used for training and testing deep learning models to identify unsafe actions and conditions requires development to put in place a foundation for the benefits of computer vision come to the fore. Notwithstanding this limitation, we have proposed a robust enabling framework for utilizing computer vision to improve safety performance in construction. By being able to integrate state-of-the-art digital technologies and unify multiple data resources our robust computer vision-based framework acts as a signpost for starting future research in the emergent and fertile area of deep-learning within the context of safety.

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Systems and methods of functional structure of web-oriented information systems

The current level of information dissemination increased the demands on the processing conditions of information systems. A well-developed information system should meet the following requirements:

- a) it must be in demand;
- b) it must be convenient for management and modifications.

Sometimes it turns out that the first goal is unattainable due to design errors, that is, the system may be inconvenient for a user. The second objective may not be achieved as well, as it is difficult to identify the main characteristics of the system that should be used in management. Both factors indicate errors in the design. Therefore, designing methods that allow the effectiveness of design problem solving to be increased at the stage of the system functional structure development, remains an urgent problem.

Each type of site can be viewed from two perspectives: from a developer's perspective and from a user's perspective. It is often the case that a site is very good from a developer's perspective, but users do not want to work with it. Conversely, there are simple sites that users are happy to work with. One reason is that the developers initially set the wrong goals. This way, for any site, it is necessary to set goals that the site owner or developer pursues, and the goals that can be achieved by the user [1].

Functional adequacy assessment method or security of the information system. In order to characterize some integral indicators of the information system, it is proposed to use the indicator "functional security". This indicator is proposed to use some variable based on the expert assessments of the quality of the information system functions. The indicator is calculated separately for each goal and for a system as a whole.

Let the functional structure be formalized for some system:

$$F.str(g_w/g_u) = \{(m_1, \{f_1, \dots, f_k\}), (m_2, \{f_1, \dots, f_k\}), \dots, (m_q, \{f_1, \dots, f_k\})\},$$

where g_w are the system goals, g_u – user goals, f_i – system functions, m_i – implementation methods.

Therefore, for each goal of a user g_{ui} and a system g_{wi} , appropriate sets of providing functions are defined:

$$F_{pi} = \{f_j\}_p, p = \{u, w\}, \text{ where } i \text{ is a goal number.}$$

Within each goal, an expert evaluation of the respective function implementation quality is carried out $\{f_j\}$. Each function f_j is a subject to a peer

review $\gamma_{pi}(f_j)$, where $p = \{u, w\}$, i – a goal number. The expert evaluation is done according to the checklist in Fig. 1.

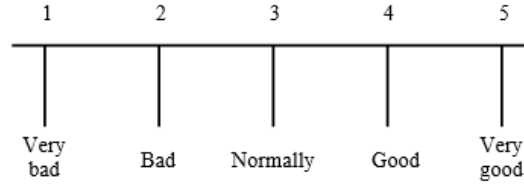


Fig. 1. Evaluating the quality of function implementation

The result is a set of estimates for each goal:

$$\gamma_{pi} = \{\gamma_{pi}(f_1), \gamma_{pi}(f_2), \dots\}, p = \{u, w\}.$$

Some estimates are uncertain, as not all features are related to every goal. For a more accurate assessment of the system functionality, it is suggested to set a weighting factor for each function w_{ij} , where j – a function number, i – a goal number. The coefficient w_{ij} is given in the interval $[0,1]$ according to the checklist in Fig.2.

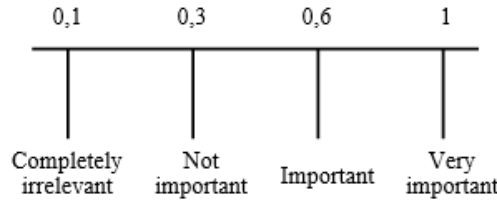


Fig. 2. Function significance

Considering averaged estimates, you can characterize the functionality of the system and its goals. For example,

$$\gamma_{pi} = \frac{\sum_{j=1}^k \gamma_{pi}(f_j)}{\sum_{j=1}^k r_{ij}^p}, p = \{u, w\}, \quad (1)$$

where k – is the number of certain functions; i – a goal number.

Estimate γ_{pi} characterizes the *degree of functionality* of the specific purpose.

$$\gamma_{ij}^p = \frac{\sum_{i=1}^n \gamma_{pi}(f_j)}{\sum_{i=1}^n r_{ij}^p}, p = \{u, w\},$$

Estimate (2) characterizes the degree of the functional usability of the respective function within the group of goals, where i – a function number, n – a number of goals.

Estimate

$$\gamma_s^p = \frac{\sum_{j=1}^k \gamma_{ij}^p + \sum_{i=1}^n \gamma_{pi}}{m}, p = \{u, w\}, \quad (3)$$

where m – is the total number of γ_{pi} and γ_{ij}^p , characterizes the functionality of the system as a whole for a set of purposes.

The final estimate takes the value according to the checklist in Fig. 3, which shows the quality of the system security [2].

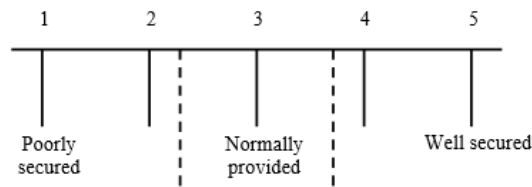


Fig. 3. Quality assurance of the system security

The functional analysis of the site is carried out by a three-step procedure:

- tentative (how the system is working). The analysis is based on expert judgments. The appraisal is done by the developer or the owner.
- current (whether the system is user friendly). The evaluation is done by the user with the help of a special electronic questionnaire.
- predictive (possible improvements). The user can add the features he wants to see.

Here is an example of the system implementation. Let the information system implement the following goals, functions and methods:

$g_w = \{g_{w1}, g_{w2}, g_{w3}\} = \{\text{<secure the order of goods>, <select the product>, <attract a buyer>}\};$

$g_u = \{g_{u1}, g_{u2}, g_{u3}, g_{u4}\} = \{\text{<order the product>, <find the product you are looking for>, <choose the best one>, <find all homogeneous goods>}\}.$

$\{f_1, f_2, f_3, f_4\} = \{\text{<providing a list of goods>, <customer registration>, <order registration>, <payment for goods>}\};$

$\{m_1, m_2, m_3, m_4, m_5\} = \{\text{<display of a product tree>, <processing of registration forms>, <processing of order forms>, <saving to the database>, <secure connection with the bank>}\}.$

At the stage of the tentative analysis, an examination was carried out. For each function, within each objective, the expert estimates were determined and the weights were set. The matrices of the expert judgments and weights for the purposes of the system and users are given in Table. 1.

Table 1 – Values of expert estimates and coefficients

Y _F	$\gamma_{wi}(f_j)$			w_{ij}			
	g_{w1}	g_{w2}	g_{w3}	g_{w1}	g_{w2}	g_{w3}	γ_{fi}^w
f_1	5	5	3	1	1	0.7	4.4
f_2	4	-	3	1	-	0.5	3.6
f_3	5	-	-	1	-	-	5
f_4	4	-	-	1	-	-	4
γ_{wi}	4.5	5	3				4.2

We calculate the estimates by (1) – (3).

$$\gamma_{w1} = \frac{5 \times 1 + 4 \times 1 + 5 \times 1 + 4 \times 1}{1 + 1 + 1 + 1} = 4.5; \quad \gamma_{w2} = \frac{5 \times 1}{1} = 5; \quad \gamma_{w3} = \frac{3 \times 0.7 + 3 \times 0.5}{0.7 + 0.5} = 3.$$

$$\gamma_{f1}^w = \frac{5 \times 1 + 5 \times 1 + 3 \times 0.7}{1 + 1 + 0.7} = 4.4; \quad \gamma_{f2}^w = \frac{4 \times 1 + 3 \times 0.5}{1 + 0.5} = 3.6; \quad \gamma_{f3}^w = \frac{5 \times 1}{1} = 5;$$

$$\gamma_{f4}^w = \frac{4 \times 1}{1} = 4$$

$$\gamma_s^w = \frac{4.5 + 5 + 3 + 4.4 + 3.6 + 5 + 4}{7} = 4.2$$

$$\{\gamma_{wi}\} = \{4.5, 5, 3\}, \{\gamma_{fi}^w\} = \{4.4, 3.6, 5, 4\}, \gamma_s^w = 4.2$$

In result, the developer rating is <good> (Table 1). So, the developer thinks he has designed the system well.

At the stage of the current analysis, the user examines.

Table 2 – Values of expert estimates and coefficients

Y _F	Objectives γ_{ui}^1				Coefficient w _{ij}				
	g _{u1}	g _{u2}	g _{u3}	g _{u4}	g _{u1}	g _{u2}	g _{u3}	g _{u4}	γ_{fi}
f ₁	4	3	1	2	1	1	0.7	0.2	2.8
f ₂	3	-	-	-	0.5	-	-	-	3
f ₃	4	-	-	-	1	-	-	-	4
f ₄	3	-	-	-	1	-	-	-	3
γ_{ui}	3.5	3	1	2					2.7

$$\gamma_{u1} = \frac{4 \times 1 + 3 \times 0.5 + 4 \times 1 + 3 \times 1}{1 + 0.5 + 1 + 1} = 3.5; \gamma_{u2} = \frac{3}{1} = 3; \gamma_{u3} = \frac{1 \times 0.7}{0.7} = 1; \gamma_{u4} = \frac{2 \times 0.2}{0.2} = 2.$$

$$\gamma_{f1}^u = \frac{4 \times 1 + 3 \times 1 + 1 \times 0.7 + 2 \times 0.2}{1 + 1 + 0.7 + 0.2} = 2.8; \gamma_{f2}^u = \frac{3 \times 0.5}{0.5} = 3; \gamma_{f3}^u = \frac{4}{1} = 4; \gamma_{f4}^u = \frac{3}{1} = 3.$$

$$\gamma_s^u = \frac{3.5 + 3 + 1 + 2 + 2.8 + 3 + 4 + 3}{8} = 2.7$$

$$\{\gamma_{ui}\} = \{3.5, 3, 1, 2\}, \{\gamma_{fi}^u\} = \{2.8, 3, 4, 3\}, \gamma_s^u = 2.7$$

Goals g_{u2}, g_{u3}, g_{u4} were not sufficiently achieved. This is reflected in the coefficients of the Table 2. The reason is poor implementation of the functions. As a result, the user rated the system as <normal>.

So this estimate is consistent with the user's real perception of the system being developed. This approach provides a more productive analysis of web-systems in order to identify poor functionality of the designed system and, as a consequence, to make the system more useful and attractive for the user.

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3D printer technology in construction area

Though 3D printer technology found its application in a lot of areas of people's lifestyle long ago, there are still some areas where this technology has not opened all its potential yet. One of them is a construction area. However, the latest experience demonstrates possibility of 3D printer use for constructing a cottage and even settlements of such cottages. Analysis of advantages and disadvantages of 3D printer use in construction is in the focus of this paper.

3D printer is a machine which uses a method of creating a physical object by printing layer-by-layer on the basis of a virtual 3D model. The original 3D printer typically uses plastic, but there is also a possibility of using a mixture consisting of concrete instead of plastic, fiberglass and other additives usually used in construction. The machine builds walls by squeezing this mixture layer-by-layer through a special nozzle at the end of the tube.

The latest research reveals several benefits that 3D printer brings to construction:

- It can erect the walls of a small building in just 6 hours, and this is without numerous workers who 35% of their working time usually have a break.
- A wall which 3D printer builds has an air gap that makes walls high sound insulated and warm.
- The iron builder can build buildings of any configuration, any variety of architectural elements and any thickness of walls.
- Savings from 40 to 78% when using this device - printer.

If to look at the use 3D printer in construction company or trust from an economic point of view, we will see that it is much more profitable then the use it human power, because when using the machine repeatedly, after the 3rd - 4th average residential building, the cost of a 3D printer pays off.

Though, there are some disadvantages that 3D printer brings to construction. Today, unfortunately the share of housing construction using 3D printer technology is less than one percent, which suggests that this technology has prospects. This device also has some disadvantages such as:

- inability to erect a house roof;
- impossibility of vibration processing.

As a result, the constructed building or structure using this technology will not last long. It is important that in the countries with cold climate, a house created using similar technology will require additional insulation. Also, one more disadvantage is concrete used in the machine which is hardened only at positive temperatures that makes impossible to use such technology in winter or in the countries with cold climates. There, unfortunately, is a limit on the height of buildings. However, this limit can be increased in future.

Today, there is a lot of buildings constructed by a 3D printer. One of the examples is the biggest house-built by 3D printer: a new building of 9.5 meters height and an area of 640 square meters was opened in Dubai's Varsan district. It became a record in size among structures created, using a 3D printer. The house serves as a good illustration of the benefits of using such technologies in construction. The authorities are confident that with their help it will be possible to revolutionize the industry by increasing the speed of work. According to The National magazine, only 15 people were required to build concrete walls. In a conventional construction project of a similar scale, the need for labor is twice as large. The use of 3D printing resulted in the volume of waste reduced by 60%. Direct costs were also noticeably reduced. Officials noted that the cost of the building was reduced from average of 680 thousand dollars to 272 thousand dollars.

The second example is the village which 3D printer built in Texas, where the administrative block was the first built by 3D printing, and then construction of the whole settlement began. Ikon unveiled its first prototype at the SXSW 2018 Texas Media Conference, and after that it was informed about construction of a whole village of the similar cottages in a poor area of the South America. Vulcan II 3D printer is designed for the construction of simple boxes of houses, and the installation of roofs, doors and window openings is carried out by the builders. The concept shown at SXSW have taken two days for its implementation and cost only \$ 10,000. This analysis demonstrates that 3D technology is relevant, promising construction device which allows to lower the price of building and construction in the future as 3D printer technology increases the speed of building erection. However, there is a set of drawbacks to be solved by IT specialists soon.

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Problems of distance learning in modern conditions

Distance learning is a new organization of the educational process based on the use of the best traditional teaching methods, as well as new information and telecommunications technologies, as well as on the principles of independent learning. Distance education is provided by the following technologies:

1) key technology - issuing a portfolio with a full set of educational and methodological materials for each discipline. Information is provided both in the form of books, manuals, and on CD-disks, audio and video cassettes, as multimedia Programs;

2) network — using remote access tools to get the necessary educational information, conducting individual consultations with teachers, and monitoring knowledge. This technology is much more effective than the traditional one, because it focuses on individualization of learning;

3) television — you can simultaneously cover a large number of the population with the learning process. This technology is more informative.

The characteristic features of distance courses are:

1) flexibility — the ability to present the course material taking into account the preparation and abilities of students. This is achieved by creating alternative sites for getting more detailed or additional information from obscure topics, as well as a number of questions-tips, etc.;

2) relevance-the possibility of introducing the latest pedagogical, psychological, and methodological developments;

3) convenience — the ability to study at a convenient time, in a certain place, non-regulation in time for learning the material, the ability to receive education on the job;

4) modularity — splitting the material into separate functional completed topics that are studied as they are mastered and correspond to the abilities of an individual student or group as a whole;

5) cost-effectiveness-the method of training is much cheaper than traditional ones, thanks to the effective use of training facilities, easy adjustment of e-learning materials and multi-access to them;

6) the ability to simultaneously use a large amount of educational information by any number of students;

7) interactivity — active communication between students of the group and the teacher, which significantly increases the motivation to study, the level of assimilation of material etc.

The advantages of distance learning technology are:

1) enliven learning with multimedia effects;

- 2) access to a larger volume of material via network libraries;
- 3) ability to get the highest rating results using a self-testing system;
- 4) the ability to explain incomprehensible topics both by the teacher and students (video conferences, electronic discussions, etc.).

Internal motivation of students to study increases with the use of combined technology (traditional and distance). The survey “How important is teacher’s ability to conduct online lessons” showed mixed results presented in the table :

Very important	36%
Important	32%
So so	14%
Not important	11%
I am against distance learning	7%

It shows that most of learners prefer good-prepared teacher, so the role and requirements for teachers are changing. Lectures make up only a small part of the training process, which focuses on creative search for information, the ability to independently acquire the necessary knowledge and apply it to solving practical problems using modern technologies. Teachers of distance courses must have universal training, possess modern pedagogical and information technologies, and be psychologically ready to work with students in a new educational and cognitive environment. Thanks to distance learning tools such as discussion forums, mailing lists, a new learning environment is created where students feel an integral part of the team, which dramatically increases their motivation to learn. Teachers should know how to create and maintain such an educational environment, develop strategies for conducting this type of interaction between participants in the educational process, and improve their creativity and skills.

As a result it turns out that the correct attitude of teachers and students to distance learning can have a very good effect on the development of the material due to their technologies and advantages.

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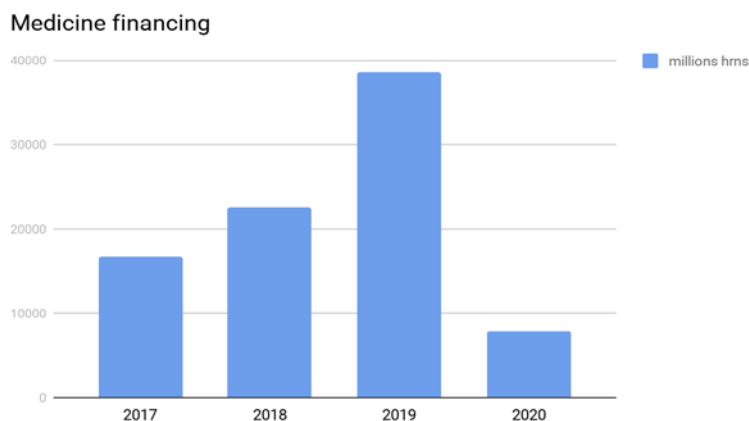
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Use of Information Technology in Ukrainian Healthcare

It is generally agreed today that Ukrainian medicine is in a terrible state, even though the financing of healthcare in Ukraine, patients, and specialists combined are comparable with other EU countries.

To begin with, medicine was free from the beginning of Ukraine's independence, but it was free only on paper. Most Ukrainians give a "thank you" for treatment, for example, an installment took by the specialist or a "beneficent gift" (which is in actuality compulsory). Cash flow cannot be monitored by the government, that's why the system is inefficient. Despite the fact that Ukrainians contribute more than 3 billion in yearly charges for social insurance, about 2 million Ukrainian people face insolvency as a result of an illness as they need to pay for expensive therapy, pills, etc. of their own pockets.[1]



Noticeable that analysis of the structure of budgetary expenditures for financing health care institutions recognizes that budgetary funds mostly are spent for staff salaries, on municipal services, etc., and charges on medicines, food, and patients keeping are extremely limited.[2]

Experts say that the Health Care System Reform was approved in 2019 radically changed the direction of Ukrainian medicine. It was based on transparency and digitization of the patient management process through such a system as e-Health and ProZorro. e-Health is system let us make all medical records become electronic. This will alleviate the burden on the doctors, let them give better-quality and quicker medicinal services to patients, and preclude loss of patients' clinical information. [1] This will give an opportunity to get information about the requirement for regional head office, progressively exact value setting, and quality control of healthcare and social insurance. New information systems will be available by the end of 2019. To date, the system has joined:

- more than 1800 medical institutions of primary care,
- more than 1200 pharmacies,

- more than 24,500 family doctors, pediatricians, therapists, head doctors;
- more than 11,000 pharmacists,
- more than 28.1 million patients.

What about patient data security? The electronic medical records system works as a platform for medical information systems connected via the REST API, without providing interfaces for end users, doctors, and pharmacists. This nature of interacting with many clients leaves a special imprint on the already sensitive issue of the safety of patient medical data. The system implements the mechanism of pseudonymization recommended by the European regulation of GDPR - the distinction between personal and medical data. Thus, even hypothetically gaining access to medical data, an attacker will not be able to associate these data with a specific patient. For access control, and Attribute-Based Access Control (ABAC) approach has been implemented, which allows the flexible configuration of access policies for the patient's medical data, as well as allowing the patient to determine with which doctor to share his medical information.

Perhaps it should also be pointed out that defects of administrative lawful acts in the field of social insurance and some mutual contradictions in them lead to the condition when the initiative of the state is frequently compelled to make changes to the legislature. So the lawful structure of medicinal services has framed some disarray that complicates realization of the specified norms, causes facts of neglect and finally leads to distortion of the legislation that regulates health care system. [2] This fact may hinder the development of a new direction for the health system.

At the moment, eHealth is an unfinished perspective project without development strategy for the next few years. To modernize medicine through information systems will help control processes within the healthcare system. It is the first step, but for the further development of the system, the following problems of the outdated system should be solved: cutting funding and support e-health reform, inadequate legislation that regulates the activity of health care system, inadequate asset backing of the industry and nonsensical utilization of accessible assets, absence of components of state financing, insufficient basic and authoritative model of human service's framework, constrained access to subjective well-being administrations, etc. The direction Ukrainian medicine is heading now presupposes much wider use of IT applications in the near future.

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Wireless data transfer technology

Modern world tends to get rid of wires and focuses on wireless technologies. Bluetooth devices, Wi-Fi access points, wireless chargers – all these things are treated as ordinary ones nowadays, though a few years ago they considered pure innovations. The aim of the work shared in this paper is to develop a wireless data transfer technology, which allows a user of any operating system and any device share files to another gadget wirelessly.

Needs analysis. If an user needs to send the photo from their phone to their PC they always have three options. First, it is to get a USB wire, connect the phone to computer, find a folder with photos, select, copy and paste them into the necessary folder on PC. But it takes much time and boring for the user. The second way is to use cloud storages and synchronize data automatically. However, cloud storages are not free and need some customization in case you need to synchronize only the specific data between devices. And the last one is to send everything via messenger, hoping that it will not reduce the quality or shrink the images. These brings us to the idea: to make it possible to transfer a file from one device to another without any wires and an intermediate storage of any kind.

Potential competitors. When it comes to development of something new, there is a need to be aware of the latest solutions of the problem identified, especially those that can be competitive with the innovation n being developed. The first competitor is Apple's AirDrop [1]. It is a very convenient technology which is used by lots of people every day. Huge data transfer speed and relatively quick connection setup. It can be used not only for files, but for links. For example, if a user found something interesting on the smartphone it can be easily opened on PC as well. It is a perfect wireless technology, but only for Apple devices.

Microsoft's, Google's etc. solutions are very similar to Apple's. Samsung has recently presented Quick Share, which is supported by only 3 devices so far [2]. Huawei has an interesting solution based on NFC [3]. To transfer data from smartphone to laptop it can be just put on specific area of laptop. Unfortunately, this technology is supported by very limited amount of Huawei devices. One more way to share files between devices is a network folder. It can be applicable for PC and laptops, but it is inconvenient on smartphones. Crossplatform solution is distinctive feature of developing technology. User will be able to transfer files from iOS to Windows, Android to iOS, Windows to Mac and so on.

Patent search. As soon as there are similar solutions on the market it should be clarified that current work will not infringe authors' rights guaranteed by patents. There are some cases when Apple was sued over sing the AirDrop technology [4]. Company Uniloc holds the patent which claims the technology of setting up the safe

connection between two devices via Bluetooth (U.S. Patent No. 7,136,999 "Method and system for electronic device authentication") [5]. Apple uses similar approach to create connection for AirDrop [1]. This patent does not prohibit the Bluetooth for setting up the connection between two devices. However, another decision should be found for connection set up or permission on patented technology should be granted.

Connection set up. To transfer information from one device to another the connection between them should be set up first. For this purpose, we can use Bluetooth as it was mentioned above. But what if the device has no Bluetooth like in case when stationary personal computers do not have such a module. Here we have two options.

Fist one is to set up connection in a local network. People's homes usually have only one access point. All PCs, laptops, smartphones etc. connect to it. Therefore, devices can be identified and contacted using IP and MAC-address in this network. Advantage of this method is that there is no need in connection to Internet. The connection itself will also be quick because it uses quite good bandwidth of local network. However, there is a disadvantage. If devices are in the different networks this method will not work.

Here comes the second option – signaling server, a server which helps to set up direct connection between two devices (kind of WebRTC architecture [6]). Its advantages: server will be available all the time and its maintenance cost are low because it does not process big amount of data. Although this requires Internet connection on both devices that can be considered as a disadvantage, but a big problem.

Maximal speed of data transfer. Those who used AirDrop at least once might have noticed how fast it is. The high speed can be achieved by creating a local network between devices that leads to data transfer speed - up to 300Mb/s. So far this is the only crossplatform way how to get such a high speed for data transfer between two devices. Sp, local network will be used for data transfer in the developing technology.

UX. Good user experience – that is what all this research for. Use of the described in this paper technology should be as simple and convenient as possible. Data transfer from one device to another should take as small amount of actions as possible. To meet these requirements, the application will be created. To send a file from a device user should press “Share” button available at any smartphones, select the app and a device to send the file. It takes only 3 clicks and no extra actions are needed.

In conclusion, this technology can find its use both for home and for business, where it might be necessary to share files between two devices wirelessly. Developing such a technology could be one step forward to completely wireless future.

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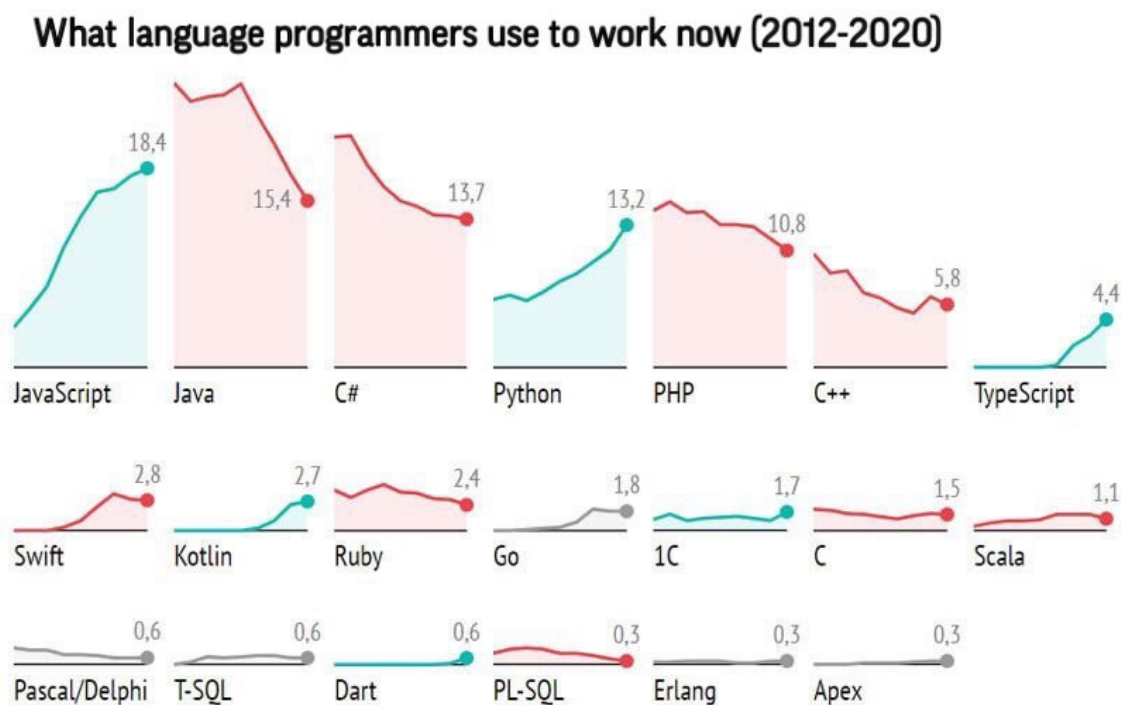
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Python machine learning technology

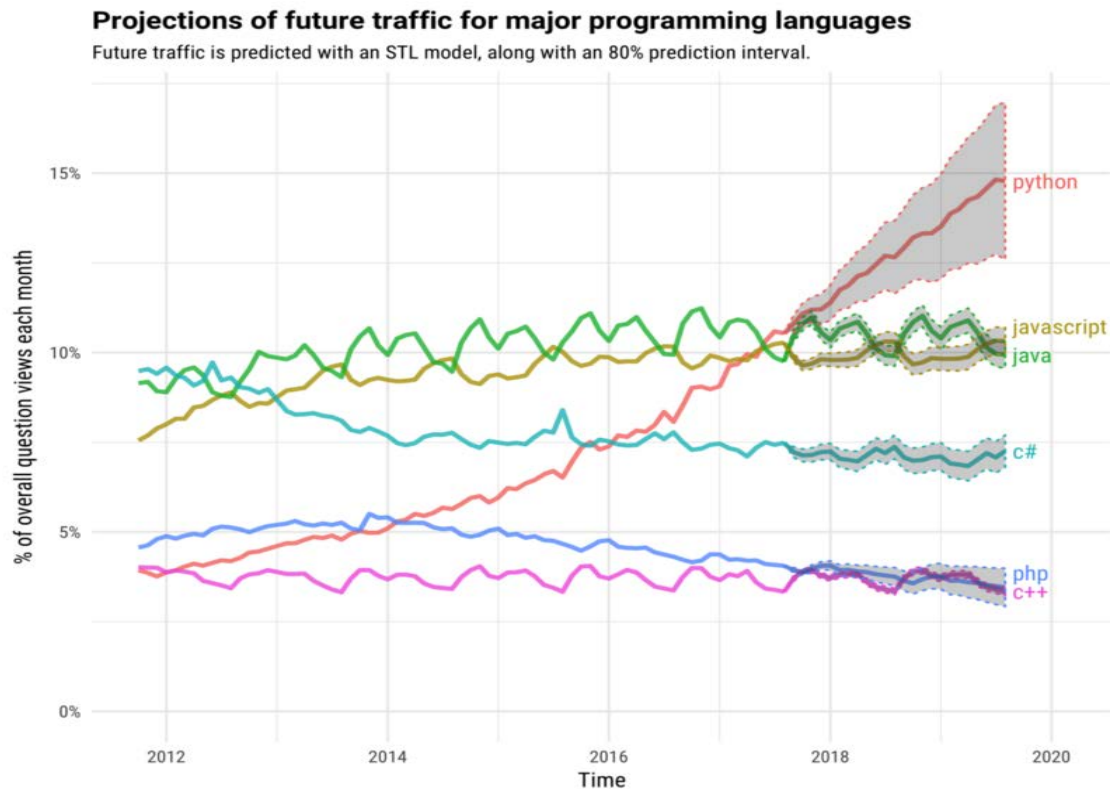
Ukraine is a country that has recently been successfully developing in the field of information technology, and machine learning is one of its most impressive sectors.

Machine learning opens the way to new opportunities and has become indispensable in our daily lives. This technology provides users with the number of options - talk with a voice assistant on our smartphones, recommend a suitable product for our customers, prevent credit card fraud, filter spam from our inboxes, and detect and diagnose diseases; This list has no end.

Nowadays, Java Script is the most popular language in the information technology industry.



But the use of Python will be the most appropriate solution, since, according to statistics, in 2020 it will be the most frequently used programming language, since it is very simple and there is no better language for organizing and analyzing data on the basis of which algorithms for artificial intelligence will be created, and, most importantly, it interacts quite easily with other programming languages.



As can see, both python and javascript will be most in demand, because both programming languages have many common aspects, for example, they follow a multi-paradigmatic approach and have a lexical scope. At the same time, there are several differences between them that cannot be ignored. JavaScript is very good when it comes to web development and ERP system development. But, considering that artificial intelligence and machine learning will tend in the future, JavaScript is not a good choice. This is a rather new field for it, and it has a long way to go to master it.

Python has become the most popular programming language for data science because it allows us to forget the tedious parts of programming and sentences us an environment in which can quickly write down our ideas and concepts straight into action.

Instead of requiring people to manually derive rules and build models from analyzing large amounts of data, machine learning offers more efficient alternative to collecting data knowledge for gradual improvement the performance of predictive models and data-driven decision making.

Not only machine learning is becoming increasingly important in computer science research, but it also play an increasing role in our daily lives. Thanks machine learning has reliable spam filters in email, convenient text and voice

recognition software, reliable web search engines and complex chess games programs. Noticeable progress has been made in medical applications; e.g, researchers have demonstrated that deep learning models can detect skin cancer with almost human accuracy.

Another milestone was recently achieved by DeepMind researchers, who used deep learning to predict three-dimensional protein structures superior to physical ones.

Thanks to the development of machine learning technology different areas of service industry -from medicine to security- in Ukraine can improve their work, as coding in Python greatly simplifies the development of complex algorithms, thereby increasing the speed of creating MLupdates.

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Ways of using unmanned aerial vehicles (drones) in modern life.

Pros and cons of using

This topic will be relevant for every person, because drones have given us many opportunities to save labor, time and finances. Drones have allowed mankind to make a real leap through the centuries. In the beginning, they were used for military purposes, which saved many lives: instead of scouts, a drone with a camera was sent to a hot spot, fixing the location of enemy troops. After that, they began to use them as fighter drones and this did not save lives, but on the contrary, took them away. But it would be somewhat absurd to consider the killing machine the world's highest asset. Therefore, some inventors and companies have come up with modern technology more useful and peaceful application.

Here are 12 ways / applications of drones today and in the future.

- Help in space

At the International Space Station, the Japanese drone “IntBall” is located; it takes photo and video reports on experiments conducted at the station, thereby saving the time of astronauts in orbit.

- For filming a movie

Today drones are actively used to remove beautiful views from great heights.

- Art

Artists from around the world often use quadrocopters in their performances. The CES-2016 exhibition has become one of the large-scale events with their participation. The tandem of art and science made such a strong impression that the performance of drones was included in the Guinness Book of Records.

- Delivery of packages and food

Already, international express shipping companies such as Amazon, Google, UPS, DHL and others are experimenting with drone delivery.

- People search

The device scans the area around, finds paths trodden by man, and flies above them at an altitude of about two meters. To prevent the robot from crashing on trees, scientists have developed special software for it.

- Fire systems

Firefighters use drones to search for fires or monitor them, as well as to deliver extinguishing agents or to raise the fire hose

- Disaster relief

Drones will help in man-made disasters when humanitarian workers cannot access disaster areas. They will assess the damage caused by industrial accidents, terrorist acts, determine the degree of pollution of large areas and provide assistance to the victims.

- Internet distribution

Google is developing the launch of a network of satellites and drones with solar panels to transmit the Internet to all parts of our planet

- Ecology restoration

In the USA, a mini-drone with the name “RoboBee” is being developed, which can hang in the air, “stick” to plants and swim in water. The wingspan of the robotic bee is only 3 cm, while the number of flaps reaches 120 per second. His task will be to help restore the ecology of the planet.

- In the guard

Copters fly over a guarded object and fly down rapidly when sensors detect suspicious activity

- Search for criminals

With them, patrolling the streets and finding criminals will be much more productive.

- Journalism

Events on the ground, large-scale events, sports can now be observed online thanks to drones

Pros and cons of using drones

<i>pros</i>	<i>cons</i>
saving money and time	privacy and security
environmental friendliness	bills
automation of production and delivery	collision with nature

As we see: there are many problems, but the benefits are enormous. In the coming years, drones will not appear above the head. However, the directions of development are very different. And for 5 years, unmanned aerial vehicles (drones) will still deliver the most necessary for people.

Internet of Things in business

Internet of things (IoT) concept was created in 1999. Technology unites and forms objects of real world in “smart” objects. IoT is constructed for automating complex system. The main idea is creating flexible and efficient system where parts of system interact with each other without any human intervention.

The number of devices available is increasing every day and all of them are connected by wire or wireless. Devices, which went online, interact with each other. They generate a big amount of data, which they can collect, analyze and use to improve comfort and to make business decisions [1]. Big data help people to analyze information about different spheres of life.

The use of such technology in the business world is no different. Devices of IoT record and transfer data to monitor important processes. They increase efficiency and allow companies to move forward [2]. IoT have a key role in design and implement new business model.

When a company understands, what clients need, it can improve quality of service and automate processes. Innovations must introduce constantly in a company. “Smart” fitting rooms, offices, shops and etc. which improve customer`s life, therefore they will be turn more often to them.

IoT allows to collect data in several sources. Data from connected devices provides information in real-time. The main thing is remembering about IoT`s threats and undertaking necessary steps for increasing security.

IoT`s sensors help to solve a large number of problems. Doctors can remotely control the patient health state with sensors and respond in time. Also, sensors can track a position of elderly person body. If a person fell sensors would connect with call-center for giving him first aid. Sensors capability can be used effectively with benefit for business.

Security systems are most popular decision with sensor which the world sees during century. Modern systems allow flexible adjustment according to your needs. Sensors can use an additional capability which people can come up new decisions for security systems. Artificial Intelligence expands the opportunities of sensors. For example: cameras can recognize faces and if a stranger come in the room with limited access sensors will alert. Different techniques can combine and create new decisions for your business.

IoT helps people to improve any sphere. Companies receive new competitive advantages, new capability which improve transmission and collect information. Big Data are collected with connected devices can use for the benefit of business.

Diversity devices help to develop new products and services. IoT will benefit business if people keep the security and use effectively connected devices.

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BYOD Approach: Challenges and Opportunities

The term BYOD (bring your own device) means that you are allowed to use personal devices (i.e. tablet, smartphone or laptop) to access organization's information resources in the workplace.

This strategy is becoming increasingly popular and companies are often dependent on their employees' ability to access mobile business applications from their personal devices. According to the survey conducted in 2016, six out of ten companies supported the policy, which includes BYOD-friendly policy in place [1]. This strategy is useful both for the company, as it is cheaper and boosts productivity, and for employees, as they can configure their devices the way they want. For example, Frost & Sullivan study sponsored by Samsung calculated time savings by showing that using personal devices for work saves employees 58 minutes daily, providing a 34% increase in productivity [3]. Most companies depend on their employee's ability to access business applications from their mobile devices (Fig. 1).

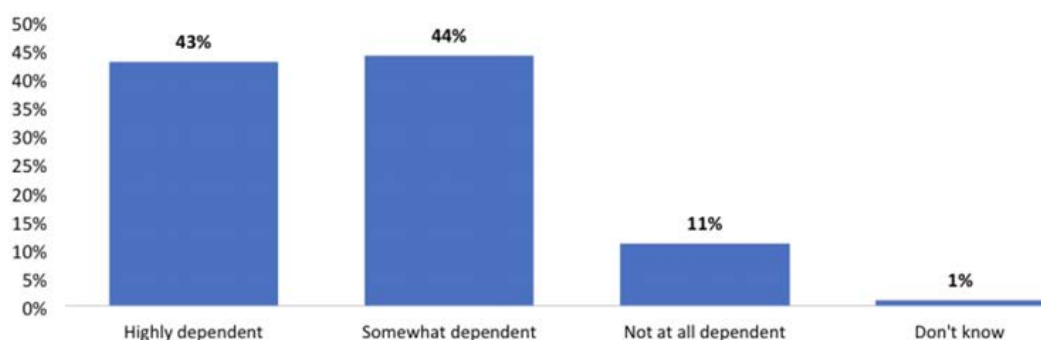


Fig. 1. Companies' attitudes to implementing personal devices in business

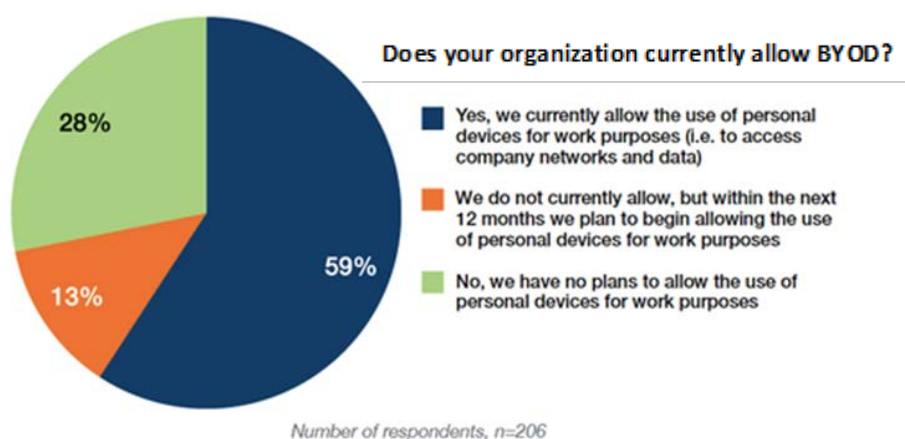


Fig. 2. Survey results on BYOD policy

However, using BYOD can lead to security breaches as well as compatibility and update problems. According to the recent survey for IT services of Damovo provider in UK, three-quarters of IT directors worry that BYOD will cause IT costs to "spiral out of control" [2]. Moreover, companies should be concerned about corporate data loss and find some way to control information on the personal devices. That is why it can be difficult to find a balance between comfort and security – employees want to use convenient applications and set their devices, as they want to, but for organization, it is important to control information on the device and impose some restrictions in order to protect data and network.

Adopting a "bring your own device" policy may not be an option for every company, but this strategy is something that everyone who makes business decisions will need to take into account [4]. In any case, an MDM (mobile device management) technology can facilitate the BYOD implementation. This software can be used to monitor, manage, and protect employees' laptops, smartphones, tablets, and other devices used in the workplace. To find a balance between comfort and safety, companies must use MDM that includes criteria such as:

- cloud-based-for updates to be automatic, backup/restore function;
- fully managed, round-the-clock monitoring, remote configuration and monitoring the settings;
- support for passwords and blacklists, the ability to delete data remotely;
- geographical restriction of access to certain data and applications in certain locations;
- logging and reporting;
- warning for users who try to circumvent restrictions;
- remote disconnection or deactivation of unauthorized devices and applications [5].

Using MDM, which contains these features, should make life easier with BYOD for both the company and users, since it helps centralize device management, updating them, etc., on the one hand, and allows users to configure their devices the way they want (but with the necessary restrictions), on the other hand. Due to the increasing number of cybersecurity threats, each company should consider implementing MDM while using the BYOD approach. In any case, the use of the "bring your own device" strategy has a strong growth trend, so organizations should take care of ensuring the corporate information security.

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Appliance of text classification techniques in an educational system

The internet today provides users with wide variety of information sources on different topics for various purposes, including learning. The amount of information in the internet grows rapidly each day. Considering these facts, there is a need in a tool for educational purposes which will have capabilities to classify the provided information sources and track a user progress within the chosen topics, and at the same time it will recommend articles for further reading. When using such a tool, users will have an ability to concentrate on different topics without losing their main matter of study. The aim of the work done was to implement a messenger bot which can assist to solve this task. This paper describes the bot's concept, the solutions applied, and challenges faced in the process of bot development by the author.

The tasks of a bot include classifying texts, tracking user progress and recommending articles according to users' priorities. The bot's principle of work is as following. First, a user loads their list of articles which are of high interest for them. Then, the bot categorizes them by their main topics, e.g. History, IT, Mathematics, Economics. After that, the user sees the result of classification that allows them to set their priorities by topics presented. Later, whenever a user reads an article, they need to tell or inform the bot somehow about their progress, i.e. which article and how much of it they read (in percentage). At the final step, users can ask the bot to recommend a source, especially when they doubt which topic exactly needs their attention. The main challenge of this work is to recognize main topics of the texts provided.

The goal encompasses three interconnected stages: gathering, processing and preparing data, choosing a system for text classification and implementation of server-side application that receives and handles requests from users.

To understand how this task can be solved, the use of term 'text classification' needs clarification of its use in this context. Text classification is the process of assigning tags from a set of predefined categories to raw texts. The classification may happen by different criteria, it includes a wide variety of tasks, for instance, detection of spam e-mails, prediction of reviews' sentiment and splitting up articles by topics.

This task is also one of the primary objectives of Natural Language Processing (NLP). Today, there are many approaches and techniques. Classification systems can be divided into two big groups: rule-based and those which utilize machine-learning methods.

Rule-based systems classify texts and utilize an approach based on a set of predefined linguistic rules. These rules tell the system how to handle such key semantic elements as words, phrases or sentences, and defines the way in which systems predicts categories of texts. For instance, if a system too often meets the

words that are more typical for and/or characterize political texts, e.g. *policy*, *economy*, *parliament*, then it can make a conclusion that it is a political text. Rule-based systems are simple for human understanding. However, such approaches have critical disadvantages that makes it unpopular compared to others. Firstly, implementation of the system requires deep knowledge about the domain, that is why linguists and domain experts may be needed to devise rules and vocabulary for the system. Secondly, development of rules may be time-consuming if texts are large and complicated. Thirdly, the system lacks scalability because newly added rules may influence performance of the system, so previous results need to be verified before applying new rules. Thus, developers usually resort to machine learning approach, as it is more reliable and common.

Machine-learning systems utilize other methods, their approach bases on statistical methods rather than on explicit instructions. The algorithm of this approach is the following: a developer gathers training and test datasets, manually classify samples, extracts features from it such as word frequency, pixel values, sound diapason etc., then basing on nature of the data the developer chooses a suitable prediction model. After that, the developer inputs acquired train data into the model and trains it, so it gives correct. The last step is algorithm verification. During verification the developer tests the model on test dataset and adjusts the system until it gives correct predictions in the most cases. The main advantage of this methodology is that even though most sophisticated systems might produce minor errors, they provide an effective and scalable solution that can process large amount of data and can be applied to most subtle problems. For the above-mentioned reasons, machine learning was used.

Machine-learning approach includes a wide range of algorithms devised for solving the task of text classification. The developer needs to consider at least a few options before starting to create an application. The choice of a prediction model depends on provided computational resources, terms and amount of data. The most known and common algorithm of prediction is Naïve Bayes. Naïve Bayes is a statistical algorithm based on Bayes' Theorem. The theorem provides the way to predict the conditional probability of an event depending on prior knowledge of conditions that may trigger the event. In other words, it allows to estimate the likelihoods of that event A caused event B if their probabilities and chance that B happens together with A are known.

In case of text classification tasks, Naïve Bayes works with probabilities of keywords' occurrence in texts of certain classes, so it counts the chance for every group that a text belongs to it. Then it compares results and makes prediction based on the highest probability. The main advantage of this algorithm is that it is simple for implementation and is effective when the developer lacks data and computational resources. However, its disadvantage is that it still might make mistakes with new complex texts and that after a certain limit adding new training samples it has insignificant effect on the model's performance.

The second known approach is Deep learning. Deep Learning is a mathematical model that tries to simulate work of human brain, i.e. the way it

perceives information and makes decisions. Basically, it is just a large group of graph nodes with connections, which have different weights that models work of neurons and dendrites together with axons, correspondingly. On the one hand, deep learning algorithms are quite complex that require more time for implementation, and they need more data samples for training. Therefore, they also demand more computational power compared to simpler machine learning approaches. On the other hand, unlike other models deep learning classifiers has a higher threshold. So, performance of a deep learning model improves with every new sample, making the model scalable and adaptable.

The third popular predictive algorithm is logistic regression. Logistic regression is a linear model which is basically a sigmoidal function which describes probability of a certain case or event depending on the input provided. The principle of work of logistic regression is that it takes frequencies or probabilities of keywords in texts and tries to fit sigmoid function to train samples that it would correctly predict a class. Even though training procedure is similar to Naïve Bayes algorithm the difference is in their functioning. The Naïve Bayes model recalculates probability that a text with a certain set of words might belong to a corresponding group, while the logistic regression model just maps an input value to an adjusted function. Thanks to this feature, logistic regression method shows better results for large datasets, but Naïve Bayes usually shows better performance in small datasets as it needs less data for training.

From my perspective, the decision to apply logistic regression is more appropriate in my work because it is simpler for implementation than deep learning models. Moreover, logistic regression promises better scalability than Naïve Bayes.

After having chosen a model, the next stage is processing data and extracting features for a predictive model. In my case, the following procedures were done: removal of common words, punctuation marks, non-words characters such as special characters, numbers because these elements convey no information for text classifier. After that the words in texts were lemmatized. It means that all the words were converted to their root forms, thus, vocabulary of a predictive model will contain only informative words. Before providing a processed text to the model, it is needed to extract features from the words. Here, features are a numerical characteristic of text that allows the model to make predictions. In case of text classification, it can be a number of words or their frequency; but these features might give low accuracy to the model. It is recommended to use term frequency–inverse document frequency (TFIDF) feature as it gives a higher weight to words that rarely appear in a training dataset but may be unique for a few documents from those set(s). At the same time, it gives small weight to commonly used words.

At the final stage, a bot applying logistic regression method and TFIDF feature was created as the dataset which was used for training the bot encompassing 40 articles on various topics in History, IT, Mathematics and Economics. It successfully fulfilled its tasks and correctly classified 90% of articles even from the sources unknown to it.

In conclusion, there are vast possibilities for applying text classification techniques in an educational process as machine learning provides a wide range of tools for solving the described tasks, and even simplest ones are enough for basic tasks of classification.

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How to protect your “smart home” system against cyber threats

Smart home technology is not uncommon today since public interest in it only increases and they are becoming more affordable for average consumer. Figure 1 shows the distribution of smart homes in Europe and the USA in recent years. But after connecting house to the Internet there is a risk of hacking attempts. Hackers are trying to gain access to home security cameras.

The purpose of this work is to evaluate all types of threats and find the way to neutralize them.

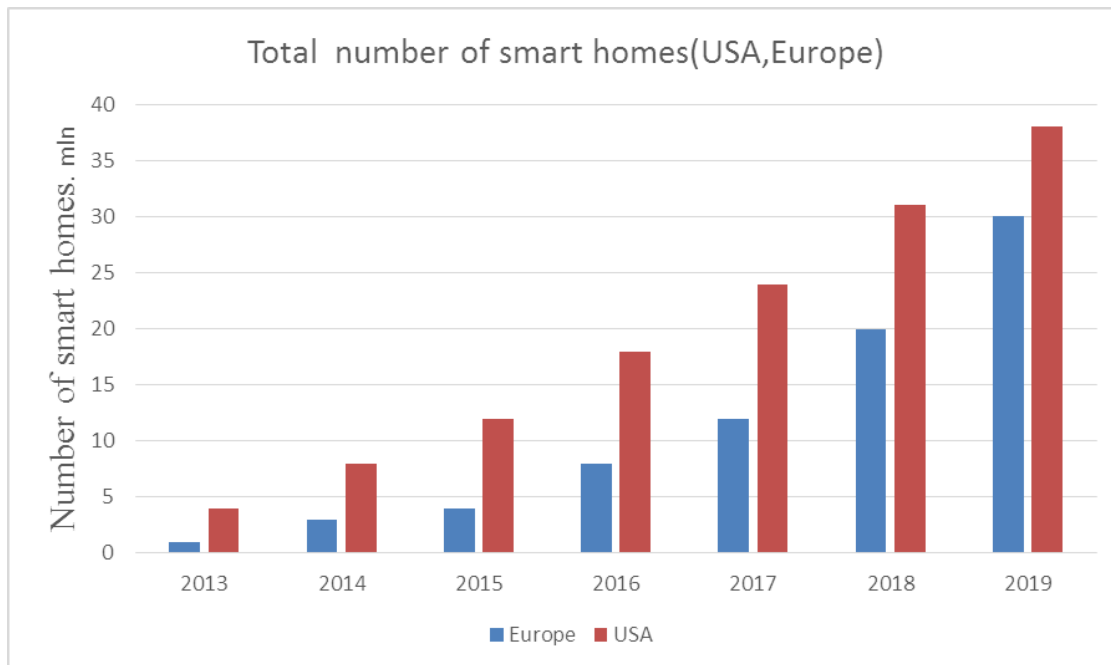


Figure 1 - distribution chart of smart homes in Europe and the USA.

Recent Avast study showed that over 49,000 MQTT network protocols are publicly available on the Internet due to incorrect configuration. The MQTT protocol is used for connecting to smart home devices and controlling them through the smart home control center. Typically, users configure the server when installing the MQTT protocol, and in most cases it works on the home computer. The MQTT protocol itself is secure but if you configure it incorrectly serious problems can arise, experts say. There exists new ransomware malware that requires a ransom for returning control of the house.

Attacks like this are rare cases for now. But, due to the fact that many data are freely available, the number of attacks can increase. Generally, at the moment, about 30 thousand IP addresses in the USA are already posted on the Internet that can open loophole in smart home system when entered into a web browser. Even a not very experienced attacker can use this data to attack since most of them use the default

username and password, which can be easily found on Google. Therefore, it is extremely important to make sure that user credentials have been changed, and set a limit on the number of password attempts.

How can hackers get into the smart home system? Many popular smart home systems use a centralized data warehouse. With such a system, hackers can penetrate all devices in the house at once. First, attackers will gain control over a poorly protected product, such as a fire sprinkler or a “brand” lighting system. After that, they will be able to act in the data warehouse on variables that relate to a product that has a high degree of security.

Protection methods. It is important to understand that in order to break into a smart home, you don't need to be an advanced hacker. Attackers are looking for users who use technological innovations, but do not know how to take care of cybersecurity. Therefore it is necessary to use specialized applications for protection .

You must activate two-factor authentication. Two-factor authentication is a security tactic used to verify a user's identity using a combination of credentials (passwords, credit cards, fingerprints). For example, a smartphone may request a password and a fingerprint to unlock, or email may require a digital code sent to the smartphone. Two-factor authentication should be activated on all kinds of devices. When this method used correctly , it is a reliable way to introduce an additional level of security for a smart home.

Protect your router. Security for smart home and IoT devices starts with a router. This is the main piece of equipment that integrates all smart devices. Although homeowners often use routers proposed by Internet service providers, they are not always protected. The fact is that these devices come with standard and easy to crack settings, as well as default passwords, which often remain unchanged.

Therefore, first rename the network and change the password using a complex chain of numbers and symbols

One of the most affordable and latest solutions on the market is the Kaspersky IoT Scanner from Kaspersky Lab released in 2018. The application scans the home Wi-Fi network and informs the user about the devices connected to it and their level of security. If the application sees suspicious activity of the smart home system or an unfamiliar device, the user is notified. The owners can always control who has access to his home network at the moment, just run the programme on their smartphone.

The consequences of the attacker's penetration into smart home system are heating and conditioning ventilation control , fire alarms, lighting and even security.

Attackers constantly hack into home security cameras and other smart gadgets in the house. According to Symantec, in 2017 the number of attacks on IoT devices grew by 600%. Undoubtedly, a smart home is part of technological progress that can make life easier for a person, but you need to be able to properly protect your system from intrusions .

It's apparent that if you want to use the Smart Home technology, you need to be responsible and attentive in order to protect your home from any cyber threats.

Besides you must be aware of measures that should be taken in case of losing control over the house.

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Information Technology in Higher Education in Ukraine

The development and use of IT in education is a modern and urgent problem in Ukraine. The systematic approach to planning the development and implementation of IT is required.

The digitalization of university education is a prerequisite for the quality future specialist training in modern conditions of intensive ICT development. Furthermore, it is used for rising of university competitive level in the educational service market.

Modular Object-Oriented Dynamic Learning Environment (MOODLE) can solve the problems of introducing and using IT in higher education. It is a system for creating an educational environment of the higher institution, which is primarily focused on providing interaction and it used for the organization of both distance and full-time education. [1]

IT is implemented by using software and hardware systems, provided with the necessary software, which increases the degree of automation and the efficiency of both the educational process and scientific research. IT significantly increases the level of work efficiency in science and education due to:

- information transmission and presenting it in a short time;
- ensuring the accuracy and quality of the tasks;
- integration with software products;
- the possibility of implementing previously unsolved tasks;
- reduction of development time, thanks to the flexibility of changing data and work process.

According to the data, the Ministry of Education and Science of Ukraine announced the reduction of universities by 3 times (Figure 1). In the development of digitalization, new trends are needed in the formation of the educational system, such as single information educational space creation as well as active introduction of new means and methods of teaching. [2]

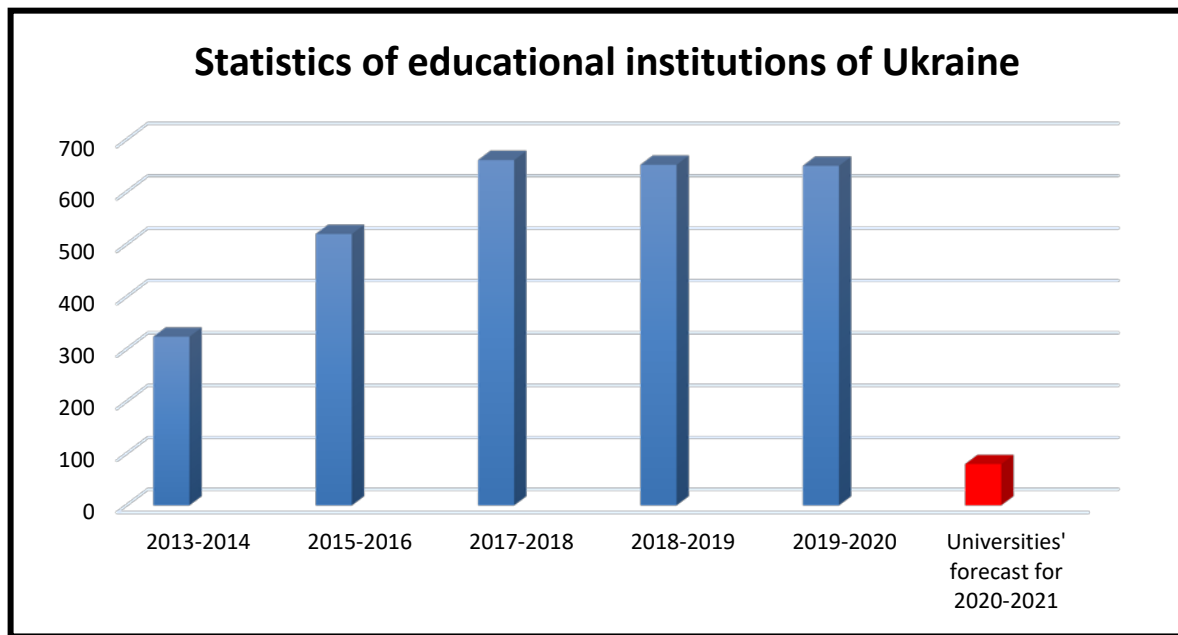


Figure 1 – Comparative graph of available Ukrainian Universities

For teachers, IT can be applicable to address the issues of preparing lecture material, electronic textbooks, creating methodological support for courses, preparing training support tools, automating testing of students' knowledge.

The automated control of students' knowledge in the form of testing makes it possible to organize centralized control and allows them to make control more objective, independent of the teacher's subjectivity. Moreover, it organizes the storage of teaching-learning materials and assessment results in e-form in the comfiest ways of the ability to store large amounts of information.

The main advantages provided by the use of IT in Ukrainian education compared to traditional training are as follows:

- IT significantly improves the perception of educational information through activating multiple ways of representation (the use of colour, graphics, sound and animation);
- IT increase the students motivation thanks to interactive mode of operation.
- IT provides a good alternative to traditional education for people with disabilities. This makes it possible to graduate anywhere and at any time. IT also contributes to socialization because social possibilities such as virtual classes, chats and blogs are integrated into the platform MOODLE.

The process of introducing IT into traditional education is a serious problem in higher education in Ukraine. Most of the world's universities use IT opportunities that eliminate the shortcomings and provide a lot of additional opportunities. The educational process is based on purposeful and controlled intensive independent work of the student's, which has special teaching aids and the possibility of contact with

the teacher. Therefore, IT solves the problem of distance learning through e-Learning, and it also complements full-time education and improves the quality and effectiveness of traditional learning.

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Forecasting stock exchange price data using auto-regression models

The stock market is an integral and important element of the financial system of a market economy. Therefore, the establishment of an effective and efficient stock market is an important step in the development of each state. The stock exchange, in turn, is one of the subjects of the stock market and is a basic element of the organized securities market. To date, trading on the stock exchange is carried out electronically, using special programs.

The success of trading on the stock exchanges depends on many factors, such as the knowledge and ability to analyze the latest news in the stock market, such personal qualities of the participant as determination and responsibility, and above all, his ability to predict stock prices. The need for society to predict events in many areas of life has led to the development of a large number of empirical and predictive methods. The process of changing stock prices is not a deterministic phenomenon, as it contains a certain random variable. That is why it is difficult to predict future results, since it is necessary to consider its probabilistic non-stationary character. Currently, there are two most popular methods of forecasting on the stock exchanges - fundamental (focused on a deeper study of the financial and economic status of enterprises) and technical analysis (using mathematical methods).

It has been suggested to consider time series models that explain the behavior of the time series based only on their values in the past (technical analysis). Autoregressive Integrated Moving Average (ARIMA) models are well suited for this case. They describe well both stationary and non-stationary time series (most time series can be reduced to the stationary series by highlighting a trend, a seasonal component, or by making a difference) [1].

The obvious advantages of this model can be attributed to their very clear mathematical and statistical justification, which makes them one of the most scientifically valid models from all the many models of trend forecasting in time series.

Another advantage is the formalized and most elaborated methodology, following which, the model most relevant to each specific time series can be selected. The formal procedure of checking the model for adequacy is quite simple, and the techniques developed to automatically select the best parameters for ARIMA greatly facilitate the forecasting process [2].

Auto-regression models were built for 10-year oil price data, about four thousand values were taken for each day of the exchange. Figure 1 presents the

results of the first five predictive values constructed by the ARIMA model with different coefficients and the real data (dashed broken line below) for comparison.

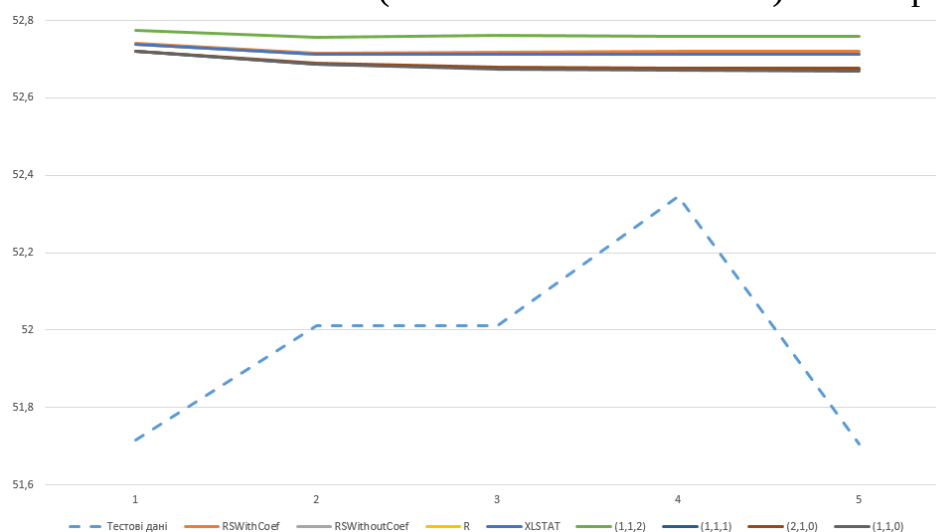


Figure 1 – Comparative graph of 5 predicted values with real (test) data

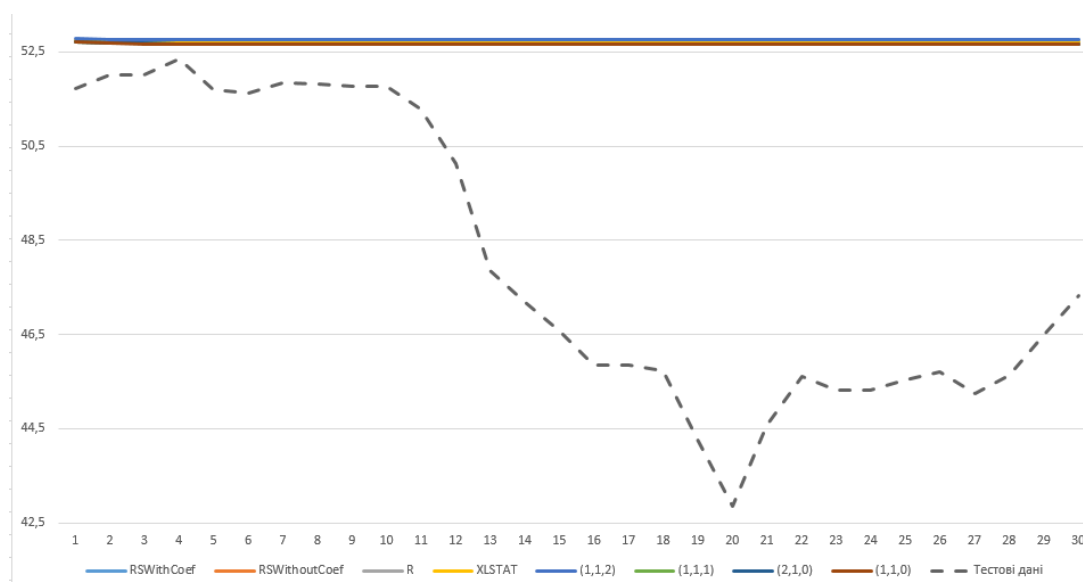


Figure 2 – Comparative graph of 30 predicted values with real (test) data

Comparison of the first 5 forecast values shows that no model is 100% accurate. The results of the study show that the predicted values are approximately equal to the real values up to 11-12 values (Figure 2), then begins a strong discrepancy.

The result confirmed the theory that ARIMA models produce a plausible short-term result, whereas for the medium- and long-term results, the predicted values for these models will have significant errors.

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Key Problems in Teaching and Providing Cybersecurity

According to the latest data (2018) of the global cybersecurity indices, Ukraine is among the countries with a level of cybersecurity that is rated as "average" [1]. Therefore, it is important to understand the main shortcomings of the cybersecurity organization system in Ukraine.

Ukrainian higher education institutions conduct training on educational cybersecurity qualification curricula. However, there is a difference between the educational curricula of some universities, which leads to a high resonance between what the employer wants from a specialist who has been trained in the above-mentioned field, and what the specialist can do. The absence of clearly defined requirements, which would be taken into account while specialists training, leads to problems concerning the employment of relevant specialists, as well as to the employer's search for qualified employees.

At present, the system of organizing cybersecurity in Ukraine is outdated and guided by principles that lag behind the world leaders in this field. This is due to the lack of a clear cybersecurity branch. Curriculum on Cybersecurity developed in accordance with the valid requirements (Order of the Ministry of Education and Science of Ukraine dated on 04.10.2018 No. 1074 "On Higher Education Standard of Ukraine".

"Cybersecurity" specialty is not focused on the labor market and global cybersecurity practices (not the total neglect of world experience, but its irrational use) [2]. The problem also lies in the difference between the higher echelons of government's understanding of cybersecurity and the material presented by higher education institutions. According to Nadezhda Litvinchuk, a state expert of information security service, the question "Is there a cybersecurity system in Ukraine?" is the basic one for solving cybersecurity problems in the country as a whole. In all the years of independence, there has been no systematic approach to this critical issue. Of course, a regulatory framework and a security system were created, but there were no key documents that could be used to develop a cybersecurity system [3]. The best proof of cybersecurity's low level in Ukraine is the Petya virus attack on critical infrastructure in 2017. The virus exploited system's weaknesses (Eternal Blue, backdoor Double Pulsar) [4], indicating that government agencies still use outdated systems that have the vulnerabilities. One of the reasons for this is incorrect approach to organizing cybersecurity.

As a rule, universities do not have adequately equipped training laboratories, which contain outdated systems that can be easily hacked by students with the help of their own smartphones. All these factors lead to a frivolous formation of cybersecurity sense in future specialists of this area, since it is impossible to have a serious attitude towards the training, taking into account that they "learn to protect

themselves with the help of unprotected means". Such attitude to cybersecurity has a detrimental effect on students' professional skills. That is, the problem is that future professionals do not have an adequate environment for developing their professional skills. For the same reason, it is not possible to provide modern materials; this in its turn generates unqualified/incompetent specialists. This makes it more difficult for employers to find specialists in the future and destroys the country's cybersecurity system. Another aspect of the global problem is the lack of understanding an integrated cybersecurity system in which all elements are mutually agreed. For a long time, Ukraine has used CSIS (a comprehensive information security system) for protecting information, but this method is already outdated and does not correspond to global security trends. However, the introduction of ISMS (Information Security Management System) has begun recently, which is more in line with global trends in the cybersecurity area. This could be a key aspect in reconsidering a cybersecurity concept in the country.

However, to create a strong cybersecurity system in the country, a comprehensive approach is needed, which will include not only reorganization at the organizational level, but also training of specialists who meet the requirements of world leaders in cybersecurity as well as the requirements of the regulatory framework of Ukraine. Thus, it is necessary to re-equip academic laboratories in higher education institutions where future cybersecurity specialists will be trained.

The minimum requirements for workstations are: 6-8 GB of RAM, the Windows 10 operation system with the latest security patch, for comfortable training. Software requirements must be developed in accordance with specific academic disciplines. The curriculum should be reconsidered and supplemented with disciplines that are most common for professionals in real life (i.e., Ethical Hacking Discipline that would cover a large number of practical skills required by a specialist).

Thus, it is proposed to carry out reorganization measures to improve the cybersecurity state in Ukraine. The problem of inconsistency between the regulatory framework and the curriculum of specialists leads to the inability to meet the requirements of the state and employers, which in turn adversely affects the overall level of protection of the country's information space. Ukraine has a great potential in the field of cybersecurity, but it is necessary to constantly improve mechanisms and methods, correctly use the experience of world leaders and organize a single cybersecurity ecosystem in which each element will be harmonized.

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Generators in Python and their applications

A generator is a special kind of object that supports an iterator's and iterable object interfaces and performs calculations of each successive iterator based on the previous one and on the interior status of a generator. One of the features of a generator is that, using the yield statement, you generate a series of values, instead of returning only one. Also, the generated data can be iterated only once, which makes the generator different from the lists or other containers [1-3].

Furthermore, containers are finite, but generators can be both finite and infinite. However, a generated element cannot be changed easily, because the next time, when you call the generator for this element, the returned value will depend on the generator's state. Also, generators store only previous value that allows the memory use to be lowered. Access to the generator elements is sequential and unidirectional. In addition, generators can be used for creating another generator.

Implementations of generators. Generators can be implemented as expressions, functions or user defined classes. Anyway, generators provide implementation of an interface that includes such methods as `__init__()`, `__iter__()`, `__next__()`, `.send()`, `.throw()`, `.close()`.

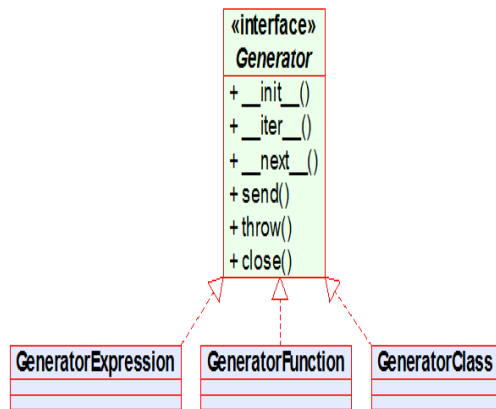


Fig.1 Types of generator interface implementation

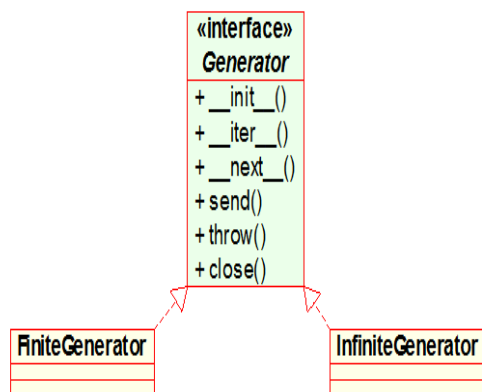


Fig.2 Finite and infinite of generator interface

These methods have different purposes [4-7]:

1. `__init__()` initializes some internal variables.
2. `__iter__()` is required to return an iterator object
3. Each call to the `__next__()` method on the generator object returns the following value.
4. `send()` allows to send data to the generator.
5. `throw()` method is used to force the generator to raise an exception.
6. `close()` can make the generator stop on the next call to it from the outside [2,6]

Depending on the implementation of `__next__()` method and variables of internal generator's state, the generator can produce finite or infinite series of values [4,7]. An infinite generator never reaches the final state, in which a call to the generator raises a `StopIterationException`, due to the implementation of its internal algorithms.

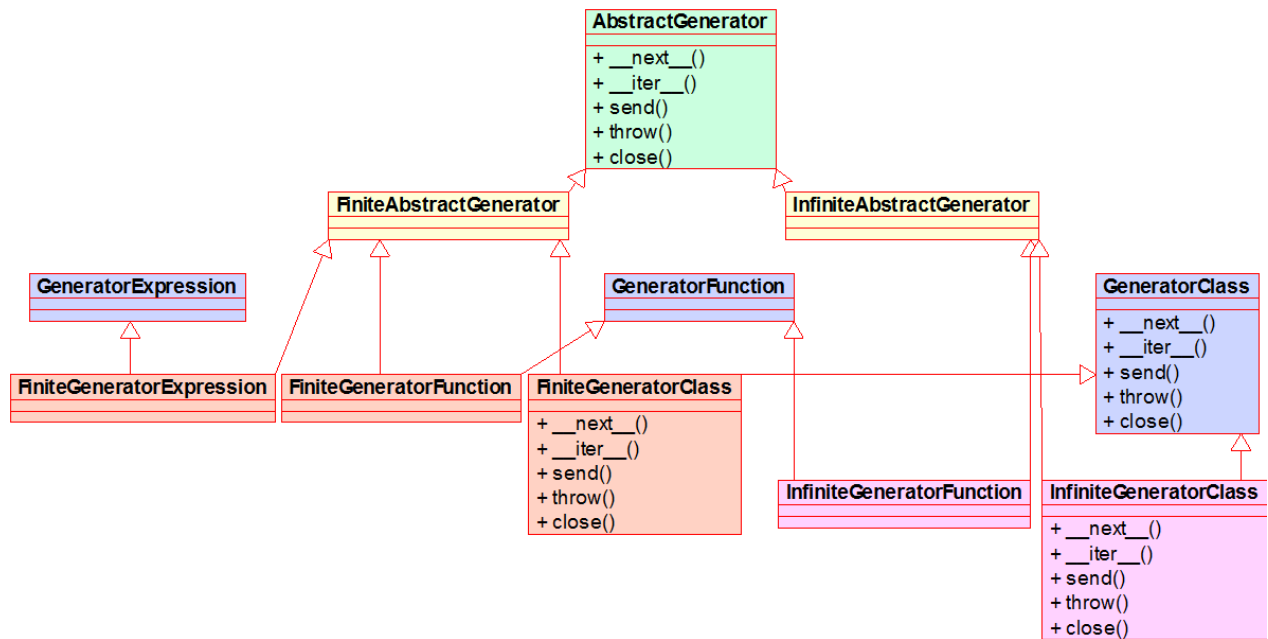


Fig.

3: Generator's hierarchy in Python

In Python, generators can be implemented in one of the following ways [4-7]:

1. Implementation of generator-expression:

```
generator = (x*2 for x in range(3))
```

Here are some examples of the usage of generator-expressions in different cases:

For loop:

```
for i in generator:
    print i
```

While loop:

```
while True:
    print next(generator)
```

It can be used to create another generator:

```
secondGen = ((x, x*x) for x in generator)
for i in gen:
    print i
```

2. Usage of generator-function:

```
def genFunc():
    for i in range(4):
        yield i*i
```

Generator-functions also can be used in loops and another generator.

For loop

```
genFunc()
for i in genFunc():
    print i
```

Usage in another generator:

```
gen = ((x, x*x) for x in
for i in gen:
    print i
```

3. Implementation of generator-class

Usage of generator-class with enforced `__iter__()` method.

```
class Fib:
    def __init__(self, n):
        self.n = n
        self.a = 0
```

```

    self.b = 1
def __iter__(self):
    for i in range(self.n):
        yield self.a
        self.a, self.b = self.b, self.a+self.b
f = Fib(10)
for i in f:
    print i

```

An implementation of generator-class with `__next__()` method.

```

class Fib:
    def __init__(self):
        self.a = 0
        self.b = 1
    def __iter__(self):
        return self
    def __next__(self):
        x = self.a
        self.a, self.b = self.b, self.a + self.b
        return x
f = Fib()
for i in range(10):
    print f.__next__()

```

4. List comprehension is one of the common method to create a list of values [4].

```
generator = [x ** 2 for x in range(10)]
```

This is an example of list comprehension usage in another generator:

```

secondGen = ((x, x*x) for x in generator)
for i in secondGen:
    print i

```

What generators are used for. First of all, the best way to iterate over the series of values without storing them all in the memory is to use a generator. One of the variety of the generators is list comprehension, which generates the whole list at once. Other containers can be generated this way. Also, the concept of coroutines is associated with generators. Coroutine is a generator that receives data from the caller. It can be done using the `send()` method, which is used to pass values back to the function. This is called “generator based coroutines”. Here is a simple example:

```

def genCoroutine():
    value = yield "Hello"
    yield value
gc = genCoroutine()
print(next(gc))
print(gc.send("World"))

```

Generators can be recursive [2]. For example, it can be useful, when you need to permute elements in a list :

```

def permute(series):
    if len(series) != 0:
        pi = series[:]
        for i in range(len(pi)):
            pi[0], pi[i] = pi[i], pi[0]
            for p in permute(pi[1:]):
                yield [pi[0]] + p
    else:
        yield []
for p in permute([1, 2, 3, 4, 5, 6]):
    print(p)

```

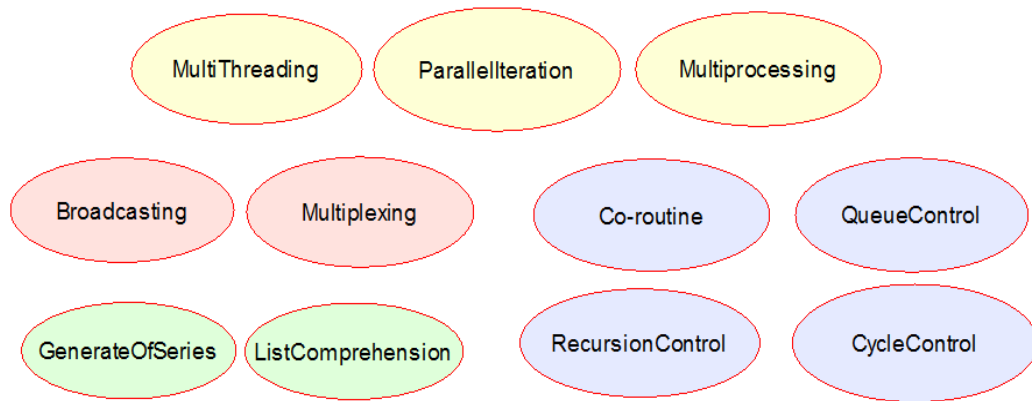


Fig. 4: Use case of generators

So, the interest in generators is related to the requirement of continuous improvement of software quality. This paper tried to analyze generator use cases and problems in software engineering where the generators can be applied. As an example of generator's usage, some code snippets have been provided.

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The problem of human-computer interaction

Every day, artificial intelligence (AI) is increasingly being introduced into our lives. People make inquiries on the Internet, write reviews and comments, translate from one language into another and communicate with chat bots.

However, all languages are different. Moreover, it is extremely important to avoid misunderstanding between a person and a computer. In order to meet those challenges, there is a direction in Machine Learning called Natural Language Processing. The main goal of NLP is to teach the computer to understand natural languages and be able to speak them.

Natural Language Processing is a general area of investigations in linguistics, computer disciplines and AI. This direction studies the problems of computer analysis, as well as the synthesis of natural languages. Some of the most effective and popular ways of Natural Language Processing are Word2Vec, GloVe, Neural networks.

Nowadays, more and more new images are distributed; thousands of comments and reviews are recorded under posts in social networks or on the Internet. Most of the data is stored in the so-called "raw" form, which makes them practically useless. To get any benefit, raw data must be filtered and processed. For this, many algorithms have been developed to deal with this data in a short period without any human help.

We can use NLP for:

- *Extracting information or facts*

This is an automatic engineering of structured data from unstructured data that defines objects, their properties and relationships. The goal is to carry out the analysis of a package of documents in a natural language and select the required information, structure it, and subsequently, add it to the database.

- *Studying the tonality of the text*

It involves automatic determination of the emotional coloring of the text and the attitude of the person, who wrote the text, to the object of discussion. Sellers can use this kind of analysis in order to determine which of the goods are most popular among buyers. It is also important for countering extremism and terrorism by monitoring social networks, for filtering and identifying messages containing information about unlawful acts and preparations for terroristic attacks. The essence of such methods is that in the first stages, a machine classifier is trained on pre-marked texts, and then the resulting model is used to analyze new documents.

- *Answering questions*

This category includes so-called chat bots, which simulate real communication with people using special programs that first analyze a certain text, and then answer the questions related to it.

- *Translating texts*

One of the most common uses of natural language processing is translating from one natural language into another. One of the most successful techniques currently in use is Seq2Seq-type neural networks.

- *Voice assistants*

They are created to facilitate everyday tasks of a person and are based on the principle of chat bots. Additionally, they are helpful for self-learning and remembering frequent commands.

The most common principles of work

A significant part of NLP technology works thanks to deep learning. Deep learning allows one to train a program to predict the outcome of a set of input data. You can use supervised or unsupervised training.

The principle of Word2Vec is to present the words in the form of vectors. Each word is presented as a binary vector of length n . The data we need will be obtained like this. Each bracket denotes a single context window. The blue field indicates the input one-hot vector, the red field indicates the output one-hot vector. Two data items are obtained from one context window. Window size is usually user-defined. The larger the size of the context window, the better our model, but this affects the execution time of the algorithm.

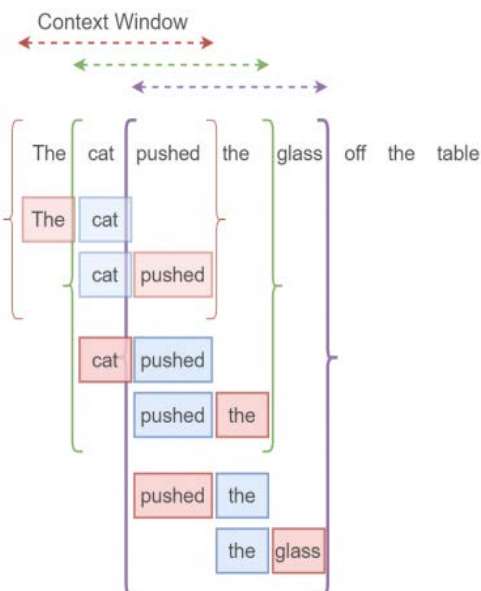


Figure 1: Creating structured data from a source

The embedding layer stores the vectors of all the words that have been added to the dictionary. The larger dimension it has, the better the model is. This giant matrix is tuned bit by bit during the optimization process. A neural network, receiving an

input vector, is learning to predict the following word, based on previous words. And finally, putting everything together, we get a ready-made model that looks like this:

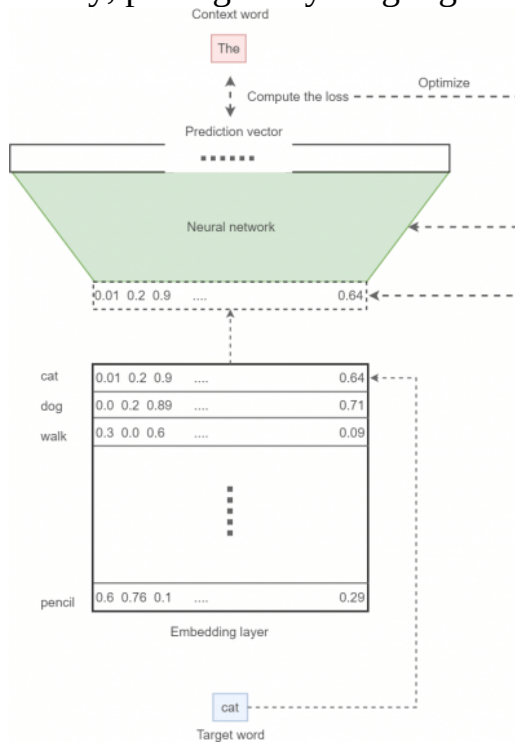


Figure 2: Skip-gram

The only disadvantage of this method is the low efficiency of using statistics of matches in the case that leads to suboptimal results.

GloVe is designed to solve the problem of capturing the meaning of one word embedding with the structure of the entire visible corpus. To do this, the model looks for matches of the number of words and uses statistics, minimizes the standard deviation, and gives out the space of the word vector with a reasonable substructure:

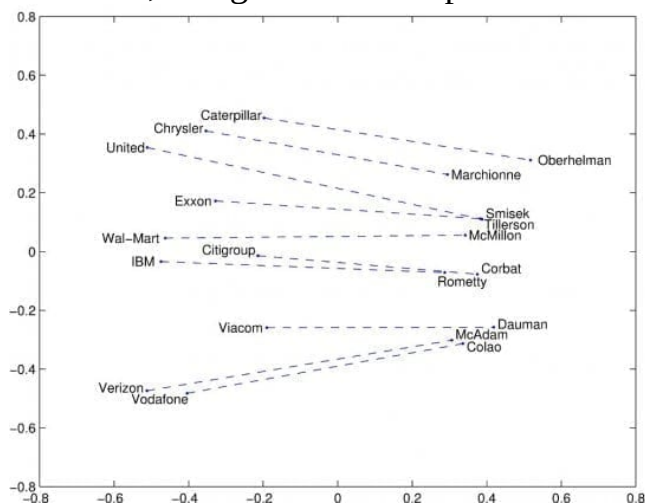


Figure 3: Country and Capital Vectors Projected by PCA

Summing up, we can say that today there are a lot of method for NLP. Different methods are suitable for solving different problems, which gives us a choice how to interact with a computer.

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Social engineering and its role in cybercrime

According to the estimates of 2019, the most of cyberattacks are dependent on social engineering [1]. The ratio between cyberattacks that are dependent on social engineering and those that are not is given below (Fig. 1).

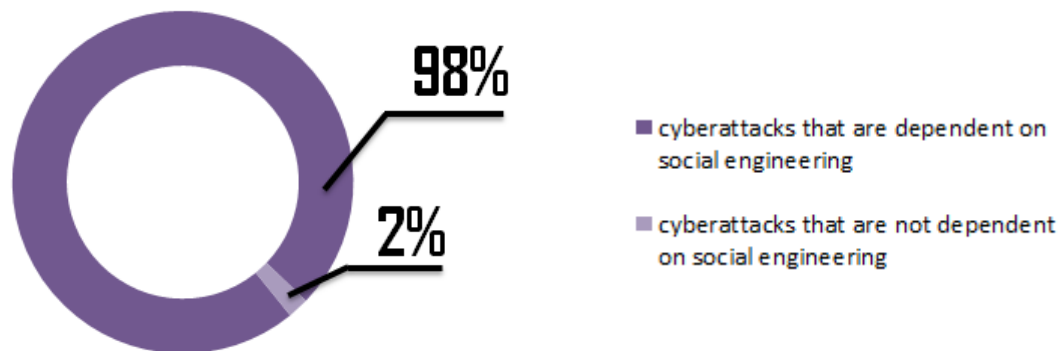


Fig. 1 Ratio between cyberattacks that are dependent on social engineering and those that are not

Our research is focused on social engineering and its role in cybercrime. The concept of social engineering and the scheme of its life cycle are presented.

A circular graph shows the ratio between cyberattacks that are successfully implemented through internal disorganization and cyberattacks that have successful realization through other sources. Components of internal disorganization are also shown.

A case study is presented by the table of the link between the dangers of social engineering methods and their awareness.

The concept of social engineering is a process of manipulating the human psyche in order to achieve the desired manipulator's goals. This process is divided into four main phases [2]. The lifecycle of social engineering is illustrated below (Fig. 2).

At the "Preparation" phase the targets are set, the victims are found, the type of social engineering is determined, and the appropriate information is chosen.

At the "Catch" phase the main goal is deception. It can be provided by using previously gained information about victims or just exploiting their carelessness and curiosity.

The aim of the "Play" phase is getting confidential information. Here victims commit actions or compromise data which intruder needs.

At the “Quit” phase the victim’s role is practically nil. The only goal here is disappearing.

The cycle is over. If new targets appear, the cycle is repeated.

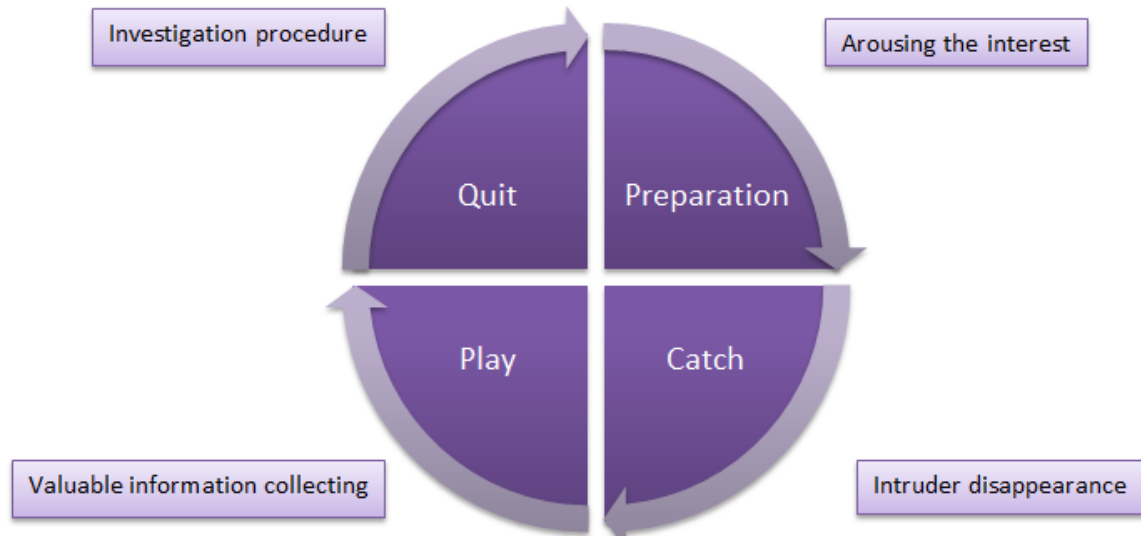


Fig. 2 Life cycle of social engineering

More than half of cyberfrauds from cyberattacks that are dependent on social engineering have a successful implementation through internal disorganization [1]. Percentage ratio between attacks that are successfully implemented through internal factors and attacks that have a successful implementation for other reasons is presented in the circular graph (Fig. 3).

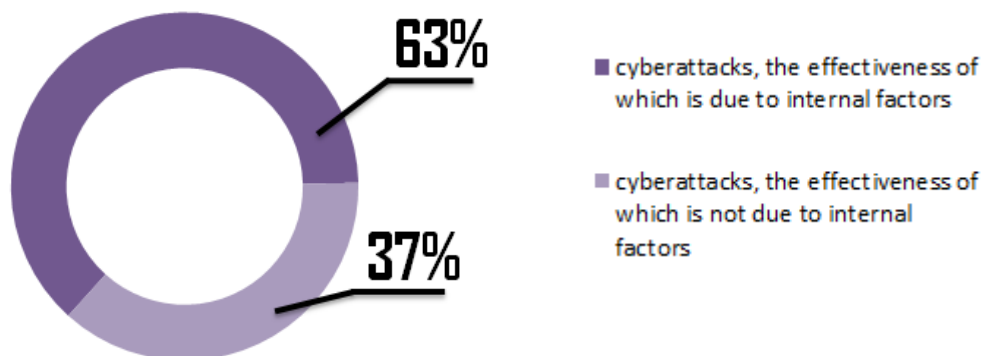


Fig. 3 Ratio between cyberattacks which are related to internal factors and which are not

Internal disorientation consists of :

- absence or ignoring the security policy;
- lack or failure of cyber security awareness programmes;
- absence of checking measures of the workers’ alertness;
- incorrect selection of working staff;
- indifference to the choice of web resources (cloud repositories, messaging services etc.).

The table below shows how awareness of the most common cyberthreats influences their implementation [3].

Table 1

Effectiveness of social engineering methods depending on the cyber awareness of the potential victim

Method of social engineering	Will cyber awareness help?	Why?
Vishing	Yes	• does not target a specific person; • ordinary patterns of deceptive schemes are used; • information verifying is not difficult.
Smishing	Yes	• primitive deception; • not to become a victim do not follow the link.
Search engine phishing	Partially	• simple method of deception; • high attention is required.
Spear phishing or pretexting	Partially	• targets specific person; • an individual deception scheme is prepared.
“Classic” phishing	Yes	• the simplest method of social engineering; • not to become a victim ignore the message.
Whaling	Partially	• thorough preparation by the attacker; • difficult deceptive schemes.
Watering hole	No	• nothing depends on the average user.
Baiting (Trojan or Road apple)	Yes	• simple fraud algorithm; • not to become a victim do not download proposed.
Quid Pro Quo	Yes	• simple psychological model is used.

Research suggests that attackers do not need to have specialized knowledges of computer network action algorithm. It is also unnecessary to develop a complex scheme of actions and involve a large number of participants. The only thing that the intruders really need is the knowledge about the fact of weakness existence and the desire to take advantage of it.

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Artificial intelligence in chemistry

Nowadays, artificial intelligence is used in every area of our life. Every day, mankind finds more and more new areas to apply this technology. One of these existing areas is chemistry. Artificial Intelligence (AI) research has generated multiple essential technologies, such as Natural Language Processing, Machine Learning, planning, and search, with a wide range of applications. These fields have led to advances where AI is already outperforming humans, for example the Chinook Checkers-playing program (Schaeffer 2009), IBM's Deep Blue in chess (Campbell, Jr., and Hsu 2002) and Watson for Jeopardy! (Ferrucci et al. 2010), and Google DeepMind's Alpha-Go in Go (Silver et al. 2016). However, there is still an uncountable number of unsolved challenges to be considered.

The term "artificial intelligence" was coined by John McCarthy, at the Dartmouth meeting in 1956. Since this term appeared, chemistry (and especially synthetic organic chemistry) are considered, along with medical diagnostics, as one of the main areas of its future application. Most of the remaining tasks were set much later. Research in AI applied to chemistry has largely been fueled by the need to accelerate invention of the medicines and reduce its huge costs and the time to market. So far, AI has made significant progress towards the acceleration of medical inventions. However, the applications of AI in chemistry are not limited to it. It is also used for chemical engineering.

Today artificial intelligence uses many approaches and methods, but at the very beginning of its development, the main emphasis was on the use of so-called expert systems based on rules stored in knowledge bases formulated by expert chemists and a logical inference mechanism. The first successful expert system in the field of synthetic chemistry was the LHASA program developed under the guidance of Nobel Laureate in Chemistry Elias Corey by the beginning of the 70s of the last century. It can be argued that LHASA made a revolution both in the field of synthetic organic chemistry and artificial intelligence, and determined the main directions of development of computer synthetic chemistry for many years to come.

Synthetic chemistry has become an area where, back in the 80s, the capabilities of artificial intelligence came very close and almost equaled the capabilities of experienced synthetic chemists. This determined the popularity of synthetic chemistry among specialists in artificial intelligence in the 70s and 80s.

Nevertheless, despite the great success achieved by artificial intelligence in the field of synthetic chemistry, by the 1990s, the popularity of this area had sharply decreased and even practically reached zero. A paradoxical thing has happened, which is still being discussed among specialists. Although the capabilities of a

computer for planning synthesis come close to the capabilities of synthetic chemists, the latter are still needed to carry out the synthesis, and no computer can replace them in this. As a result of this, a computer program began to be perceived as an expensive “toy”, which can be dispensed with and is not worth spending money on.

AI has become more popular today thanks to increased data volumes, advanced algorithms, and improvements in computing power and storage

The main task for artificial intelligence in chemistry today is to analyze and process a big amount of chemical reaction data. For example, AI methods is actively being used for word processing and image recognition to extract information from literature and other sources on the methods of synthesis of chemical substances, their properties, and reactivity. The first examples of automatic data extraction used databases from dozens of reactions, then went thousands, tens of thousands, and now work is already going on with millions and tens of millions of reactions, which already cover all the reactions carried out throughout the world over 200 years of the existence of synthetic chemistry. This now can significantly reduce the cost of hiring a lot of qualified chemists (usually low-paid from third world countries) who extract information from the gigantic volume of published literature for updating databases. AI methods are also beginning to be used for automate processing and analyzing information already collected in databases, searching and correcting errors, as well as replenishing missing information automatically, thus increasing significantly the value of such information.

In recent years, the deep learning methodology has also become available, which makes it possible to extract knowledge based on very complex laws from a large amount of data. Recently all this has led to an explosion of interest in the use of artificial interest in synthetic chemistry.

Artificial intelligence has already helped in many projects. Here are some examples.

A computer scientist Regina Barzilay and her team from Massachusetts Institute of Technology developed the machine learning tool. Further their collaboration with a researcher James Collins dealing with synthetic biology resulted in discovering new antibacterial compounds by applying machine learning platform. The system screened more than 107 million chemical structures and found nine potential antibiotics, with one in particular showing potency against 97% of the resistant bacteria it was tested against.

Aiming to tackle the growing antibiotic resistance crisis, a collaboration of synthetic biologists and computer scientists developed a deep learning platform to predict antibiotic activity. In particular, the group wanted to discover compounds with structures distinct from known antibiotics, to boost their chances of success against resistant bacteria. Here is another example.

IBM researchers have developed a new artificial intelligence system, which is based on the methods used to translate text from one language to another. However, this program considers the atoms of chemicals as letters, and the molecules as separate words and the result of its work is by no means a translation, but the

determination of the final results of complex organic chemical reactions, which, in turn, can be useful for medicine development.

Currently, the program provides results that are not less than 80 percent reliable. At the same time, if artificial intelligence finds that a chemical reaction can go in different ways, each of which will lead to a separate result, it will give out all the possible solutions, ordering them according to the calculated probability.

Considering all this information it can be concluded that Artificial intelligence-based tools are now capable of helping scientists to design new molecules and synthesize them. In many cases, these tools reach impressive performance and boost chemists' productivity. However, AI is not perfect yet and chemists still have to monitor its work. This tool is not created to replace chemists, it is created to help them! AI development will lead to a greater degree to the emergence of additional specialties and jobs rather than eliminating old ones. In the field of synthetic chemistry, AI will save people from routine work taking up most of the time, and make the work of chemists much more creative and productive. AI will rather help in the development and effective use of human capabilities than will pose a threat to it. Researchers are expected to make great improvements in this area and in the next few years and these tools are sure to become essential.

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Will robots be able to replace people?

Today robots are actively integrating into people's professional and daily lives making work safer and more efficient, and everyday life comfortable and easier. On the other hand, some scientists have begun making disappointing predictions about the danger that artificial intelligence can pose to humanity. One of the most real threats is fast robotisation that can result in active replacement of humans by robots in many areas of work.

According to the IFR (International Federation of Robotics) report published in the Foundation for Information Technologies and Innovations (ITIF), the world average in 2017 was 85 robots per 10,000 employees. That is 15% more than in 2016 [1]. The 2019 IFB report shows a new 6% world increase in 2018 – 99 robots per 10,000 workers. What is more, IFR forecasts predict an average increase of 12 percent per year from 2020 to 2022 (Fig.1).



Figure 1 Annual installation of industrial robots in 2013-2022 [2].

Figure 2 provides more detailed information about the level of robotisation in different countries of the world with top 5 leaders [2].

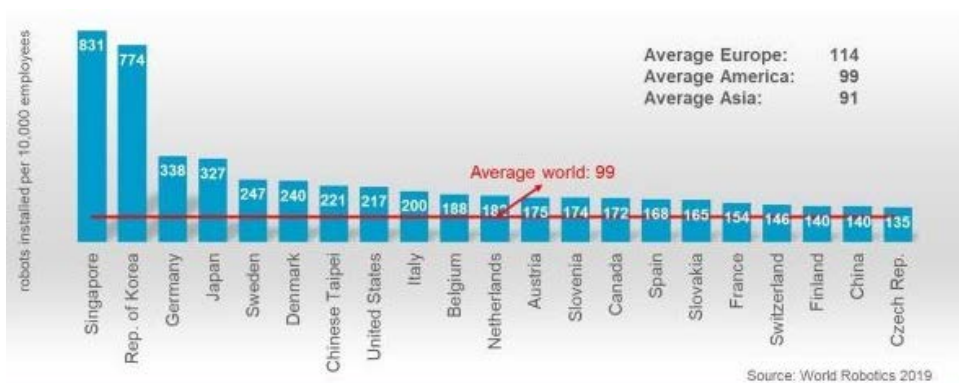


Figure 2 Robot density in the manufacturing industry in 2018.

For example, Singapore remains the world leader, increasing the figure to 831 robots per 10,000 workers, followed by South Korea with 774 robots and Germany

with 338 robots [2]. Russia and India are closing the ranks of 27 countries with 4 and 3 robots per 10,000 workers respectively [3].

Previously mankind has already experienced three industrial revolutions and, considering the recent developments in virtual and additional reality, 3-D printing, block chain, Internet of things and other technological advancements, we are on the verge of the fourth industrial revolution. What is more, the rapid progress in artificial intelligence has smoothly integrated self-driving cars, smart houses, online consultants (bots), video games and other smart stuff into our reality.

And these changes are expected to continue as many big companies invest in AI development. For example, Google and Baidu spend about \$25-30 billion on the development of artificial intelligence every year.

The question is how long it will take robots to replace people at work. According to the research done by the economists Carl Frey and Michael Osborne, 47% of jobs in the U.S. will have been at risk of disappearing under the pressure of robotisation by 2033. The World Bank has calculated that for China this share could be as high as 77%. The International Labour Organization estimates that even in countries such as Cambodia, Indonesia, the Philippines, Vietnam and Thailand, 56% of workers are at risk of automation [4].

It is predicted that robots will have been able to translate texts no worse than a native speaker by 2024 and drive a truck independently by 2027. And by 2056 robots will have already been capable of performing surgical operations of any complexity.

So, let us consider the professions which are expected to be at the highest risk of robotisation. They are couriers, consultants, journalists, drivers, housekeepers, librarians, bookkeeping, accounting, and auditing clerks, factory workers, waiters, bank tellers, insurance underwriters, and other jobs which include physical, predictable or repetitive tasks, machine operation, data processing and collecting..

Professions where automation is least likely are those with a creative approach where decisions must be made by a person in the conditions of uncertainty or without a clear algorithm for action. For example, jobs that involve caring for others (teachers, nurses and psychologists), making unpredictable decisions (managers) or using creativity (artists, writers, designers) are less likely to suffer from automation.

There is no doubt that robots have already occupied an important part of human life, but we still cannot consider them friends. Some reputable experts like Elon Mask and Stephen Hawking even called robots the biggest threat of the 21st century. But still, a human being is a living being with emotions and this is our main trump card, while a robot is just a set of programs that the machine will follow during its "life". Robots have neither feelings nor emotions, which are the most important things in human society, just as a doctor robot will not ask you if it hurts you or a psychiatrist robot will not sympathize with your grief.

So, artificial intelligence is one of the most incredible developments of humanity, but it does not mean that human labor market will be empty and people will be in the sidelines. It is just necessary for people to develop creativity and critical thinking to do things which robots are not capable of. And though, it is difficult to

say today how the future will develop, we should remember that the future belongs to humanity and artificial intelligence can be just a faithful assistant.

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Applying biomedical engineering to solve urgent human problems

In the modern world, there is an active development of technologies and robotics of production, but the level of injuries still remains high. According to statistics, about 12% of people on the planet have violations of their body structure resulting in their functionality reduction. Unfortunately, this affects the level of person's physical and social activity, reduces the quality of life and becomes an obstacle to the implementation of professional activities. More than 50 million people every year become disabled for one reason or another, about 300,000 lose their legs, and 390 thousand lose their hands. The loss of a limb not only leads to physical limitations, but also carries social problems for the victim. All this affects the quality of human life.

Trying to reduce the negative impact of trauma, humanity is changing the infrastructure of cities, adapting the environment for people with disabilities, and also resorting to artificial limbs - prostheses. With the development of modern technology, bioprostheses are increasingly becoming the choice. Bioprostheses are limb prostheses, driven by miniature motors that are activated during the passage of biocurrents that occur in the human body. Thanks to the creation of bioprostheses, it became possible to return the lost functions of the body, whether it be a limb or an internal organ, and return a person to a full social life.

The main problem is that many prostheses cannot fully perform all the functions of their biological prototypes, because they are not able to provide feedback to the human nervous system. The question also arises of the habituation of the carrier to its new body part. Fortunately, some industrial companies are already starting to produce limbs capable of transmitting the movements that a person wants to make as much as possible. Also, these prostheses are able to deceive the brain of the wearer, forcing him to get used to them.

These electronic devices replace lost organs and limbs by interacting with nerve cells. They are made from artificial materials, but a person can control them using his own nervous system due to the method of target muscular reinnervation. Its essence is that the nerves that previously controlled, for example, the amputated limb, are connected to the preserved muscles and they send signals to the electronic sensors of the prosthesis.

After limb amputation the motor nerves remain in the human body and then are connected to the areas of the large muscle, for example, the pectoral muscle, if we are talking about an amputated arm. When a person thinks he needs to move a finger, the brain sends a signal to the pectoral muscle. The signal is fixed by electrodes that send a pulse through the wires to the processor inside the electrical arm to the desired area. The prosthesis makes a movement. A person can pull his hand if he feels, for

example, a high temperature. Now companies are actively working on the introduction of bionic limbs.

In 2013, the first bionic leg appeared, which was completely controlled by the brain. It was created by the Rehab Institute of Chicago. If a person wants to make a movement, the brain sends an impulse down the spinal cord to the intact muscle. Electrodes are installed in the prosthesis that control these pulses. A special computer program decodes the received data and passes it to the prosthesis for execution, whether it is bending or straightening the knee, bending the ankle or taking a sitting position.

Mit Media Lab created the Mind controlled leg prosthesis, which focuses on the senses known as proprioception - a sense of the position of the parts of your own body relative to each other and in space. The technology of sending a signal to nerve cells allows you to feel the artificial limb due to the signals received during muscle contraction. At the same time, the bionic leg can exactly repeat all natural movements.

Bionic brush developed in Scotland by Touch Bionics is made to fully reproduce the work of a living brush. It is controlled by two electrodes implanted into the skin and receiving signals from the muscles. A feature of the bionic brush is that all fingers move. They have built-in pressure sensors that allow you to feel the touch by determining the level of pressure. For more complex movements and greater accuracy, the brush can perform an additional 48 movements using the smartphone application. The brush can handle fragile objects while 5 fingers are driven by autonomous motors, and the wrist can be rotated 360 degrees.

One of the most amazing bionic prostheses is the Argus2 artificial eye, which at the moment implies implanting a special sensor into the eyeball. Argus2 works by receiving visual signals from antennas, cameras and sensors, the data from which are processed by a computerized system and sent as pulses to the surviving cells of the optic nerve. Glasses help shape images allowing, thanks to 60 supersensitive electrodes, to see the outlines of shapes and colors objects, read large print and navigate in space.

Of course, these are not the only samples. There are quite a few companies and laboratories at different universities that create different parts of the body. Bionic prostheses are used not only as independent parts of the body, but also sometimes as exoskeletons to help recover wounded limbs.

One of the few drawbacks of bionic prostheses is their cost. A single prosthesis can cost anywhere from \$ 30,000 to \$ 70,000. This is due to the fact that “Bionicity” implies, in addition to replenishing the mechanical functions of a lost limb, the naturalness of its use. And the developers are focused on optimizing the structure of prostheses, and for this we need the most durable, ergonomic, functional solutions from the point of view of mechanics. However, the task of providing maximum management functionality does not have a turnkey solution on the market.

In conclusion, we can say that bionic prosthetics is not yet a highly developed industry; this affects both the price and the functionality of the finished product. But

at the same time, today's developments already allow people who have lost body parts to return to normal life, albeit at a high price.

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Project managers in the IT –market: why is there a need?

Project management had a long history before its integration into the IT-industry began. It has its roots in the creation of a world-famous Gant's bar chart in 1910, which was used to demonstrate the duration of the project and to track the order of each subtask performance [3, 125]. In the IT- industry project management was introduced in the 1960s, and nowadays hardly any company that would not adopt this approach into its activities can be found [4, 56]. The developments in the information sphere required some modifications that would allow to solve specific technical problems and clarify them to its customers. This has led to the emergence of a new job- IT- Project Manager, which is a very common field of activity today.

The main responsibilities of the project manager in the IT company can include:

- managing project tasks and requirements;
- developing project schedule;
- making a budget;
- assessing and spreading risks;
- improving the quality of product;
- building a project team;
- organization of successful project implementation;
- communication with the customer, etc.

Flexibility in applying different methods to tailor a particular project to clients' needs allows not to go beyond the "golden triangle" (budget, requirements and time) and to generate profit [7, 89]. On a general basis, project managers calculate the budget and resources for the project development in compliance with the customer requirements. This approach can help to reduce the risk of project failure and to transform the initial idea into a business.

Rapid development of the information technology industry enables many foreign companies to abandon the position of project managers. This can be explained by the fact that flexible methods are extending not only to management of sub-tasks, as it was previously, but also to the functioning of the project as a whole and its full life cycle: initialization, planning, executing, controlling and monitoring, closing [7, 33].

Theoretically, it means that the use of such flexible methodologies as Agile or Scrum allows the company to do without project managers, and delegate their responsibilities to the whole team [5, 45]. Tech Lead that is, a specialist who organizes the work of the team from a technical point of view can regulate company team work without the participation of a project manager [6, 98]. Therefore, it may seem that the job of a project manager is not in need. In fact, it is not so.

The basis for the success of the project in the modern world is not so much in making a profit but in the level of product quality and the degree of customer satisfaction that will return to the company again and again. Some researchers argue that a satisfied consumer will tell about the firm to five of his acquaintances, a dissatisfied one-to ten [2, 34]. This proves that the higher level of trust in the company is, the bigger is its income. Implementation of flexible methods inside the team allows to solve many tasks of the manager, except for two basic - communication and project integration. That is why very often modern project managers master the skills of system analytics. They partially act as an architect, creating new functionalities of the product, in order to make it more individual, more useful and satisfy the requirements of customers, as well as detail its development for the team.

Some projects cannot exist without a person who will solve problems in real time. Thus, after the implementation of any project, the support is needed not only in technical, but also in managerial aspects. In unexpected situations, such as server failure and site errors, it is necessary to explain to the customer what to do and solve this problem with a team that can be scattered around the world. If a mobile development missed the error and did not notice it immediately, it will be difficult to keep informed the users. Some users will not update their applications and the error will remain. For example, approaches with remote management of mobile application functionality have grown out of this problem. This situation requires the skills of the project manager, not the Tech Lead or developer.

Equipment-related projects also require managers, because millions of people depend on their timely delivery. This greatly increases the cost of error.

Another type of projects that need managers are umbrella projects. Umbrella projects are used to develop applications that work together and have clear boundaries within a single repository [1, 78]. These projects do not contain either source code or tests, but they may have their own dependencies. Such projects are large and complex. Complexity means explicit and implicit dependencies, and on a certain scale development without a dedicated project manager becomes extremely inefficient. In such projects the main tasks of a project manager are project integration, dependency and timing. He should identify all the dependencies and direct the team in the right direction to create an effective application.

There are also projects where the cost of error is estimated not by money, but by people's lives or at the state level. These are in a medicine, military, aviation or space industry. It is in such projects that a specialist with a high level of project management skills, organization of human resources and knowledge of the characteristics of these areas and all risks of the project is needed. It is the project manager who helps to understand the requirements of the customer, his specific needs and establish effective communication.

Regarding this, it can be concluded that project managers will always be in demand. In addition, their skills can not be completely replaced by machines with programmed methodologies or by people who understand only one side of the project. Of course, hiring a manager for small projects may seem quite expensive,

but even in in this case, in the absence of such a specialist, the risk of project failure increases sharply.

Project managers are those team members who ensure the existence of the entire project life cycle :

- initialization - work with customer requirements;
- planning - make up the terms of reference ;
- executing - control the timing and coordinate the team;
- controlling and monitoring - follow the development of the project and work with the customer;
- closing - close the project (if necessary) with the least losses and the expected result.

They create the image of the company and realize the possibility of live communication, which is an urgent need in the digital world. The requirements for professional skills of project managers will constantly grow as they cover not only creative thinking, the ability to establish good rapport with team members and clients, but also the understanding of what is needed for a success of a particular project at every stage of its development and what will happen if it turns out to be a failure. The risks must be assessed, reduced and held accountable. These measures can eventually lead to an increase in the number of client-oriented successful projects that could not exist without organized management.

But you can also say that the need for qualified managers will also grow. As branding in the global marketplace is becoming increasingly valuable, creating a positive image of the company will also play an important role. Clients need confirmation that their money will be invested in a really working project that will bring them either profit or a finished product. Large companies will be willing to pay high enough amounts for the proper organization of work and the success of the project. And this is exactly what competent project managers provide.

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Calculation of credit default risk (Scoring)

Scoring is a technology, which can help a credit organization to decide whether to give loan to an applicant or not. The Applicants can be presented by various economic agents who are the part of the credit system. There are legal entities and individuals, countries, individual entrepreneurs and corporations. Basing on the history of theoretical development models of all economic agents and on existing work, you can get valuable knowledge which can help in future researches. Now, the econometric models, discriminant and cluster analysis, an artificial intelligence and expert systems are often used in many popular assessment methods. The main methods of machine learning are described in this paper.

Discriminant analysis. According to the research, this method is one of the most popular methods of scoring. It takes its origin from the work of Ronald Fisher. Discriminant analysis is one of the first methods, which is used to build scoring systems. Using of this method is still ongoing and it often serves as a benchmark of high accuracy due to the use of new procedures.

Genetic algorithms. The method of applying genetic algorithms is formed by classifying trees. Mutation and crossover algorithms are applied to trees, where for new generation's parents only those trees get chosen, whose classification results are better than that of the rest. After creating the initial population, the mutation and crossover processes repeat with a subsequent estimate, which is taken as the relative number of classification errors.

Combined methods. The hybrid and combined list includes methods which use many different methods aimed to increase the effectiveness of scoring. Currently, the most commonly used methods are bagging, boosting and stacking. They are examined below.

Bagging: A more effective using of bagging is when the basic training algorithm is unstable and highly dependent on small changes in the training set.

It is assumed that there is a certain learning algorithm which is using the training set L , creates the predictor $\varphi(x, L)$, which gives y for the specified x . Basing on the training set L , we can construct the set of training sets $\{L_k\}_{k=1, \dots, K}$.

These sets include the same objects that were randomly selected from L . Suppose that K_+ is equal to the number of those k for which $\varphi(x, L_k)$ gives a positive answer. The aggregated predictor φ^- will give a positive answer only if $K_+ > \frac{1}{2}$.

The main objective of *boosting* is to form a stronger classification algorithm based on a weak algorithm in accuracy. At the same time, a weak algorithm is "acquired" due to the fact that the weight of the examples from the training set is

redistributed, that is, if the recognition is correct, the weight decreases, and if not, it increases.

Let X be the space of $\{(x^{(j)}, y^{(j)})\}_{j=1,2,\dots,l}$ - is the training sample. The main algorithm starts in a series of rounds $t = 1, \dots, T$. Denote by $D_t(j)$ the weight that was assigned to the object in round t . The indicated actions are necessary in order to find the map $h_t(x)$ with values in the interval $\{-1; 1\}$ in round t , which minimizes the probability of error $\varepsilon_t = \sum_{h_t(x^{(j)}) \neq y^{(j)}} D_t(j)$.

Scale update sequence:

$$\text{Let's } a_t = \frac{1}{2} \ln \left(\frac{1 - \varepsilon_t}{\varepsilon_t} \right).$$

$$\text{Then } D_{t+1}(j) = \frac{D_t(j) \exp(-a_t y^j h_t(x^{(j)}))}{Z_t} \quad Z_t - \text{normalization coefficient.}$$

The final form of recognition algorithm:

$$H(x) = \text{sign} \left(\sum_{t=1}^T a_t h_t(x) \right)$$

This enhancement method is based on the use of the exponential loss function and is called AdaBoost. This method, with a lot of noise precedents, makes the algorithm retrain. To minimize this effect, you can use the logistic loss function (the name of this algorithm is LogitBoost).

In *stacking* method, several algorithms are combined using a specific combinator, whose role, as a rule, is to logistic regression. In scoring, combined methods are actively used.

Conclusion. Today, there are a large number of scoring methods, but they still need improvement. For example, you can improve the data collection process and select factors that can filter out unnecessary information and give a more accurate assessment of credit scoring. In addition, in combination with modern methods (for example, genetic programming with neural networks), it is advisable to improve and conduct additional research, since they have only recently got widely known and used, but, despite this, they have already demonstrated their superiority over other methods.

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Modern methods of natural language processing in machine learning

The volume of information produced by mankind is greater than ever and the amount of this data is growing every day. However, significant benefit from this information can be gained only with the correct processing and data analysis. In a time when technology was not yet so developed, all that had to be done by human way. To solve this problem, many algorithms have been developed that allow to do this using computer technology. These models have recently been gaining a fairly extensive use in various fields like classifying the state of the market, prediction of human behavior in a lie detector, in medicine – the prediction of epileptic seizures, identification of faces, voices.

Natural Language Processing (NLP) is the general direction of mathematical linguistics and artificial intelligence. It studies the problems of computer analysis and synthesis of natural languages. In relation to artificial intelligence, analysis means understanding the language, and synthesis means generating literate text. The solution of these problems will mean the creation of a more convenient form of interaction between a computer and a person. The main areas, which statistical, hybrid and introspective methods in natural language processing are solving, include such as machine translation, extracting facts, text generation, analysis of tonality of the text, text summarization, answers to questions, speech recognition, information search, etc.

Machine learning

Nowadays, the most commonly used methods in research are methods based on machine learning. This training has two types: supervised and unsupervised learning.

In the **supervised learning**, the purpose of training is to obtain the necessary rules by which you can classify new objects similar to those that made up the marked data. As examples of supervised classifiers we have Support Vector Machines, Artificial Neural Network.

In the **unsupervised learning** the classifier does not have any labeled samples. In this case, there is the concept of text clustering (the task of combining objects into groups that does not intersect in pairs based on a given measure of their similarity / difference). The classification is done by exploiting some criteria like Euclidean distance or Fisher separability measure. A common example of the unsupervised classification method is the k-means cluster classifier.

The 3 modern methods of machine learning in natural language processing

1. Hidden Markov Model in speech recognition

In 2012 an automatic speech recognition application was carried out to decrease the Phone Error Rate. Convolutional Neural Networks (CNN) method was applied within the framework of a Hidden Markov Model, which showed that the Phone

Error Rate obtained by CNN is better comparing to a 3-layer neural network baseline method previously applied.

When analyzing natural language, it is necessary to build a table of the probabilities of using words in each grammatical meaning. This is so-called process - Part-Of-Speech tagging.

And one of the problems is that the word can be used in most cases, for example, as a modal verb like the word “can”, but sometimes it can also be a noun. Given this drawback, the model which we are observing takes into account the fact that the adjective or noun will follow the article, what is made by Bayes rule:

$$\operatorname{argmax}_{t_1 t_n} \prod_{t=1}^n p(w_i | t_i) p(t_i | t_{i-1})$$

w_i - a vector describing the characteristics of the frequency spectrum of speech.

It can be seen from the proposed formula that we are trying to choose tags so that the word matches the tag, and the tag matches the previous tag. This method allows you to determine that some word acts in some sentences, for example, as a noun, and in the other ones as a modal verb.

POS tagging in speech recognition is quite important. Because the correct definition of the grammatical structure of the sentence allows to choose the right grammatical structure for the expressive coloring of the reproduced sentence.

Combining information on the lexicon, the acoustic with the language model, Hidden Markov Model finds the optimal phone sequence with the Viterbi decoder – realization of an Automatic Speech Recognition.

2. Word2Vec (Word to vector)

The basis of this text analysis method is the representation of words in the vectors form of a given dimension, having similar words close to each other. For example, the distance between the vectors of the words “boy” and “girl” will be significantly smaller than between the words “boy” and “dog”. This feature allows more flexible presentation of data that can later be used in the training of neural networks and various classifiers. There are two main approaches for creating a word-vector correspondence base.

Skip-gram is an architecture that uses the current word to predict the words surrounding it. What is done by using the formula you see on the screen.

$$\frac{1}{T} \sum_{t=1}^T \sum_{-m \leq j \leq m, j \neq 0} \log \frac{\exp(U_0^T V_c)}{\sum_{w=1}^W \exp(U_w^T V_c)}$$

The function is basically saying that we’re going to add the logarithm probabilities of the center word and surrounding ones to predict them.

Continuous Bag of Words is a model architecture that predicts the current word based on its surrounding context.

Word2Vec maximizes the logarithm probability of context words given a center word and modifying the vectors through SGD to predict the surrounding words of every word.

3. SEQ2SEQ (sequence to sequence)

Sequence-to-sequence is a universal encoder-decoder library for TensorFlow, which has achieved great success in tasks of machine translation, text summarization, abstract images, etc.

This input model accepts one sequence of elements (for example, words, letters, image attributes) and returns another sequence of elements.

The encoder processes each element of the input sequence, translates the received information into a vector called a context. After processing the entire input sequence, the encoder sends the context to the decoder, which then begins to generate the output sequence element by element.

Conclusion. With appearance of large amount of information and needs, the mentioned here methods are actively used nowadays in different fields of processing data by using powerful computer technology which significantly simplifies our lives and does the work in seconds that taken hours or even years for people to solve.

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Social engineering phishing attacks and COVID-19 world pandemic

Numerous phishing attacks worldwide show terrible trends during the COVID-19 world pandemic. The global pandemic is more dangerous than it seems at first glance. While doctors and scientists are fighting the virus, and the world economy is falling down, cyberattacks become the cherry on top.

Global IT companies notify that March world's cybercrime attempts were up to 37% compared to the previous month [1]. The situation is similar in Ukraine.

The cyber incidents statistics for 4 weeks of pandemic lockdown is given by the State Service of Special Communication and Information Protection of Ukraine [2]. Taking into account the fact that such reports were not published previously, it can be assumed that the number of incidents was negligibly small.

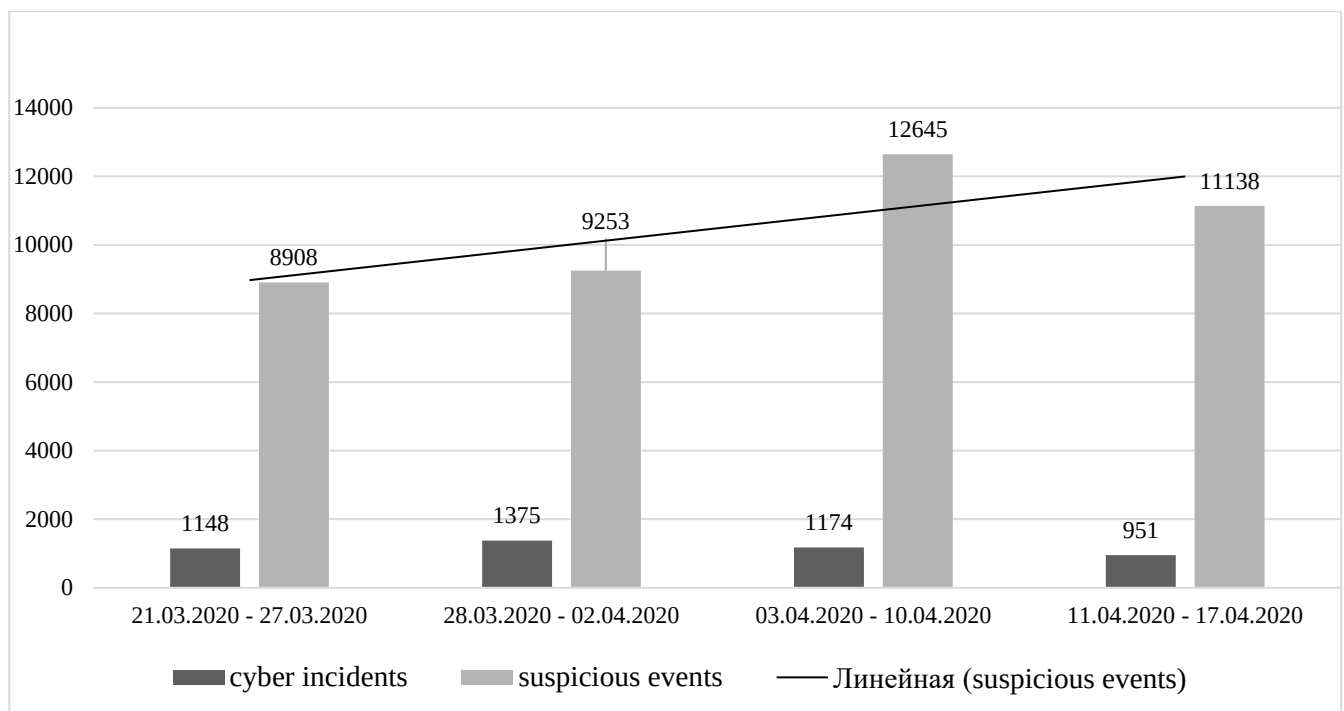


Fig.1 Cyber incidents and suspicious events in Ukraine

However, the number of incidents fades away compared to the number of recorded cyberattack attempts. Suspicious events are gradually increasing (Fig. 1).

Why is this surge of cybercrime activity happening right now? The first reason is our dependence on Information Technologies. Almost all our activities are transferred to the Internet due to lockdown. Business, work, education, shopping, entertainment, sport – everything goes online.

The second reason is people panic and worry. The future is unclear. People lose their jobs, habits and regular lifestyle. They want to know how things are going,

when this situation will end and of course, they want to get distracted and entertain themselves. Here social engineering comes into play.

Phishing scams are cyberattacks that use social engineering. You can receive letters and messages from unknown senders. It will look like a well-known organization mailing. There is a link or a file in the e-mail and a description why you need to immediately click on it and follow the link or download the file. Some hidden malware files will install. Trustworthy looking web site will ask you to enter your logins, passwords and bank account information. Furthermore, users can independently find one of phishing websites or malicious links and files surfing the Internet.

Attacks exploit such topics as COVID-19 statistics; news about pandemic; instructions and recommendations provided by government, healthcare organizations, insurance companies etc.

World Health Organization on its website warns people of possible phishing emails from WHO fakes [3]. Towards the end of March there were more than 70,000 domain names related to “corona” and “COVID” terms [4]. Not all of them were created for something bad, but some of them definitely have already become or will become phishing attacks. Ukrainian cyber police have blocked 157 fraudulent Internet links related to coronavirus as of April 8, 2020 [5]. Baracuda Security shows their statistics of coronavirus related phishing attacks. The number of them in March increased by 600% compared with February 2020 [6].

Google was blocking more than 100 million phishing emails a day from April 5 to April 11. Almost one fifth of them, 18 million daily mails, include words “corona” or “COVID” [7, 8]. The other 82 million phishing attacks may use one of the points listed below:

- fake sales promotions (goods, online courses, media platforms, etc.);
- simulated letters from banks;
- work from home articles and job vacancies;
- counterfeit notifications from schools and universities;
- religious mailings;
- falsified charity organizations.

KnowBe4 made their own Phisher Treat Map where anyone can watch real-time phishing attacks [9]. Indeed this map may include only a tiny part of all world’s phishing attempts. Nevertheless, every 5 seconds from one to six attacks appear.

In case of previous imperfect (for users and companies) statistics, the year 2020 phishing scams predictions look threatening. Around 30% of phishing messages get opened by targeted users in 2019 [10]. This figure has increased since 2015 by 7% [11]. Year 2020 percentage will be even more because of social engineering and high online traffic. The percentage value will include more attacks due to a sudden increase of the number of phishing attempts in 2020.

Companies that did not pay a lot of attention to cybersecurity and employees cyber awareness are at great risk. In the conditions of remote work, the costs and loss of assets caused by actions of cybercriminals will be significant. Taking into account the fact that IT and IS (Information Security) departments will unlikely receive

sufficient funding this year due to the global economy downfall, a lot of attacks on companies like this will succeed.

To sum up, cybercrime exploits fear and uncertainty. Online criminals try to access sensitive information, like log in and credit card details, by presenting themselves as a trustworthy figure. More time online could lead to riskier behaviour. Moreover, a heightened dependency on digital infrastructure raises the cost of failure.

Awareness and recommendations are given by each IT organization and not only. There is the simplest guidance that will help to not be hooked by cybercriminals' social engineering:

- do not open or download attachments in emails you did not expect to receive;
- do not click on unknown links;
- delete suspicious emails immediately;
- do not install software from unknown sources.

In addition, according to Internet Security Threat Report (ISRT) – 2019, around 48% of malicious emails have Microsoft Office files attachments [12]. Hence, if you are not sure of your attentiveness or want to be as safe as possible, some extra tips below are for you:

- turn off MS Office access the Internet;
- disable start screen displaying when MS Office opens;
- do not use Office MS templates from the Internet if possible.

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Creating enterprise security policy

Nowadays, it is very hard to ensure the integrity of personal data in a large flow of information which is always processed and transmitted.

Information security is a major cause of rapid growth of technology. Moreover, information needs protection, whether it is personal data or government secrets [2]. However, not so many people understand correctly what information security is.

As a set of methods and means to ensure the integrity, confidentiality and accessibility of information, information security must be given due attention [1].

This paper is focused on creating security policy for the big enterprise Public Joint Stock Company INTERPIPE NTZ.

For the last five years the scope of information technologies has undergone significant changes. Along with the significant competitive advantages, the existing changes have brought new risks to the operations of industrial enterprises. The widespread adoption and increasing use of information systems, especially in the field of governance, require greater attention to ensure their security at all levels. In this case, companies that develop information security take all responsibility for the proper level of cybersecurity.

Information security policy is only a part of general enterprise security policy and has to inherit its basic principles. Besides, during the creation of information security the policy access levels should be taken into account.

Information security policy should be the result of the joint work of security technicians, as well as personnel. Only in this case the policy created will work correctly.

In order to make sure that the policy is created in compliance with all rules and regulations, there are only a few questions to answer:

- Who has the right to use the resources?
- How can enterprise use the resources properly?
- Who is empowered to grant privileges and allow use?
- Who can have administrative privileges?
- What are the rights and obligations of users?

The first section of our study analyzes information security at large enterprises, the importance and purpose of its implementation. Details that need to be taken into account during the creation of information security policies are provided.

The second part of the study is more practical and presents deep enterprise research. The information obtained will allow us to create the correct policy based on enterprise needs.

In order to have full understanding of the enterprise process, the general information about enterprise was collected, such as work schedule, duties of employees etc.

Analysis of the physical environment of the enterprise was made with architectural and construction features of the premises. The location of all CCTV cameras and sensors with a description of communication systems is described and analyzed.

The next step of research is a detailed description of the computer system including basic technical equipment (Fig. 1).

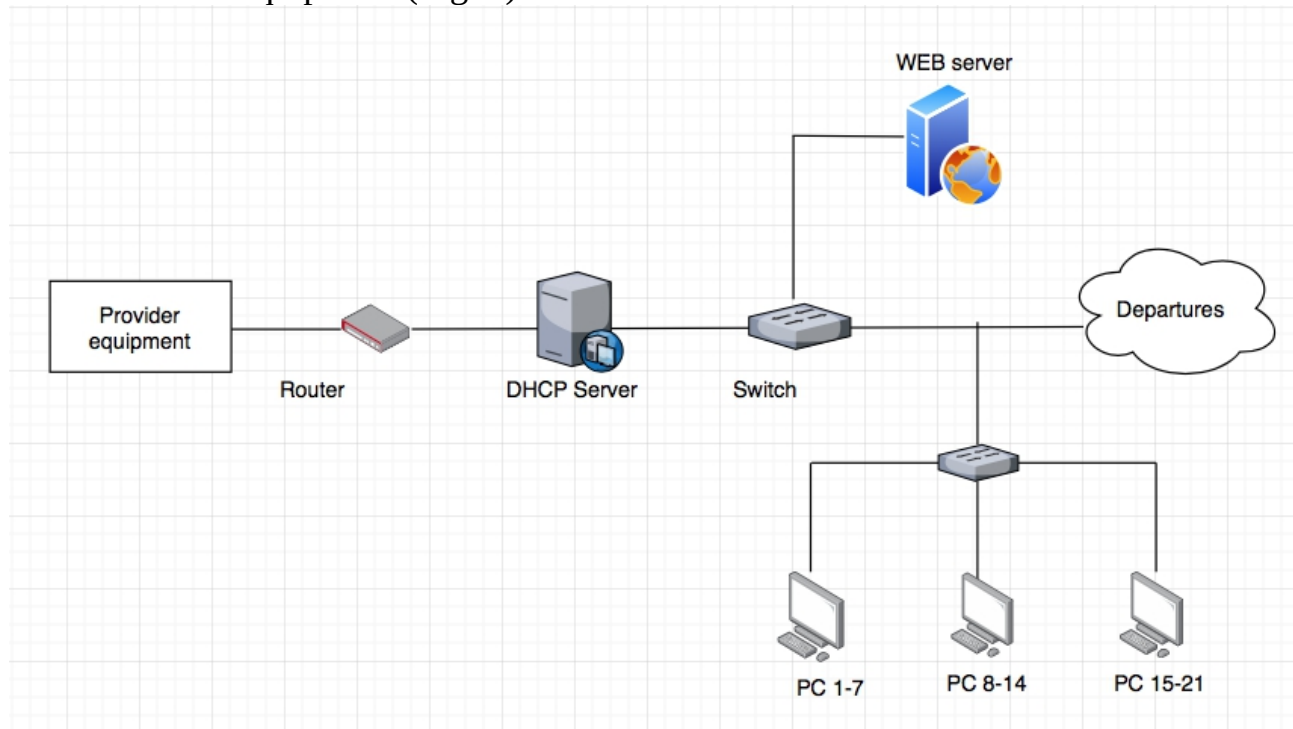


Fig. 1 Computer system and technical equipment

The model of information flows was created to have a correct picture about all processes at the enterprise.

All the people involved in the enterprise process can be considered as potential offenders. The model of the offender is created and provided in research, where each potential offender is divided into types, internal and external, according to the position. The types of offenders are given in the table according to the access and knowledge (Fig. 2).

Offender	Type
Staff	Internal
Support staff (part-time workers, cleaners)	Internal
System administrator(s)	Internal

Persons who spread viruses / malware carry out	External
Representatives of enterprise management	Internal
Suppliers, supervisory and emergency personnel	External
Unfair partners	External
Clients	External

Fig. 2 Types of offenders

The next important step is to create a model of potential threats based on location, access to information, technology, and type of information. In order to see real numbers, a graph was created with potential channels of information leakage and the probability of their realization in percentage (Fig. 3).

The most important part is risk analysis at the enterprise and correct choice of the functional profile. The security specialist can create a correct policy to prevent threats with the help of the functional profile.

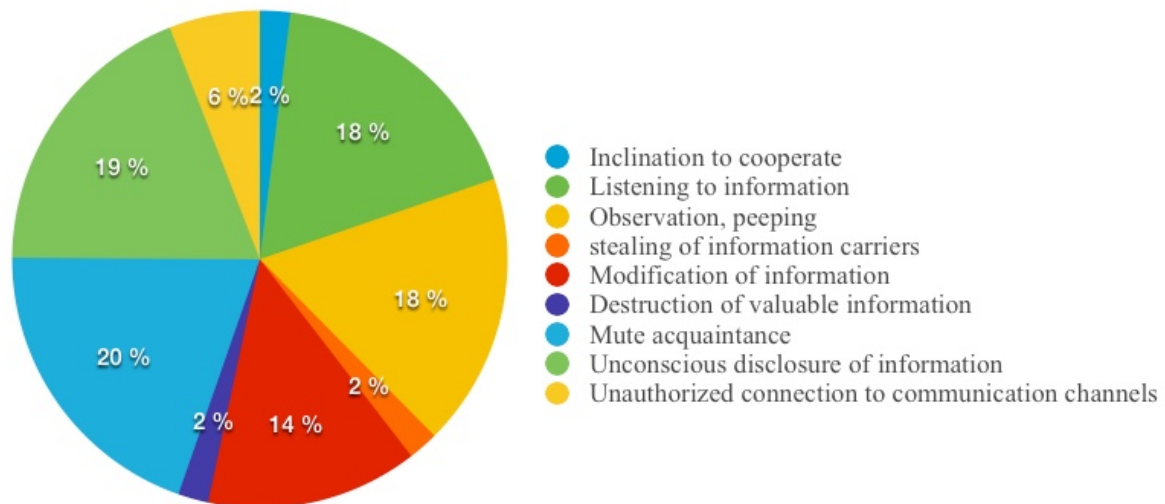


Fig. 3 - Potential channels of information leakage

The economic part of the study embraces economic component of usage effectiveness, calculations of capital and operating costs for the implementation of the proposed security policies. The possible losses from attacks on the information system in the security department are analyzed and evaluated. The overall effect of the implementation of the information security system is also calculated.

The period of investment return and the payback period of the capital investment are calculated.

The findings of this study indicate that the threats at the enterprise could be completely eliminated with the help of such policies as Password Security Policy, Grant and Delimitation Policy, and Infrastructure Monitoring Policy.

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State and prospects of information technologies development in Ukraine

Digitalization of society is a global social process. Modern development of IT have fundamentally changed people's lives - their work, leisure, ways of uniting in communities and even attitudes towards themselves. In today's world, knowledge and information generate new knowledge. Their volume and impact on the productive development of society are growing at an extremely high rate, which necessitates the development of new ways and means of disseminating and using global knowledge for further progress, which is the main feature of the knowledge and information society.

Analyzing the international rankings of Ukraine according to the leading indices, we can say that the situation is not the best, namely: network readiness in 2015 - 71st place out of 143 countries, the development of UN e-government in 2014 - 87th place in the world among 193 UN member states, Internet development in 2014 - 46th place out of 86 countries, Internet penetration in 2014 - 95th place out of 191 countries, ICT development - 79th place out of 167 countries; e-commerce in 2014 - 58th place out of 130 countries, the global cybersecurity index - in 17 groups of countries (out of 29 groups of countries) (Reforms, 2018). However, according to the publication (Market, 2018), we observe positive trends in the country itself: the domestic IT market in 2016 grew much stronger than in other countries. The overall growth of the IT market is 22%. At the same time, developed world markets are growing by no more than 5% per year.

In Ukraine, the IT sector faces internal obstacles, without which the development of the IT market would be much faster. Over the past few years, more than 10,000 IT specialists have left the country to work abroad, or one tenth of their total number. This is due to the low standard of living in the country, political instability and legal insecurity of business from pressure from government agencies and law enforcement agencies. This situation facilitated the active relocation of individual specialists and entire companies to other countries, which led to the loss of one tenth of revenues from the IT industry and significant reputational losses for our country. Another important market problem is the lack of an industry development strategy and education program for future professionals.

However, despite significant growth, the Ukrainian IT market on a global scale remains small and accounts for about 1% of the global figure. The global market for IT services in 2017 exceeded \$ 3.5 trillion, of which more than 40% is accounted for by the United States.

Thus, to ensure the sustainable development of the Ukrainian IT market, it is necessary to reduce the level of government intervention and help improve the business climate in the country. As long as the business climate in Ukraine is worse

than in neighboring countries, Ukrainian innovators will sell their startups in other countries, where more favorable conditions are created for their development. In addition, the analysis of the data of the World Economic Forum (Readiness, 2015) shows that with a fairly large potential for IT development in Ukraine, there is almost no demand from the population in general and from government and business in particular, for these technologies. Yes, our country now ranks first in the number of IT developers in Europe, and the prices for information and communication services in our country are among the lowest in the world. Most of the population of our country, government and business still use IT opportunities only at the lowest, trivial level.

To increase the share of our country in the world market, the annual growth rate of IT services must exceed the world average, providing an increase of at least 30-40% per year. The experience of many countries shows that in the process of forming national informatization the problem of ensuring the widespread use of IT in all spheres of society must be placed next to other important issues - overcoming poverty, improving the quality of health care and more.

Information technology is one of the most important factors stimulating economic growth and development of civil society, employment, social and political development of our country. Analysis of the dynamics of the domestic market of information technologies is show the significant impact of the IT sector on the economy of Ukraine in terms of growth of foreign exchange earnings, exports of IT services, increase in budget allocations. According to the results of the study, the main internal barriers faced by the Ukrainian information technology sector are the following – low standard of living, the lack of an industry development strategy and problems with the demand for IT among the population of Ukraine.

Today, the world community is on the threshold of the fourth industrial revolution, which envisages the transition to a new set of systems that combine digital, biological and physical technologies in a new powerful combination; ensures the availability of global digital communications; low processing costs and high data storage density, as well as even closer relationships between the population and digital technologies.

Digital technologies open up unique opportunities for the development of our economy and raising the living standards of citizens.

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eSIM: our future

Phone connectors are a thing of the past. The monolithic building is the future.

The offices of telecom operators are the past. Operator selection through the application is the future.

Frantic roaming rates are a thing of the past. Accessible internet all over the world is already real!

This article will talk about eSIM. I will explain why this technology is cool and promising.

Since manufacturers are constantly striving to create more compact, thinner and lighter devices with a large number of functions, the internal space of their case is an absolute priority in the development of each new product.

So back in 1991, the SIM card that users inserted into the phone was the size of a modern bank plastic card. It's even amazing how overwhelmingly its size has decreased over the years, to a miniature Nano-SIM card.

However, in addition to the card, it is necessary to take into account the additional space inside the device's case, including the compartment itself with the SIM card connector. With the development of more durable and waterproof phones, the question arose of removing all possible "holes" in the case, and the fewer they are, the better. This will free up a lot of space that can be used more rationally. For example, to increase the battery, put new sensors, additional antennas, fewer problems with the production of the case and moisture protection, etc.

However, everything is changing. In the past few years, Apple introduced Apple SIM for use in iPad tablets, and now there is a new solution – eSIM, which was supported, within the framework of its products, not only by Apple, but also Google.

What is eSIM?

This is a built-in universal integrated circuit board that is soldered directly to the device motherboard at the time of manufacture of the device itself. The full name is embeddedSIM. At the same time, eSIM has not only the same functions as our usual SIM card, but also a considerable number of advantages.

The first advantage is space. Engineers are fighting for every millimeter in new smartphone models, and some kind of SIM card tray takes up unnecessarily a lot of space. Using eSIM will free up a lot of space in phones.

Another benefit is automation. The world of the Internet of things will become automatic. This applies not only to watches, trackers and glasses that work without a phone, but also to other small devices. For example, the most common surveillance cameras will start showing videos not only where there is Wi-Fi, but even from a

dense forest, and cars will be updated by air and upload traffic information to the autopilot.

Another eSIM value is that the Cellular Market Will Change. Choose a tariff plan, pay, a QR code arrives in the mail, scan it. Congratulations, you are the owner of a new tariff plan. It is incredibly convenient, especially for those who travel a lot.

You can also use just one eSIM for the whole world, just changing the tariff plan to a new one.

And last but not least, one number for multiple gadgets.

You can simultaneously connect your tablet, your second tablet, a smart watch, a smart car, and your other very smart devices to the same number (if you have one). If only the device itself supported the technology.

eSIM is our future, but it definitely won't come overnight. Look at your phone now: it still has a physical SIM card or even two, and will still need it when you pass it on to your children, other family members or decide to just sell to buy a new one.

eSIM in Google Pixel 2 and Google Pixel 2 XL currently only work through the Google Project Fi service and therefore they still have a physical Nano-SIM tray for cards of all other operators.

Nevertheless, despite the fact that the transition of all manufacturers to the eSIM standard, its adoption by operators and the "sunset" of obsolete devices will take some time, it certainly won't take another 27 years before a physical SIM card goes down in history and forever.

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Prospects for the use of virtual and augmented reality

Virtual reality (VR) is a three-dimensional computer environment that allows a person to feel like in real life with smells, sounds, movements, etc. Usually helmets / glasses are used to immerse oneself in the world of virtual reality.

For the effect of presence, the following systems are used:

- iTracking, tracking the movement of the pupils of the eyes and allowing you to determine where a person is looking at every moment in time;
- motion tracking, track any body movements of a person;
- with 3D controllers;
- from a feedback device, for example, swivel chairs or vibrating joysticks.

VR helmets / goggles are divided into 3 types:

- 1 type, work with computers or consoles: HTC Vive, OculusRift, Playstation VR;
- 2 type, work with mobile devices: Google Cardboard, Samsung Gear VR;
- 3 type, independent virtual reality glasses that work on the basis of specialized operating systems (AuraVisor, SulonQ, DeePoon).

Augmented reality (AR) differs from virtual in that it represents the technology of adding virtual information to the elements of real life. For example, when working with glasses at a real production facility, a drawing with dimensions is displayed and the worker sees how and how much it is necessary to process the manufactured part.

The most popular use of virtual reality is **entertainment**, for example, computer games. To solve the problem of lack of seats in sports stadiums or in concert halls, VR can be used, too.

Difficulties in practical implementation:

many companies developing computer games do not want to switch to VR, cause creating games in virtual reality is very expensive;

for broadcasting concerts, sporting events, cameras with a 360 ° view are needed.

Until recently, there were no VR wireless helmets, but in 2018 the problem was solved, and now in many countries VR parks are being built for games in large spaces.

In addition to entertainment, virtual, along with augmented reality, is used in the field of **education**. Thanks to this technology, for example, future doctors can do the operation as close to reality as possible, future drivers can practice without the risk of an emergency. With the help of virtual and

augmented reality, pupils and students can see physical phenomena that are very difficult or impossible to see in real life. For example, how electrons move through wires. It also allows you to make new scientific discoveries.

Difficulties in practical implementation:

The problem of updating educational programs due to a lack of specialists.

In the field of **medicine**, this technology helps patients to get rid of various phobias, post-traumatic syndromes, and depression. For example, witnesses and victims of a 2001 terrorist attack in the United States were treated with VR. They were shown this tragedy in virtual reality and the level of depression decreased in most participants in the experiment.

Difficulties in practical implementation: the effect on the human body is not yet fully understood. Some people complain of headaches or nausea when using VR.

Using these technologies, new possibilities in **architecture and design** appear. Usually, customers have problems when they buy new furniture or make repairs in the house. Thanks to augmented reality technology, they will be able to see how the object will be located before buying.

Difficulties in practical implementation: All products of the company must be digitized using a special program and equipment.

VR and AR can be used not only in **military training**, simulating combat situations, but can also be implemented in real battles. Thus, instructors will be able to adjust the actions of units in real time. The guides will also receive more information about the area.

Difficulties in practical implementation: equipment and information transfer systems should provide a minimum delay in the transfer of information, because the time for making decisions on the battlefield is limited.

To sum up, VR and AR technologies are promising and can be used both in everyday life and in various sectors of the economy.

However, at present, VR and AR still require large expenditures for implementation and are not always brought to industrial applications, although they already bring tangible benefits in their implementation.

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Application of smoothing methods for production volume forecasting

The object of the research is the LLC TPK "Terra" enterprise - the leading domestic manufacturer of high-quality protective coating for industrial use for corrosion protection of metal structures and reinforced concrete structures. The paper describes a system analysis of this enterprise by developing a functional model of its processes and decomposition to the second level of detail.

Functional model of the system. To understand the processes at the enterprise, the IDEF0 model was built with the help of AllFusion Process Modeler 7.0 (BPwin). Initially, the functionality of the enterprise is described as a whole, without details. This description is called a context diagram [1, 2, 7]. For this process the context diagram is represented by a model (see Fig. 1), where I_1 – raw material, I_2 – application for manufacturing, C_1 – laws of Ukraine, C_2 – safety documentation, C_3 - regulatory documentation, M_1 –staff,, M_2 – technical equipment, O_1 – paint, O_2 – covered surfaces.

The entry-level context diagram (Figure 1) shows what factors are required at the entrance (raw materials and ordering).

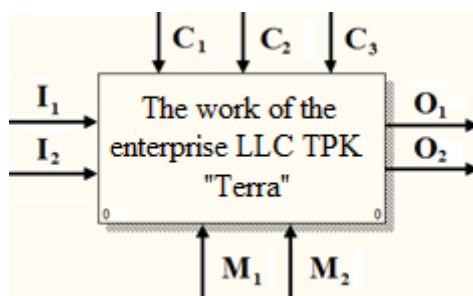


Fig. 1. The model of enterprise processes

The next level of the functional model is the decomposition of the context diagram (see Fig. 2) into the following subfunctions: coating production; construction works on a covering [6].

The function "coating production" (see Fig. 3) is decomposed into the following subfunctions:

- order formation;
- purchase of raw materials;
- production;
- shipment.

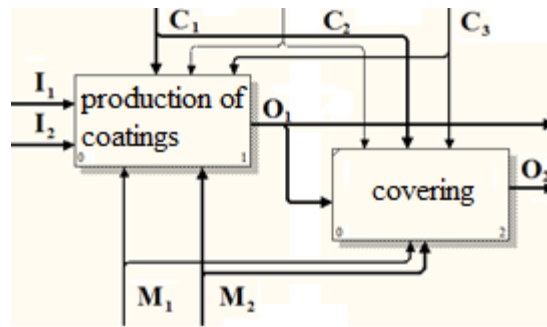


Fig. 2. Decomposition of the model

After decomposition of the "coating production" process, we can see that this process is rather time-consuming, especially considering the fact that a large number of different types of raw materials and workers are involved in the manufacturing process.

Since the process of coating production is quite complex and is the core of the enterprise - its main source of profit, it was decided on the feasibility of forecasting production volumes for further production. Forecasting with further planning on the basis of projected values is an important component because it helps to save resources and, at the same time, to increase profits.

Therefore, for this task, a system analysis of the enterprise was conducted to specify each stage, on the basis of which some methods of prediction of values were selected [6].

Solving the prediction problem. While studying the enterprise activity, the sales figures of one type of coverage over the past 2.5 years were analyzed.

In this paper, λ is chosen for exponential smoothing, which minimizes the root mean square error of the forecast by 10% and the predicted value by 50 units of product.

The results of exponential smoothing are shown in Fig. 3.

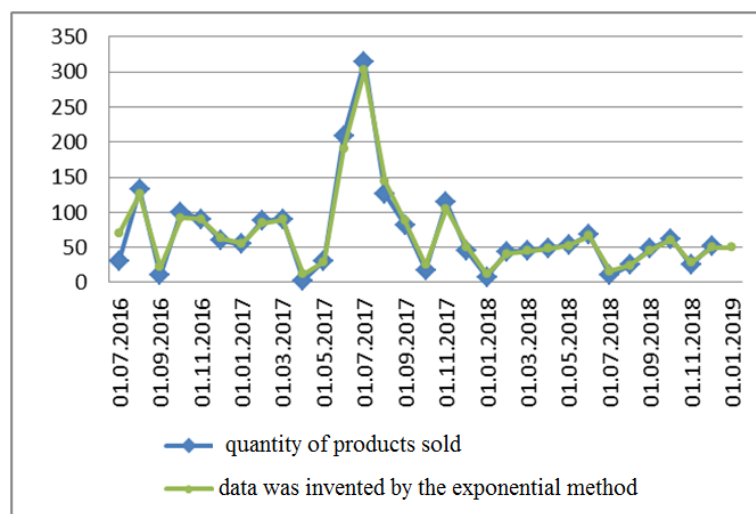


Fig. 3. The dependence of actual and calculated data according to the exponential method

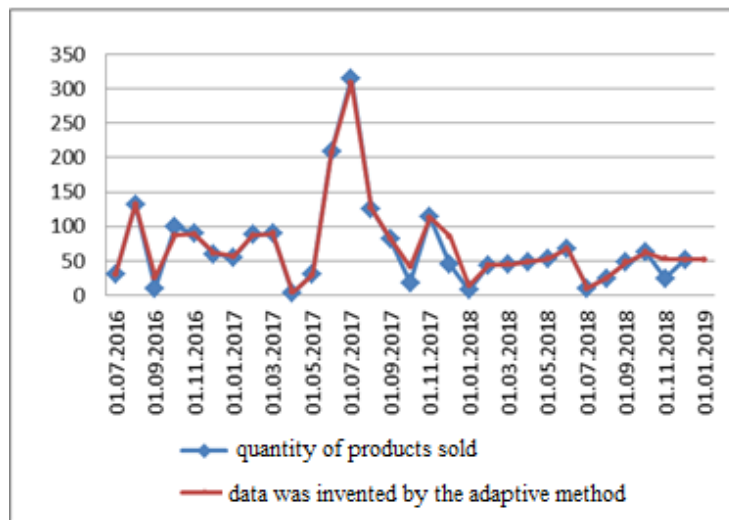


Fig. 4. The dependence of actual and calculated data according to the adaptive method

The standard error of the forecast according to this method is 11%, and the forecast value is 52 units of goods.

Estimation of the forecast quality. For any model, the question of whether it can be used for the relevant analysis and forecasting is really important [5].

The following criteria are used to verify the adequacy of the models:

- the series criterion for determining the randomness of deviations from the trend;
- the peak criterion for checking the equality of zero of mathematical expectation;
- the R / S-criterion for determining the conformity of distribution of residual component to normal law;
- the Darbin-Watson criterion for determining the independence of the residual component values [3, 4].

This problem is solved by the time series smoothing methods, namely, exponential and adaptive smoothing methods. The analysis of forecasting results is carried out and the exponential model is selected for further forecasting in production. As a result, the recommendations for next month's production volume of 50 units of "EP Mastik" were given.

Conclusion

As a result, the task of forecasting the volume of anti-corrosion coating production has been solved. This task is relevant both for the enterprise itself and for meeting the demand in the sales market. The most effective mathematical models that can be used to predict the development of production processes are models based on time series. One of the most common methods for predicting the performance of such series are smoothing methods that are used to reduce the effect of random

fluctuations. The problem is solved by the methods of exponential and adaptive smoothing. To check the adequacy of the models obtained, the series test, the peak criterion, the R/S criterion, and the Durbin–Watson criterion were used. The analysis of each prediction model obtained was carried out, and the quality of forecasts was also assessed. The conclusions are made regarding the further manufacturing of products based on predicted values. The proposed model has a practical value and can be used in forecasting at industrial enterprises.

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The introduction of computer technology in the protection of human health

Today, technology and human activities are closely related. Every year, information technology more and more firmly enters all areas of activity. Right now, computers are helping people do hard work in mines, manage giant corporations, launch rockets into space, find the information they need in a huge library, which called the Internet. But a lot of questions dealing with the current problems in population health, medicine and necessity to develop technologies whose objectives are to help solving urgent medical tasks are still under consideration.

Strange as it may seem, computers have long helped doctors in their hard work. Today, information systems in medicine are being used more and more and you cannot do anything without IT when creating a serious clinic. Especially relevant is their introduction into the practice of commercial clinics and medical centers, because in addition to the benefits for medical staff and patients, information systems are beneficial from a purely economic point of view. We all know the use of such technologies in medicine as computed tomography, ultrasound diagnostics, microcomputer technologies of X-ray studies, respiratory and anesthesia devices, microcomputer-controlled systems for intensive medical monitoring of the patient, computer dentistry and prosthetics and so on. Computer networks are used to send messages about donor organs that are in great demand for patients waiting for transplantation need. Computers make it possible to establish how air pollution affects the incidence of the population of a given area. In addition, with their help it is possible to study the effect of blows on various parts of the body, in particular, the consequences of a blow in a car accident for a person's skull and spine.

The first use of computers in medicine was in 1954. It was the invention of a computerized cytoanalyzer. A computerized cytoanalyzer is an electronic optical device for screening cells suspected of being malignant. Currently, in different countries, systems for storing patient information using smart cards are widely used. The program "Dent Card" well established in Europe can be given as an example. This card allows you to quickly, accurately, and unambiguously determine by whom, when and to what extent the patient is insured. All information about it can be divided into visual and information recorded in the memory of a number. There are several reasons for using the Dent Card by a computer system: the coding system excludes any unauthorized access to the database, which in the future is one of the important factors for protecting the confidentiality of patient information in the work of insurance companies.

But the use of computers in medicine is no longer limited only to diagnostics. They are increasingly being used in the treatment of various diseases: from the preparation of an optimal treatment plan to the management of various medical

equipment during the procedures. In addition, computers now help sick people in everyday life. A great number of devices designed for sick and infirm people being controlled by computers have already been created. For example, new employees appeared in British hospitals are robots that can perform not only simple actions, but also carry out surgical operations. At the London hospital, Guy's and St Thomas' Hospital, the equipment is responsible for providing any medical support. Da Vinci medical robot is reported to perform a complex operation to extract a kidney from a living donor within one minute.

From the facts it becomes clear that computer technology helps cure a person, but the issue of technology possibility to protect human health is still under consideration. Let's have a look at statistics dealing with the number of occupational diseases recorded for the period 2017-2019, where the first place belongs to respiratory diseases - 40.1% of the total number of occupational diseases. This is a consequence of air pollution of the working area by harmful airborne particles (dust, smoke, fog), gases and vapors, the absence or use of respiratory protective equipment not meeting the requirements for their functional purpose and anthropometric dimensions of users' faces. As ordinary respirators have no control over the duration of the protective action of the filters, an advanced respirator (Smart respirator) is proposed to solve this problem by increasing the protective properties of dust mask.

Protective effectiveness of a dust mask is carried out by installing a pressure drop meter in a semi-mask thus providing an operative assessment of the density of its adherence to the face of the worker during the performance of operations and increasing the protective action of the filtering elements. This pressure drop meter is implemented in the form of a pressure control sensor, control unit and information processing unit, recording and storage of information, alarm system and power source. The design of a dust respirator with a pressure gauge consists of the following elements: 1 - cover of the filter box; 2 - filter box; 3 - the cover of the control unit; 4 - the case of the control unit; 5 - a cartridge with a valve of inhalation; 6 - half mask; 7 - exhalation valve (pic.1).

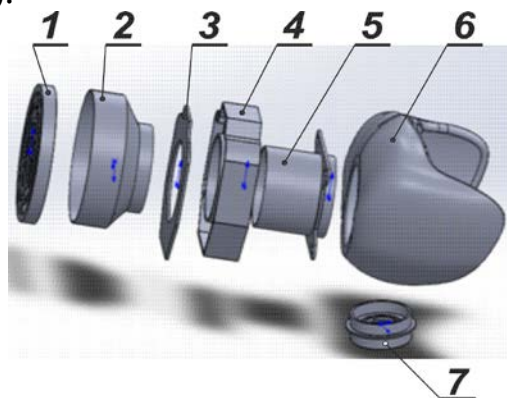


Figure 1.

A method of automatic control of the protective effectiveness of a dust respirator is applied by installing a pressure gauge on the half mask. By doing this we can estimate the compliance of the half mask with the anthropometric size of the employee, the density of fit during its operation (no gaps between the face and the

half mask during sliding) and keep the protective action of the filters until they become critical by means of pressure drop, which indicates the need to replace them.

It can be concluded that medicine and computer technology have been working together for a very long time to solve human health problems. From chronological events, we can conclude that these areas will continue to work together. Moreover, it should be emphasized that medicine and computer science are interconnected and due to this fact a lot of new and innovative methods of treatment and health protection have been developed.

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Using information technology to overcome language barriers

The pace of globalization is forcing an increasing number of people to communicate with foreigners. Language affects nearly all aspects of life and therefore the issue of language barriers is important and critical in intercultural interactions. There are different ways to counteract language barriers and information technologies, such as machine translation and text recognition, are the most effective.

Let us analyze how they work. Firstly, the text must be entered into the program. There are four distinct ways to do this: keyboard input, handwriting on the screen, voice recognition and optical character recognition.

The keyboard input is simple. The first hard part is handwritten text recognition (HTR). This operation is possible right now due to deep learning, using different types of neural networks, such as convolutional neural networks (CNNs) and Capsule Networks (CapsNets), which absolve the limitations of CNNs.

Automatic speech recognition (ASR) is also possible and many IT companies developed their own APIs for it. For example, Microsoft Speech API, Google Web Speech API and open source alternatives like Sphinx and HTK. The algorithms behind the APIs are quite complex and will not be reviewed in this article.

Optical character recognition (OCR) is used to scan images for texts and parse them. The resulting file is often a digitized document that can be edited with an ordinary text editor or translated. Modern OCR programs use an algorithm called feature detection, which allows them to detect the individual component features to understand which character is made from these components.

After the text is received, it must be translated. Machine translation (MT) is not perfect yet, but it is developing fast. MT is used in many different ways – from translating one word or phrase to translating millions of words in a short period of time. Yet, MT systems require training to increase quality. There are various types of MT systems: generic MT, customizable MT, and adaptive MT.

Generic machine translation provides ad hoc translations for millions of people. Examples for generic MT platforms are Google Translate, Bing, Yandex and Naver. Also, generic MT can be bought by companies for batch pre-translation and connected to their systems via API.

Customizable MT has a basic component and can be trained in a specific domain (medical, legal or other). In these domains this method of translation can work much better than generic MT.

Adaptive MT offers suggestions to translators and learns from their input in real time. It can significantly improve translator's performance.

There are also disparate approaches to machine translation. First-generation rule-based (RbMT) systems are based on grammar, syntax and phraseology

algorithms. Statistical systems (SMT) use big data in translation. Texts are being matched by patterns and the system finds the most statistically suitable translation. Neural MT (NMT) uses machine learning for translation. This process takes a lot of power, so it is often run on graphics processing units. The last approach to translation has been getting more popular since 2016. Probably, neural technologies are going to be the most accurate for text recognition and translation.

After the translation, there are many ways to output the result. The basic one is a plain text or a text over image. But to create a simultaneous interpreter, we need to have a voice synthesizer. Speech synthesis technology (often called text-to-speech (TTS)) is widely used today in various software. The synthesis process is divided in three parts: "text to words" (pre-processing), in which algorithm tries to understand the meaning of a text to pronounce it correctly; "words to phonemes", where program breaks the words into smaller parts - phonemes; "phonemes to sound", a complex process where phonemes are converted into real sounds.

So, today the machine translation technologies are progressive and are developing fast to become perfect. Everyone who has been using, for example, Google Translate for years, can notice that it has become more intelligent and is making fewer mistakes than before. Maybe, in the future, we will be able to translate everything correctly, and the language barrier will not be such a problem.

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Using custom iterators in C++

Iterator is a conception used to identify, move and change an iterable object. It is a pointer with the ability to change its position in the defined order. Any iterator has to implement CopyConstructible, CopyAssignable and Destructible conceptions. Also, it must have an ability to be dereferenced and incremented. Pointed value should implement Swappable conception ^[1]. Iterators are rather powerful and usable tools for working with containers. It can be used in many forms and for different goals. The most common examples of iterators are those used in classes such as arrays, vectors, lists, maps, etc. Mostly it is all about default STL ^{[2][5]}, but you may meet a conception of iterator in other libraries. Good examples are Boost, SFML, OpenCV. It is used in different libraries but in similar situations. The main aim of the iterator is to tell the order of processing data. It works perfect when you use a library, but the problem appears when you need an iterator for your own objects.

Creating a custom iterator

First of all, you need to create your own iterator if you want to process your container. There can be much more tasks which can be solved with the iterator but let us take a look at its obvious plus. Using iterators helps you make your code easier to read and to change. The algorithm of processing is separated from processing itself. It makes all loops similar. The loops' algorithm changes only if an iterator algorithm is modified. For example:

```
for (auto iterator : iterableObject) {
    loopBody(iterator);
}
```

This loop allows you to process data in any order. You only need to change the increment method (or apply a decorator pattern). An important thing to notice is the “auto” type used. C++ is a compiler language, so “auto” will be replaced with the actual type used. It raises a question of how to use this loop if data, taken with the help of iterableObject, has more than one type. In such a situation you should try to implement polymorphism. If all the types in iterableObject are inherited from one abstract class (or interface), it is quite easy to get pointers to any data you need. The good moment is code testing. Not only the loop, but its tests are all similar, too. It does not matter how the order changes, this loop will always work this way. Before C++17 this loop had looked like this:

```
auto && __range = range_expression ;
for (auto __begin = begin_expr, __end = end_expr; __begin != __end; ++__begin) {
    range_declaration = *__begin;
    loop_statement
}
```

But in C++17 the place, where `__begin` and `__end` expressions are declared, has been changed^[3]:

```
auto && __range = range_expression ;
auto __begin = begin_expr ;
auto __end = end_expr ;
for (; __begin != __end; ++__begin) {
    range_declaration = *__begin;
    loop_statement
}
```

There is another way of using iterators in loops. Default STL has “`for_each`” in the `algorithm.h` file. We could suggest to use it this way:

```
std::for_each(beginIterator, endIterator, functionalObject);
```

In this case you do not work with data type at all, and the only things you need are the iterators’ positions. Also, this loop allows you to change the value immediately (*range-for* loop allows you just to read the value but not to change it). An action performed is defined in `functionalObject`. Here we suggest a possible implementation of this loop^[1]:

```
constexpr UnaryFunction for_each(InputIt first, InputIt last, UnaryFunction f)
{
    for (; first != last; ++first) {
        f(*first);
    }
    return f;
}
```

`FunctionalObject` can be a function or any object which has a functor (also lambda can be used). This function should have exactly one argument of the type an iterator points at. It will be applied to all the elements from `beginIterator` to `endIterator`. As a result, this `functionalObject` will be returned. It allows you to use *for_each* to change inner fields of `functionalObject` if you need to:

```
#include <vector>
#include <algorithm>
class PositiveNumCounter {
private:
    int counter;
public:
    PositiveNumCounter() { counter = 0; }
    void operator()(int num) { if (num >= 0) counter++; }
};
int main()
{
    std::vector<int> nums{-1, 5, -6, 1, 3, -7, 8};
    PositiveNumCounter counter = std::for_each(nums.begin(), nums.end(),
                                                PositiveNumCounter());
}
```

In this example a newly created counter will get a value of the counter created for each loop.

How to create an iterator

The most common way to create an iterator is to create a class in your container. When it is created, you should write a list of the methods it must have. This list depends on the type of an iterator you want to create. Below we suggest the UML diagram describing these types:

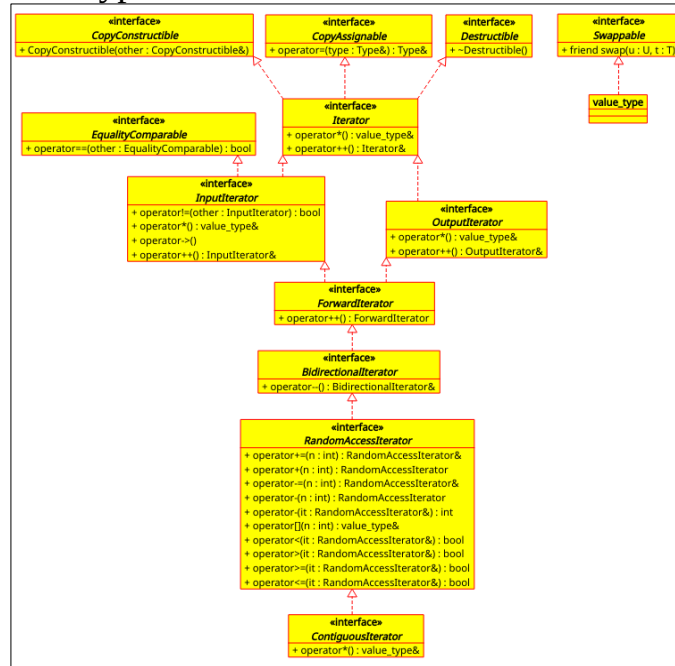


Figure 1 Types of iterators

Simple **Iterator**^[1] was described in the introduction, so there is no need to focus on it again. **InputIterator** implements **Iterator** and **EqualityComparable** interfaces. It should be dereferencable, and the value type must be specified (unlike **Iterator** which `value_type` is not specified). Also, you may compare it to another iterator of the same type^[1]. The only difference of **OutputIterator** is that it can set a value for pointed object while **Iterator** can only read a value^[6]. **OutputIterator** cannot be set in the same position as before, it can write data in the object and point to it exactly once^[1]. **ForwardIterator** is simply an addition of **InputIterator** to **OutputIterator**. The most important moment is that it can be used in multipass algorithms. It must implement **InputIterator** and may implement **OutputIterator**. If you do not want to implement **OutputIterator**, `value_type&` returned by the `operator*` should be constant^[1]. **BidirectionalIterator** can be run in both directions, so it can be incremented and decremented^[1]. **RandomAccessIterator** is much more complex. You may add integer values and subtract them. It should change a position of the iterator. But it also has an ability to get objects with the help of an operator `[]`^[1]. Finally, **ContiguousIterator**, added to C++17 standard, should be able to perform such operation: `*(it + n)`. Other options of this type work exactly as in **RandomAccessIterator**^[1]. Also, your container should have `begin()` and `end()` methods which return iterators. You may determine their return value yourself because it mostly depends on specific containers and the tasks you would like to solve with this

pattern. The following example shows how to create an iterator with a class:

```
#include <iostream>
#include <algorithm>
class IntegerContainer {
private: int* elements; int nElements;
    class Iterator {
private: int* value;
public:
    Iterator() {}
    Iterator(int* _value) : value(_value) {}
    Iterator(const Iterator& it) : value(it.value) {}
    bool operator!=(Iterator& it) { return !(value == it.value); }
    int& operator*() { return *value; }
    Iterator& operator++() { ++value; return *this; }
    };
public:
    IntegerContainer() { nElements = 2; elements = new int[nElements]; }
    IntegerContainer(int _nElements) { nElements = _nElements; elements = new
int[nElements]; }
    Iterator begin() { return &elements[0]; }
    const Iterator end() { return &elements[nElements]; }
};

void setValues(int& value) { value = 10; }
int main() {
    IntegerContainer container(5);
    std::for_each(container.begin(), container.end(), setValues);
    for (auto i : container) { std::cout << i << std::endl; }
    return 0;
}
```

In this code you may manipulate with the container values by the setValues function.

Using iterators with non-container objects

If you do not have a container, the way of developing remains the same. Because, as iterators are just pointers to some data, it can point to anything you would like to^[4]. The only rule is that your object must have begin() and end() methods (at least, if you use common iterators). For example, you may use an iterator with the data generated by generators. It needs specific increment rules and can be used with both finite and endless loops. If a generator finishes, a loop also finishes because a generator's iterator becomes equal to an iterator returned by the end() method. Also, an iterator can be a pointer to the functions you need at the moment. It works perfectly with the decorator pattern mentioned before. It allows to keep the algorithm separated from the main program. You may also create an iterator for another iterator if you want to change behavior of your iterator.

To sum up, iterators can be used for working not only with containers but also for organizing loops. It makes all loops look the same and your code becomes portable and reentrant. Also, iterators can be a tool to modify your program algorithms and behavior with data (or even with self-modification). Iterator pattern is closely connected with a decorator, wrapper and generator.

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Development optimal strategy of inventory management of the catering

In our country, particularly in Dnipro city, the structure of catering is developing rapidly. There are many competitors in this field, with many concepts, that can reach more of the target audience. In order to be competitive you need to know the sphere of your activity and develop your business, and attract more visitors and, of course, optimize the work of the entire establishment. The main task of any enterprise is profit maximization. To do this it is necessary to regulate all the needs of visitors, control the inventory and optimize the work of the company [1].

The task of inventory management in the general case is formulated as follows: to determine the optimal stock size, quantity, frequency and delivery time of the order, at which the total expenses become as small as possible. Expenses are usually determined by the cost of purchasing, shipping and storing products. Often an enterprise does not spend money on storing products because the warehouse with all necessary resources is located in premises that is owned or leased by the company [2].

The purpose of this work is to increase the efficiency of the enterprise, which is a catering establishment, by the analyzing its functioning, technologies of receiving products, identifying opportunities for rational purchase of ingredients for products offered by the company, optimizing the plan of implementation of mixtures.

According to the results of the SWOT-analysis, it was possible to identify the strengths and weaknesses of the enterprise, identify those opportunities, the implementation of which will eliminate or compensate for some threats that arise during the institution functioning (table 1).

In addition to the SWOT-analysis the ABC-analysis was carried out, which in turn provided recommendations for the purchase and sale of finished products, i.e. optimization of the logistics system of the enterprise.

Table 1. SWOT-analysis of the catering

Strengths	Weaknesses
• purchase of resources at the most favorable prices in the market, get more profit than competitors have • well-qualified staff • location of the establishment-the city center	• a big amount of partners • low staff salary • ineffective advertising • the unpredictable absence of any resource in the warehouse
Opportunities	Threats
• prospective clients learn everything they need about company from the	• сильні конкуренти • недостатнє кількість працівників

Internet	• можливе підвищення тарифів • несвоєчасне постачання ресурсів
• improving the quality of service	

Strengths

Weaknesses

-
-

Opportunities

Threats

-
- strong competitors
- too little amount of employees
- possible increase of tariffs
- late delivery of resources

The mathematical models of the three following optimization problems that have arisen at the enterprise are presented and implemented:

- maximize profit in terms of implementation and over-fulfillment of the volume of sales of the company products, taking into account available resources;
- maximize waste of high-cost and perishable ingredients;
- minimize purchases of ingredients for the production and sale of products (in this case, cocktails) according to the plan of the previous month.

The following notation will be used to construct mathematical models of problems.

N-number of mixes (cocktails) to be sold; we will connect index n with each cocktail;

M-number of ingredients used for cocktails; m is the ingredient number;

bm-mass of the ingredient in one unit of container, g/pc;

sm-purchase price of one unit of ingredient container, UAH/pc;

pm-quantity (availability) of purchases of the ingredient in the appropriate packaging, pc;

dmn-is the content of m-th ingredient per 1 unit weight of n-type cocktail;

Vn –weight of one serving of n-type cocktail, g/serving;

Cn –price of one serving of n-type cocktail, UAH serving;

Markupn –markup for 1 serving of n-type cocktail, %;

ExpectedPlann –the expected plan for the implementation of n-type cocktail, servings.

The first task is to find the number of servings of each type of cocktail, which in terms of implementation and over-fulfillment of the volume of sales of the previous month would allow having maximum profit taking into account available resources.

Let all the above values are known. Let x_n be the number of servings of the n-th cocktail that is desirable to be sold in the current month. Then the mathematical model of the formulated problem has the following form:

For this task, it should be noted that resources were purchased at the beginning of the month so that they were sufficient to fulfill the Expected Plan.

Analysis of the results of the solution of this problem revealed the cocktails, the expediency and profitability of which are generally zero. These are cocktails with ingredients, which in turn are full cocktails. Moreover, when these products are mixed into one, the price for them is significantly reduced. Therefore, it is concluded that it is advisable to remove these mixtures from the menu and to leave only the ingredients separately.

In addition, the solution of the problem showed such cocktails, which are the most profitable. Total profit amounted to 21952 UAH, and considering the resources utilized during month, the profit amounted to 19631 UAH. That is, 10% of all profit is recycled good. Recommendations for a possible reduction of this indicator are provided. Therefore, the second task is to find a plan for the implementation of cocktails in the current month, in which the most perishable ingredients are used as much as possible. Let P be a set of indices of such perishable and high priced ingredients. The mathematical model of the third problem is minimizing the purchases of ingredients for the production and sale of cocktails according to the plan of the previous month.

Let p_m - the amount of ingredient in the appropriate packaging that must be purchased for sales of cocktails in previous month.

Then the problem looks like:
under conditions

It is easy to see that all three models are tasks of integer linear programming [3,4]. All the calculations were done using the Excel Solution Finder. As a result of the solution, the optimal amount of ingredients needed to be purchased is obtained and thus the profit is increased.

Therefore, the paper proposes a systematic approach to analyzing the work of a catering establishment, which is based on: 1) a thorough SWOT analysis to identify weaknesses in the functioning of the enterprise, to seek opportunities to eliminate these deficiencies and prevent external threats; 2) ABC analysis to evaluate the importance of both the product and resources, that is to identify goods that need some attention and ingredients that require regular procurement; 3) mathematical modeling, formulation and solution of optimization problems. This research methodology can be applied to any enterprise not necessarily related to catering.

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Use of recommendation system for game industry analysis

At the time, when computer games appeared, there was a big problem for the developers to create games on pretty weak machines. So, the ability to make something good, using limited computer resources, was a sign of mastery.

As the time passed, and computer technologies progressed very fast, it became easier to implement bigger game projects. Also it increased the amount of games, and the rate of creating new ones as you can see on pictures below.

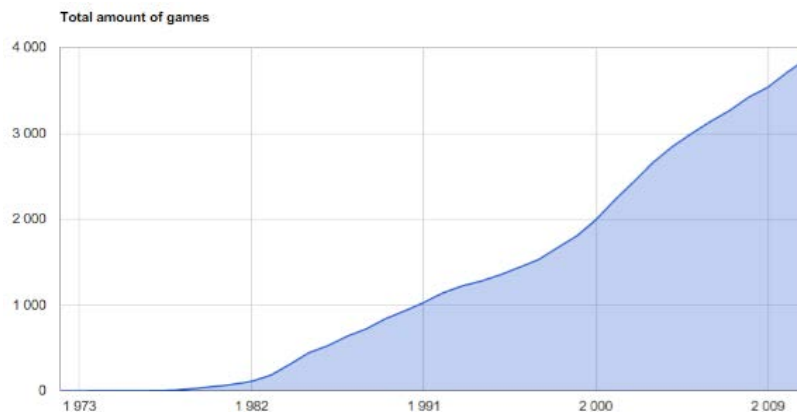


Fig. 1 – The number of games in 1973-2009 years

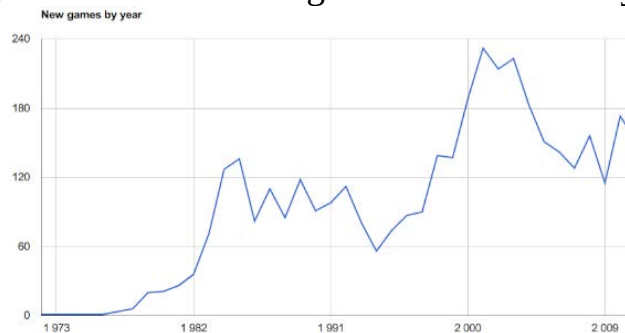


Fig. 2 – Releases of new games in the period of 1973-2009

After 2009 year graphs did not change much. Also, increasing of the software amount available for easier development has led to the creation of indie-games usually developed by one person or a small group.

Today, the gaming industry has become a big business sphere, there are so many gaming studios that the market is overflowing and ideas are running low. So, now the main problem to solve before creating a game is finding a perspective idea or copying and transforming the existing ones.

For the purpose of finding a way out of a situation where you need to understand how profitable a game project is likely to be, it becomes necessary to have an algorithm for finding similar existing games. The search algorithm is a

recommendation system that aims to help make decisions about choosing a new game project. The principle of the algorithm is easy to understand and use. Let us say a user has an idea for a new project and some floating details about the way it is implemented, and then he gives these implicitly set elements to an algorithm that, in turn, finds options roughly reminiscent of existing game projects and shows them. In this way, it will be possible to analyze previous setbacks or successes and to draw a conclusion as to the course of moving the idea: what to add or remove, or even to put it in the long drawer altogether, since it is better to stop than to make absolutely failed decisions causing significant losses for a company.

Having determined that today gaming is a large business, often requiring large sums of money, as well as sufficiently long periods of development time, part of which is spent on a very important analysis of trends and client expectations, it becomes clear how difficult the process of creating and launching even one project into the gaming market is. Therefore, an algorithm capable of saving time and money is of great value because the larger the project, the more noticeable is the saving of resources allocated to it. Due to the considerable usefulness of such a recommendation system, it has been created and can be used for generating income in various way for example, being installed as an online advertising service.

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Optimization of the production plan with the help of demand analysis

The aim of the study is to optimize the production plan in the conditions of Matroluxe. The scientific innovation of the expected results should consist in adapting existing methods for optimizing production plans in a company environment. The practical value of the results obtained in the work lies in the possibility of improving the work of the company through the introduction of developments to optimize the production plan and minimize costs in the implementation of logistics operations.

1. System analysis of the LLC «MATROLUXE» activity

During the analysis of the enterprise, the objectives of the model, the functional activities of each of the enterprise units and the functional interactions between them were identified. Fig. 1 shows the structure of the company, which consists of four main departments: Internet Department, Procurement and Sales Department, Procurement Support Department, Administration.

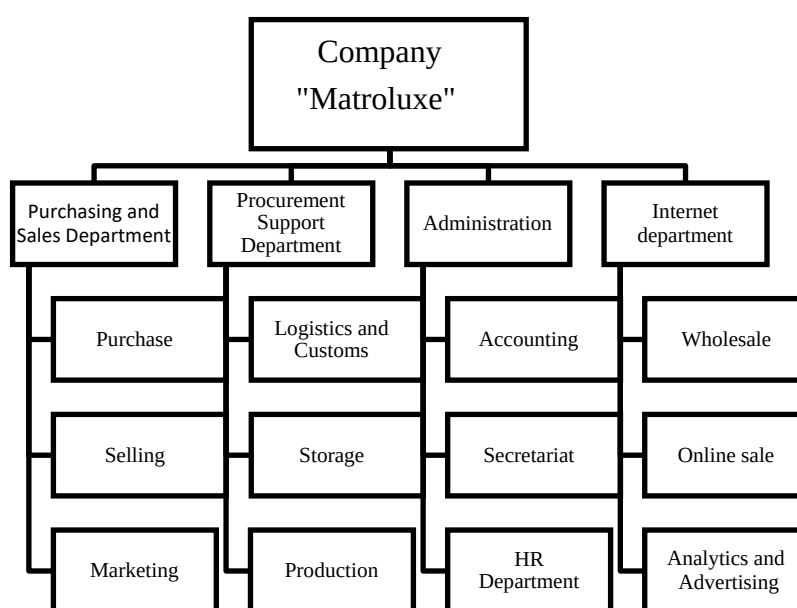


Fig. 1 Structure of LLC “MATROLUXE”

Manufacturing process and product transportation are separate operations and technologies. Their task is work coordination of several enterprises. (Fig. 2)

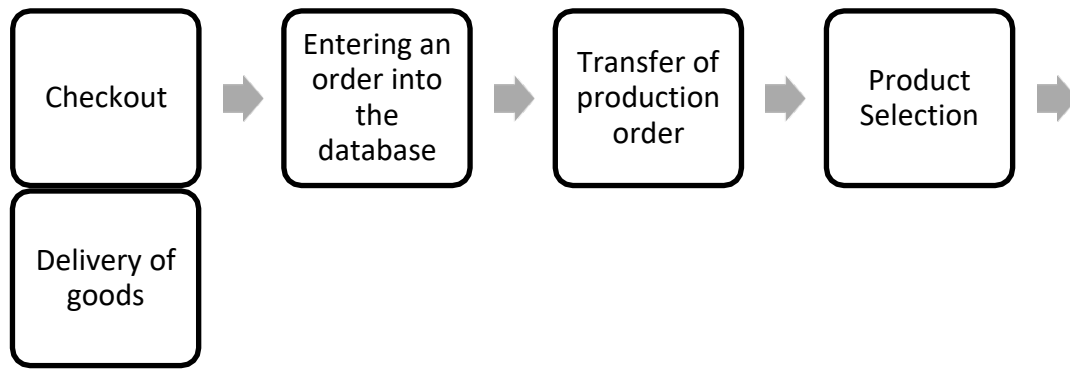


Fig. 2 Manufacturing process of LLC "MATROLUXE"

2. Making the optimal solution by the ABC-XYZ method

The general problem of the linear programming is formulated as follows: to find the optimum of the linear function $y(x)$ if linear constraints in the form of equalities and inequalities are imposed on the variable tasks:

$$F(X) = \sum ci * xi \rightarrow \max; \quad (2.1)$$

ABC is an analysis tool that allows you to explore the product range. The product range is usually analyzed according to two parameters: sales volume (quantity of the sold products) and profit (trade margin). ABC analysis is based on the Pareto rule, according to which 20% of product range items provide 80% of profit. The model of the ABC-XYZ algorithm is presented in Fig. 3.

A	A	A
A	A	A
X	Y	Z
A	AB	A
B	Y	B
X		Z
B	BA	B
A	Y	A
X		Z
A	AC	A
C	Y	C
X		Z
BB	BB	B
X	Y	B
		Z
C	CA	C
A	Y	A
X		Z
BC	BC	B

X	Y	C Z
CB X	CB Y	C B Z
CC X	C C Y	C C Z

Fig. 3 Model of the ABC-XYZ algorithm

Group **A** is a very important product that should always be present in the range. Group **B** is of medium importance. Group **C** is the least important product, it is the candidate for the exclusion from the range and the new products. This method of analysis is suitable for our tasks, as it will allow us to distinguish the best and most cost-effective products that can maximize cost-effectiveness. The basis of adaptive methods according to the moving average scheme is the exponential smoothing model.

XYZ analysis is a tool that allows you to differentiate your products according to sales stability and fluctuation of consumption. The method of this analysis includes calculate each coefficient heading of a variation or fluctuation in cost. The result of the XYZ analysis is the grouping of goods into three categories based on the stability of their behavior:

Category **X**, which includes products with a fluctuation in sales from 0% to 10%. These are products that are characterized by stable consumption and a high degree of forecasting. Category **Y**, which includes products with a fluctuation of sales between 10% and 25%. Category **Z**, containing products with a fluctuation of sales of 23% and above.

The combination of ABC and XYZ estimates reveals clear leaders (AX group) and outsiders (CZ). Both methods complement each other well. If the ABC analysis allows us to evaluate the contribution of each product to the sales structure, then the XYZ analysis allows us to evaluate sales jumps and its volatility.

As an example, let us analyze the calculations for one of 156 products. For the ABC indicator, we use the height of the mattress, this is a very important indicator, since the lower the height, the more mattresses can be accommodated in the warehouse, thereby optimizing the output. This type of product has a height of 7 cm, which is included in the 20% of the lowest and most compact products presented by the company, therefore it falls into category A. Then we calculate the coefficient of variation. The calculations are shown in Fig. 4.

Silver Cocos							
Year and quarter	1q r.	2q r.	3q r.	4qr.			

2016	32 91 1	53 20 1	27 55 4	557 50			
2017	39 24 5	28 39 7	24 36 8	470 66	Av r. sal es	Avr. deviation ($\bar{d}$)	The coefficient of variation (w)
2018	55 47 7	46 41 8	45 67 7	801 33	56 92 6	13943	24%
Average by quarter (Mi)	42 54 4	42 67 2	32 53 3	609 83	43 56 4	8150	19%
The coefficient of variation (v)	0,9 37	0, 95	0, 71 7	1,3 8	1	0,19	19%
Sales amount without seasonal component (k)	56 80 7	47 38 9	61 16 5	572 44	55 40 9	4131	7%

Fig.4 Results of calculations

Based on the obtained calculations, we can see that the products of Silver Cocos product coefficient of variation is **7%**. Thus, it falls into category X. Having done these calculations for all units from the list of **156** products, we got **8** items that provide 80% of all sales. To optimize production, it will be cost-effective to focus on these types of products and keep them in stock.

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Terrestrial laser scanning

There are currently several reasons of wide application of laser scanning systems due to their excellent features and parameters. This is the result of creating spatial objects such as buildings, structures, interiors, space, terrain, etc., with exceptional speed, accuracy, complexity and safety. The scanned object is then visualized by specialized software as the cloud of points. Subsequently, it is possible to perform a wide range of analytical tasks and also to generate models of the object. This technology also starts to take over in quarries for the purpose of topographic mapping or monitoring of advance of the quarry material and determination.

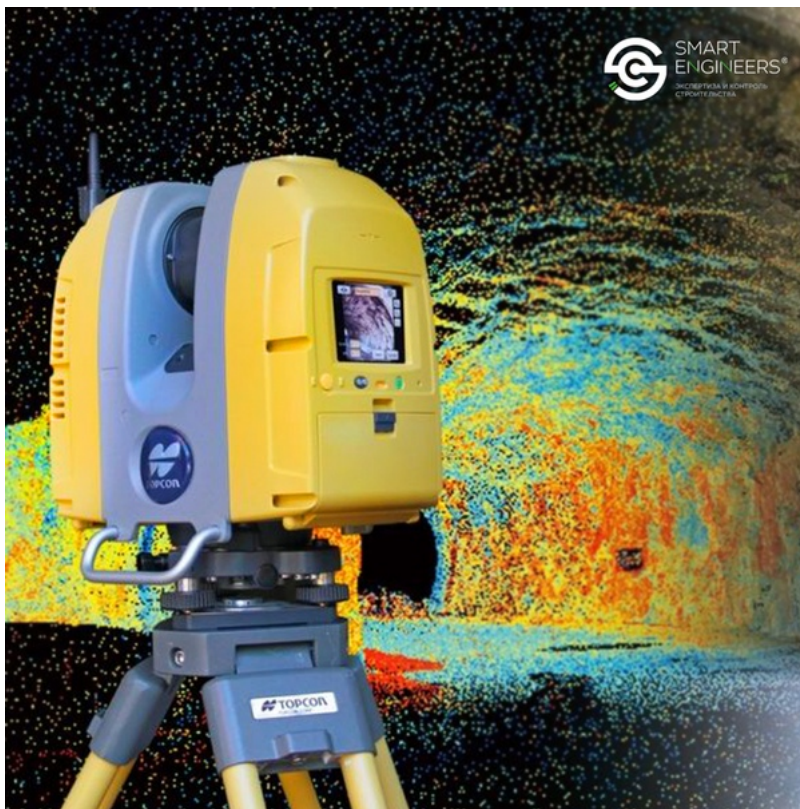


Figure 1. TLS at work

3D scanners are also in great demand because they can be used not only for measuring architectural and construction objects but for performing a great deal of operations. It is worth noting that the equipment will never be idle as with its help

you can get a great variety of useful data: ultra-detailed digital models of various reliefs, topographic maps and plans, virtual terrain models and drawings of individual structures.

When using materials of three-dimensional scanning, the customer is given a complete topographic basis for the entire object immediately in a single coordinate system. This helps to avoid errors and eliminates the influence of the human factor if the work is done fragmentary using various tools and equipment

Such key benefits should be listed as following:

- capture valuable data in inaccessible areas at unprecedented spatial and temporal resolutions
- improve safety by removing personnel from hazardous areas
- reduced cost and time of data collection

As for mapping specifications such points should be emphasized:

Lidar range	Up to 100m
Lidar accuracy	+/- 3cm
Global SLAM accuracy	+/- 0.1% typical
Angular field of view	360° x 360°
Data acquisition speed	300,000 points/sec
File size	~300MB/min
Processing time	2 x data capture time
Point cloud file format	.laz, .ply

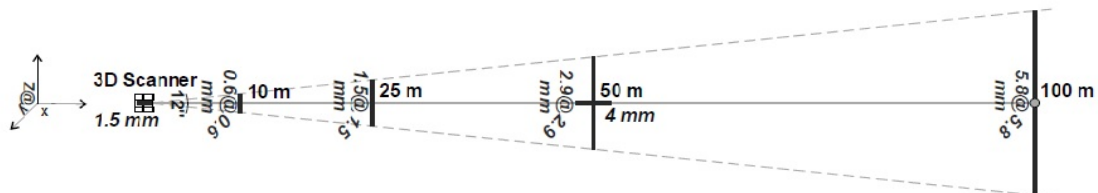


Figure 2. Schematic overview of the basic measurement errors for Scan Station C10

It is concluded that the laser scanning method becomes a competitive method for classical and photogrammetric measurement methods of slope monitoring in terms of accuracy. It is also excellent for objects with a fan-shaped construction, which include open pit mines and provides very fast and easy access to data in real time.

But it should be emphasized that terrestrial laser scanning cannot be treated as the only measurement method and should be supplemented with more accurate geodetic measurements established by engineering practice.

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Substantiating selection of means to control kaolin raw materials quantity

Kaolin is an exogenous or sedimentary rock that is almost entirely composed of clay mineral kaolinite, which has the following physical properties: density - 2.58... 2.60 g/cm³, bulk mass - 1.8... 2.2 g/cm³, fire resistance - 1750... 1800 °C. Due to its high fire resistance, chemical inertness, dispersion and low dielectric constant, kaolin is one of the most universal types of mineral raw materials used both in crude and enriched type. About 150 kaolin deposits are located in Ukraine.

High cost of kaolin raw materials and products of fire-resistants kaolins requires constant monitoring of their quantity and quality and is considered to be an urgent task for the owners of the mining enterprises. Specific physical properties of both clays in general and, kaolin clays in particular, as well as some peculiarities of production technology and processing of this raw material substantiate the necessity of carrying out the control by applying geodetic and laboratory measurements as well as operational accounting.

Classification of methods for determining the amount of kaolin clays

The most effective and accurate method is the surveyor-geodetic one because this method allows you to determine the actual volume of the rock mass that is separated from the massif in the place of direct mining of raw materials in the quarry. However, determining the volume with the highest possible accuracy does not mean that the quantity of raw material Q , calculated as the volume multiplied by the density of the material γ , according to formula (1), will be determined with sufficient accuracy. But the issue of density determination is not within the scope of mine survey service, although the density value has a significant effect on the specific outcome. Therefore, the problem of determining the quantity of raw materials is a significant unsolved problem for the owners and management of the enterprise, unlike the task of determining the volume of the same raw materials.

$$Q = V\gamma \quad (1)$$

It is clear that the volume of raw material, defined at the mining site as the difference of the contours of the mining range at the beginning and end of any period V_1 , is always less than the volume of the same raw material transferred to the warehouse V_2 . However, in the first and second cases, the amount of raw material is the same calculated by formula (1). This situation can be defined by formula (2).

$$V_1\gamma_1 = V_2\gamma_2 \quad (2)$$

This equation means that the density of kaolin clay in the array γ_1 is greater than its density in the storage γ_2 . Therefore, it is obvious that the main task in determining the amount of raw material is to define its density. Unfortunately, the solution to this problem in the production industry still has not been found. The use

of density data in the specialized literature cannot solve the problem outlined, since the difference in carried research works varies significantly.

At the stage of storage of kaolin clay in warehouses located directly in the career, it makes no sense to control the amount of raw material because mass determination in such conditions is physically impossible, and the surveyor-geodetic method only allows you to determine the product volume stored in a warehouse. Volumetric mass of clay materials under such conditions cannot be determined due to the large, unstable and simultaneous influence of such factors as material's residence time figure, the height of the figure, the presence of voids between the individual components figures, as well as saturation with moisture.

Therefore, for a more accurate calculation of the amount of raw material extracted, the density should be determined directly in the massif γ_1 , and should be done by specialized organizations. That is, the most probable value of raw material Q can be calculated from the volume of raw material in array V_1 according to formula (2). In this case, the value of the density γ_2 cannot be determined laboratory; it can be calculated, if necessary, also by the formula (2), which in this case is transformed into formula (3).

$$\gamma_2 = \frac{V_1 \gamma_1}{V_2} \quad (3)$$

This figure γ_2 is not a stable because its value depends on a number of factors, for example: the time of storage of raw materials in an open warehouse; the height of the shape in which the raw material is stored; the humidity of the atmosphere and the raw material itself. In addition, the density of raw materials in the formed stock is also heterogeneous in terms of its entire volume. Due to the general influence of all these factors, it makes no sense to use the material density index γ_2 .

At the stage of transportation of extracted raw materials from the quarry for processing, another accounting method is implemented, namely, operational control. It consists of calculating the number of transport units loaded on the quarry and the same transport units that arrived in the processing area. In addition to the usual arithmetic calculation of loaded transport units, when entering the processing plant, the mass of the loaded vehicle is most often determined and, after unloading, the mass of the empty vehicle is re-determined. Thus, determining the mass of the displaced rock mass can be considered as a laboratory method of controlling its amount. At the same stage, it is suggested that the humidity of the raw material be determined. This must be done with high-quality and high-precision moisture meters. Due to this, density control and hygroscopic separation can be performed moisture (absorbed by the material), which for refractory clays can be from 1% up to 3% [1].

Subsequently, the kaolin raw material undergoes processing, the result of which is ready-to-use products. When stored as baked granules kaolin products are not prone to water saturation and the finished product volumetric mass may vary slightly. Therefore, control quantity of finished products can be carried out by geodetic method.

After such intermediate control of the quantity of kaolin products, the product is loaded into the appropriate container and into the appropriate transport for delivery to consumers thus determining the mass of shipped products by special weights.

The proposed classification of methods for determining the amount of kaolin raw materials and finished products at different stages of production allows to systematize the process of determination and control. The basic methods for determining the amount of kaolin raw materials and finished products are given for each of the production steps. This will allow providing a more reasonable and balanced assessment of the results, taking into account the accuracy of the work, the physical properties of the source material and technological features of production.

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Estimating the cost of paleontological sample from the geological and mineralogical museum of NTU “Dnipro Polytechnic”

Nowadays, Ukrainian market of paleontological remains is developing being limited by several internet-sites where the price for different extinct organism experience considerable fluctuations. Price of one and the same sample with similar parameters may be within the range of USD 15 – 35 along with the price changes within the range of USD 30 – 7. That market is uncontrolled, so one cannot be sure of not paying several times more while buying some item. The research has helped us determine the prognosticated cost of paleontological samples and orient ourselves in terms of characteristics and value of both ordinary samples and the ones being the museum pieces.

Experts of the State Gemological Center of Ukraine have elaborated “General classification of the collection samples of natural rocks and fossil animal and plant remains of the geological past”. The paper makes it possible to determine the prognosticated cost during the assessment of uncommon samples being kept in the natural history museums of Ukraine [1]. According to that classification, we have assessed a sample from the Geological and Mineralogical Museum of our university.

A formula to calculate the value is as follows:

$$\Pi_B = M * B * K$$

where Π_B – prognosticated value, M – mass, g, B – basic value in monetary units per mass unit, K – coefficient of value increase.

We have selected the most interesting paleontological sample of a brachiopod, genus of *Gigantoproductus*. The sample (Fig.1) represents the external core with only one valve (pedicle) available; there is no dorsal valve. The surface contains radial lines, sinus is slightly seen, the tip is wide and massive. There are minor shell remains on the sample's surface. That organism existed within the territory of Donbas in the Lower Carboniferous deposits. It has following sizes: 186 mm along the wings, length of 125 mm along the sinus, and height of 65 mm.



Fig. 1. Remains of a brachiopod from Donbas.

The sample weight is 1311 gr.

We believe that the sample belong to the “rare” category because of its impressive sizes and rarity at the territory of Donbas. However, it cannot belong to the “rare ideal” category due to the lack of dorsal shell part. Thus, its coefficient is 8. There are no samples of such sizes in the corresponding museums of T. Shevchenko KNU and I. Franko LNU.

Price in USD 1 for 1 g is stipulated by the comparison with other similar samples.

Prognosticated value may be as follows:

$$\Pi B = 1 * 8 * 1311 = 10488 \text{ (USD)}$$

M=1311 gr, K=8 (category of rare samples), B= USD1 per gr.

Consequently, rather high calculated prognosticated cost of the sample from the Geological and Mineralogical Museum helps orient oneself in the prices for such samples in other museums with similar exhibits and to understand the value of the samples under estimation from the viewpoint of both their scientific and monetary values, if there is the need in replacement of such samples or certain insurance activities etc.

The methodology along with the obligatory search for price analogues may be used to estimate the prognosticated cost of any uncommon samples which are kept in great amounts in natural history museums of our country.

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Coal height of coal seam k_5 of "Kapitalna" mine

"Kapitalna" mine is one of the largest mines in Ukraine, located in the city of Myrnohrad in Donetsk region. It is located in the central part of the Krasnoarmiyskiy geological and industrial area of Donbas. The total area of the mine field is 60 km², with an average of 17 km along the stretch and 3.5 km down dip. The coal seam k_5 is represented by coal of rank G and Zh.

Previously [1], peculiarities of distribution of toxic and potentially toxic elements in the main coal seams along the cross-section of the Pavlogradsko-Petropavlovskiy geological and industrial district of Donbas were investigated.

The isopachyte map of the coal seam k_5 is shown in (Fig. 1). The coal height of the coal seam varies from 0.65 m to 2.15 m. The average coal height of the coal seam in the mine field is 1.39 m. The highest coal height value is associated with wells No.2878 and No.3444, which are located on the north and west, respectively.

The lowest value was observed in well No. 3416 in the southeast of the mine field.

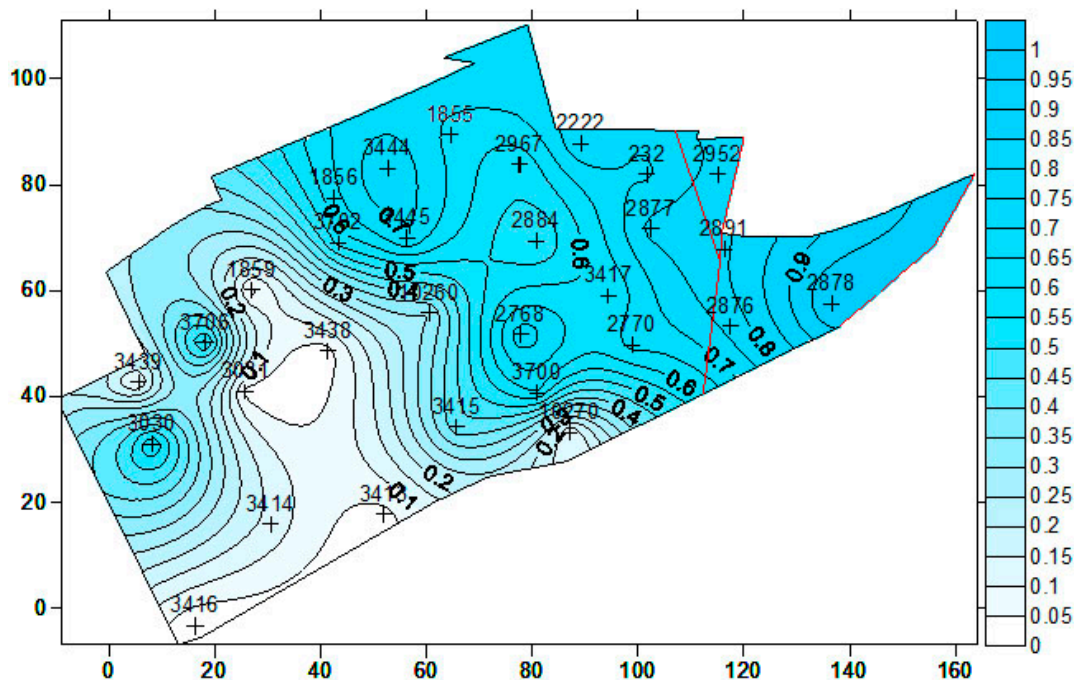


Fig. 1. Map of isopachytes with normalized values of coal seam k_5 of "Kapitalna" mine

In regional plane (Fig. 2), the coal height of the k_5 coal seam increases from southwest to northeast.

The direct average correlation between the coal height of the coal seam and its bottom is established ($r = 0,50$). With increase of depth of the coal seam bottom, its coal seam increases slightly. Also the weak direct correlation is established with the

ash content of the coal ($r = 0,28$) and the total sulfur content ($r = 0,25$). Linear regression equations (Fig. 3-5):

$$m = 0,2661 + 0,5107 \times h; m = 0,4489 + 0,3495 \times A^d; m = 0,4789 + 0,2773 \times S_t^d.$$

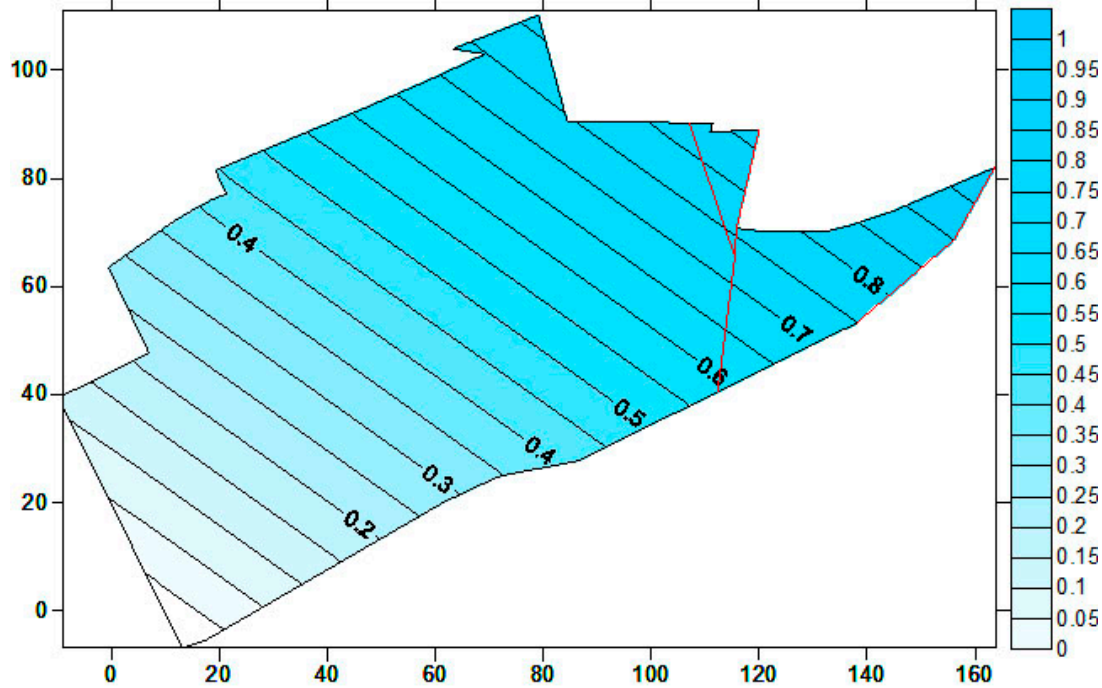


Fig. 2. Map of the regional constituent with normalized values of isopachytes of coal seam k_5 of "Kapitalna" mine

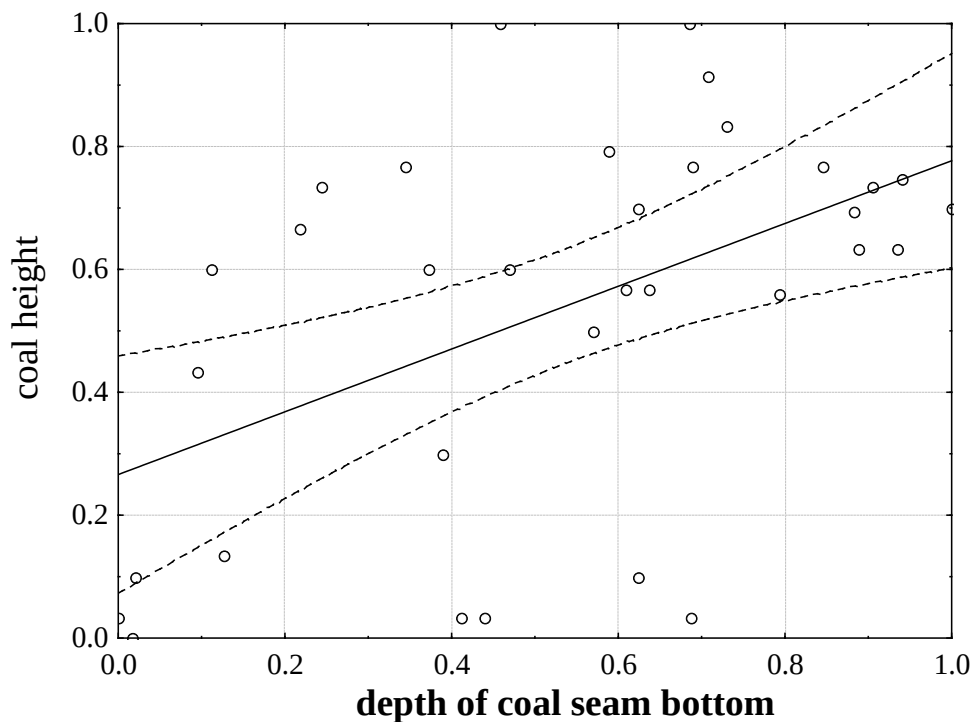


Fig. 3. Line of regression between normalized values of coal height and depth bottom of coal seam k_5 of "Kapitalna" mine

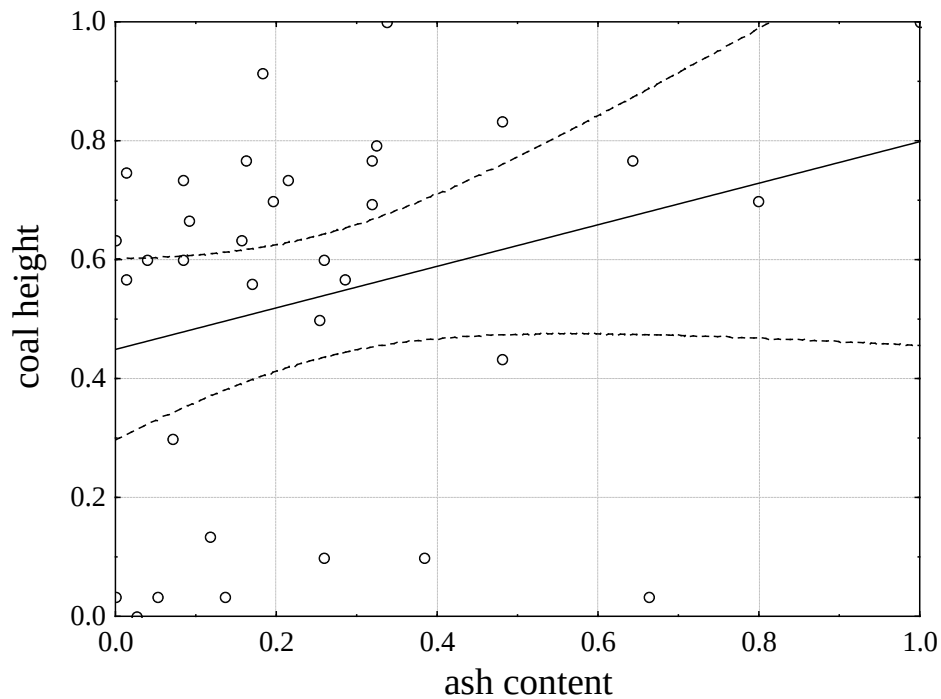


Fig. 4. Line of regression between normalized values of coal height and ash content of coal seam k_5 of "Kapitalna" mine

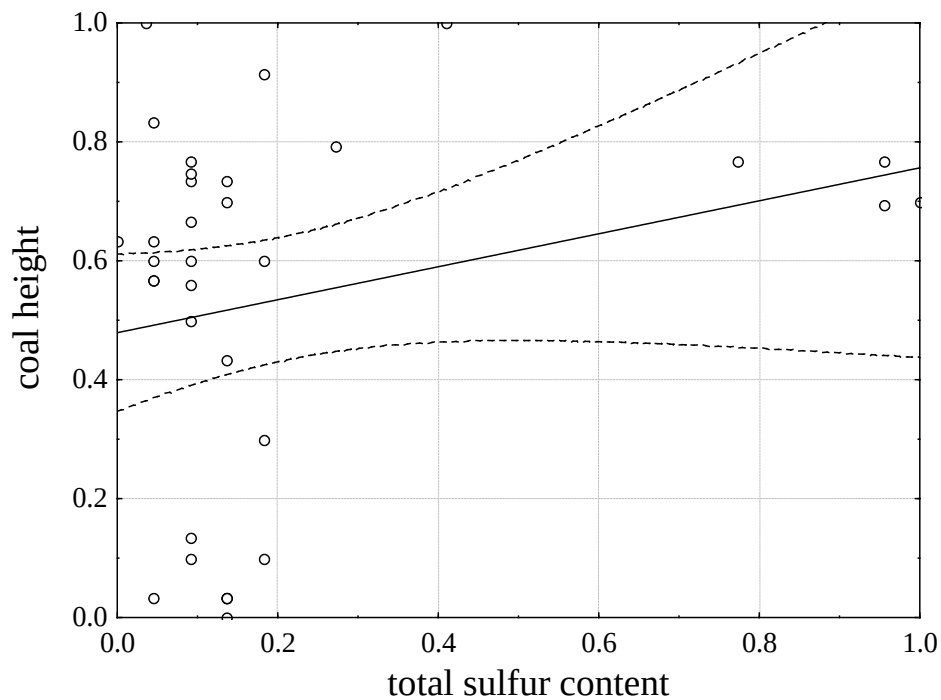


Fig. 5. Line of regression between normalized values of coal height and total sulfur content of coal seam k_5 of "Kapitalna" mine

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Problems of deformation in buildings and structures in Ukraine

The issues of safe construction and operation of buildings in Ukraine are very urgent nowadays. To solve this problem different techniques are applied. One method dealing with it is controlling deformation processes during the construction of a new facility near existing buildings. A slight deformation of the structures and subsidence of the soil beneath them is a natural process, since the soil and the structure itself settle with their own weight over time. Preliminary calculations are usually not enough to accurately predict how the building will behave. Therefore, during the construction, as well as during operation, a little regular monitoring of the deformation of the object is required. Observations of the precipitation of the structure are carried out by means of geometric and trigonometric leveling, hydro-leveling, micro-leveling, as well as photo and stereo photogrammetric methods.

Types of observations can be divided into two groups: vertical and horizontal. Deformation in the vertical plane includes: settlement (settlement of the structure and soil under its own weight); subsidence (soil sags due to groundwater, melting ice layer, and so on). Draft occurs during any construction. As the building is erected, pressure on the foundation and soil increases, they become denser, and some “lowering” of the object relative to the initial level occurs. Depending on the type of soil, both the speed and magnitude of the deformation are different. Horizontal changes (shifts of structures or rolls) can occur only due to a shift and subsidence of the soil.

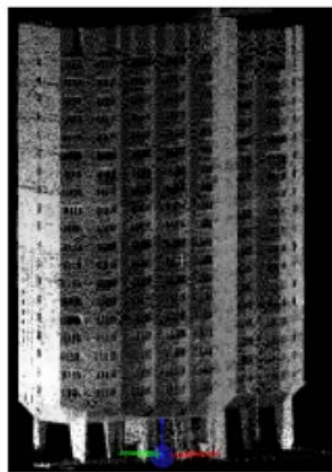
Practical results of geodetic measurements can be processed by probabilistic-statistical methods. This allows not only to determine the deformation of structures and engineering structures, but also to predict the process of deformation with the widespread use of mathematical methods of analysis. Most modern buildings are distinguished by complex structural solutions - a large number of storeys with a relatively small footprint or the presence of responsible production lines is located in a large area. To study the deformations of individual structural elements, technological equipment and the entire structure, special deformation marks are installed on them and are subsequently observed. Thus, the organization conducting the geodetic observations collects material containing a large amount of important information as directly about the received geodetic reference network (deformation network) and the quality of the observations made. As a result, the condition of the whole structure and its elements is identified separately.

Another important issue is the control of deformations in high-rise buildings. The existing regulatory documents as a whole contain recommendations on the assessment and control of deformations in high-rise buildings. But there are no practical methods for applying such a modern geodetic method as ground-based laser

scanning (TLS). TLS technology can be effectively used to solve various engineering problems. Its main advantage is the ability to quickly build models of objects that are represented by a set of points with known coordinates. Thus, by using the systematic analysis of TLS, it is possible to compare changes in the coordinates of three-dimensional models.

Regarding the issue of structure deformability, an important factor to be mentioned is the ratio of the height of the building to its conditional radius of the base. For example, a building of equal size (cube) of virtually any height in terms of deformation will undergo approximately the same relative deformations. And their characters (bending, torsion, shear) will be the same. However, the height assumes different values in a case with a fixed base resulting in so-called "effect of height". At the same time, there may be the cases where the base of the building is stable, but the upper floors can withstand critical deformations. But then this contradicts the building monitoring approach, which includes measurements of the lowering of the foundation.

To substantiate this a 22-story building located on Grushevskogo Street, 9a in Kiev was selected. The model of the research object was formed, and a digital solid-state model of the object was also created.



Thus, it can be concluded that the monitoring of deformation processes in the construction of facilities in Ukraine can increase the level of compaction and high-rise construction and monitoring systems can significantly increase safety of high buildings. Nowadays, we have special equipment and hardware base for creating flexible and open monitoring systems to perform all required tasks both at the construction stage and at the stage operation of the facility. In addition, there is great demand to create a regulatory documentation regulating the results of observations.

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Prospects and challenges for the use of unmanned aerial vehicles

Technological advances and increasing investments result in raising the interest to Unmanned Aerial Vehicles (UAVs) as a practical, deployable and technological component which is widely used in many civil applications due to its specific features and availability. UAV platforms also offer a unique experimental environment for developing, integrating and experimenting with many Artificial Intelligence technologies such as automated planners, knowledge representation systems, chronicle recognition systems, etc.

Nowadays, the application of unmanned aircraft has more and more spread in various fields such as health care, construction, security and others. If we consider surveying, then at the moment unmanned vehicles displace various devices used before them, such as laser scanning and theodolite survey.

After studying many sites, we can conclude that "drones" are becoming more common in various areas.

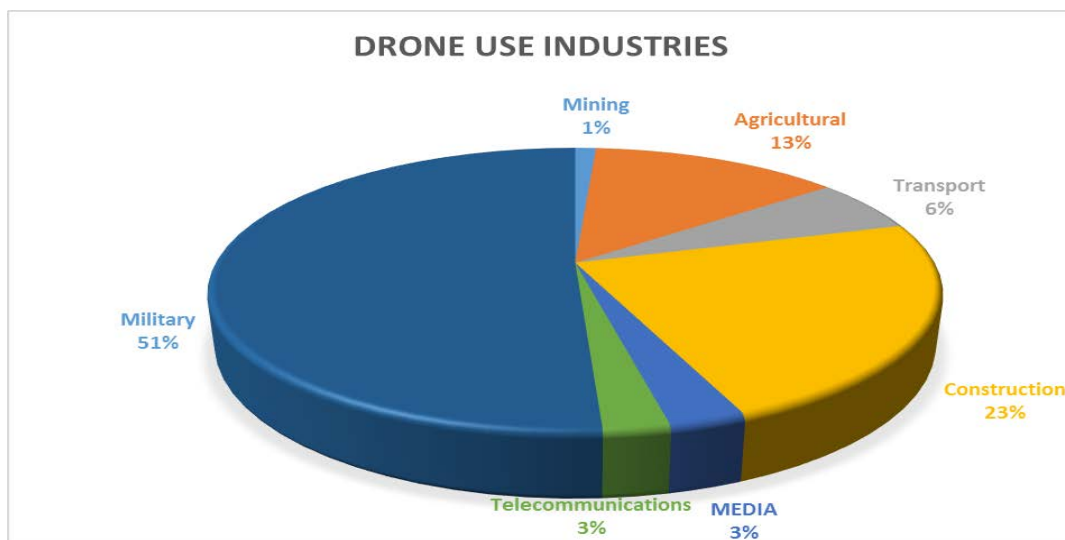


Figure.1 Distribution of industries that use unmanned vehicles

We can also note that every year the profit from the sale and investment in the development of unmanned vehicles increases. More and more countries are implementing the use of unmanned vehicles in their infrastructure.

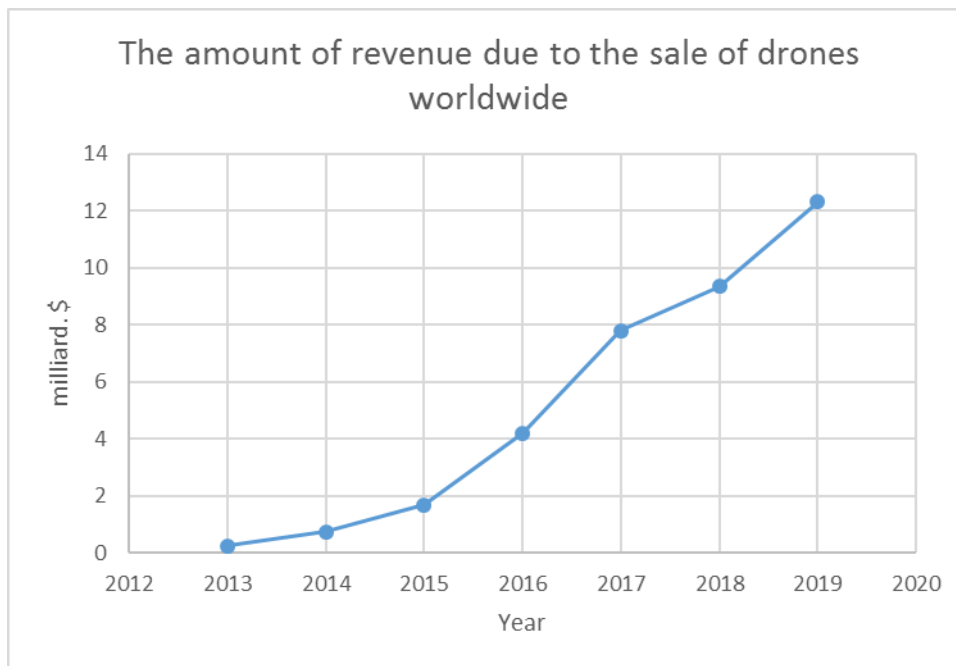


Figure.2 Increase in profit from the sale of unmanned aerial vehicles

One of the striking examples of the effectiveness of the use of drones is their use in construction by the Strakhovskyi Group. This is one of the few companies in Ukraine that uses unmanned aerial vehicles in many stages while building constructions and structures. With the help of drones, they perform tasks of different focus, such as: photographing a finished building, checking the completion of construction work, accumulating information about what is happening on the construction site, etc. The work was carried out without additional involvement of human, financial and other additional resources.

Depending on the complexity of the task and the conditions of work, there are different types of unmanned aerial vehicles. Currently, the following drones are leaders in the geodetic industry: - DJI Phantom 4 RTK (20 MP camera, mechanical shutter, capacious battery); - Phantom 4 RTK; - Hexacopter DJI Matrice 600 Pro (three sets of modules, 6 kg load, high-performance cameras). There are also various modifications of the aforementioned drones, but the price of an unmanned aerial vehicle changes depending on this. Also, for the operation of an unmanned aerial vehicle, you will need the software necessary for geodetic surveys. The most popular are: DJI Terra and DJI GS Pro applications. The software package allows you to increase the efficiency of an unmanned aerial vehicle, namely: perform flight tasks in automatic mode, flight data management and their combined performance.

Advantages of using drones can be listed as follows: labour reduction, greater reliability, low cost compared to traditional methods, production multitasking, reduced costs for the study of territories and surveys.

However, despite all the advantages of using unmanned aerial vehicles, they have not received widespread, for various reasons. Firstly, that is high price of equipment, software and training of surveyors is not appropriate to perform small amounts of work or not required at present; secondly, it is still advisable to use total stations or theodolites for certain types of surveys; thirdly, the inability to use them in certain geological structures. Therefore, in case of emergency, to perform specific

tasks, the production employs private entrepreneurs who are armed with this equipment.

It should be concluded that the development of unmanned aerial vehicles offers a great variety of opportunities for specialists dealing with such areas as GIS, remote sensing and land management and gives possibilities to conduct local monitoring of natural resources with high frequency and minimal cost. But one challenge is still underdeveloped, namely legal issues in terms of regularities and security that should be paid much attention for future implementation.

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Comparison of corrections obtained during RTK positioning using methods Near, Max, I-Max

Real Time Kinematics (RTK) is a differential GNSS technique originated in the mid-1990s that provides high performance positioning in the vicinity of a base station [1].

While using RTK method during obtaining coordinates of the points different models of geodesic network corrections are applied. In this article such methods as MAC (Master Auxiliary Concept) and “Nearest” are described.

In case of using MAC model, some ambiguities can take place. To eliminate them in the process of correction solutions Max and I-Max are used.

The Max solution contains all the information related to the network of reference stations or to a certain cell within the network:

- Observations and coordinates of the master station;
- Differentiated observations and coordinate differences for the rest of the stations.

It is transmitted in the format RTCM 3.1.

I-Max is a solution for receivers that do not have the ability to interpret the RTCM 3.1 format. Individualized corrections are generated for each user based on their location (RTCM 3.0 or 2.3).

In case of model “Nearest”, the system remains the same as a base and rover mode acts as a single station, and the rover device is connected to the nearest reference station and takes corrections. It is suggested to use this method if the user is out of the network [2].

The measurements were held in Jaén, Spain, together with the UJA university. For the measurements, the Leica GPS 1200 system was used. First, the GNSS antenna was located above the point we want to determine (fixed point on the roof of the building A5 of UJA). Then a splitter was connected by cable with an antenna and then with the three controllers for the RTK mode and each of those receivers recorded the data for 20 times. We also determine the same point in a static mode to use it as a control point for RTK.

After the measurements to process the results, the LEICA Geo Office program is used. At the beginning, the coordinates of the UAE point have to be included. It is a station of the GNSS network called RAP (Red Andaluza de Posicionamiento). To do that in the portal we download the RINEX format files, choose necessary measurement time and import them into the program.

Table 1 – Coordinates of the Static point

Geographic coordinates			
Point Id	E	N	Up
E	37° 47' 13.90962"	-3° 46' 38.29380"	504.035 m

Table 2 – Geographic coordinates RTK (nearest)

ID	E	N	Up
1	37° 47' 13.90958"	-3° 46' 38.29386"	504.185 m
2	37° 47' 13.90958"	-3° 46' 38.29385"	504.183 m
3	37° 47' 13.90960"	-3° 46' 38.29383"	504.182 m
4	37° 47' 13.90960"	-3° 46' 38.29375"	504.175 m
5	37° 47' 13.90967"	-3° 46' 38.29373"	504.177 m
6	37° 47' 13.90970"	-3° 46' 38.29375"	504.170 m
7	37° 47' 13.90959"	-3° 46' 38.29371"	504.169 m
8	37° 47' 13.90960"	-3° 46' 38.29378"	504.174 m
9	37° 47' 13.90963"	-3° 46' 38.29389"	504.176 m
10	37° 47' 13.90963"	-3° 46' 38.29382"	504.179 m
11	37° 47' 13.90962"	-3° 46' 38.29378"	504.177 m
12	37° 47' 13.90957"	-3° 46' 38.29375"	504.176 m
13	37° 47' 13.90959"	-3° 46' 38.29375"	504.177 m
14	37° 47' 13.90960"	-3° 46' 38.29372"	504.176 m
15	37° 47' 13.90963"	-3° 46' 38.29375"	504.178 m
16	37° 47' 13.90967"	-3° 46' 38.29377"	504.182 m
17	37° 47' 13.90963"	-3° 46' 38.29382"	504.176 m
18	37° 47' 13.90977"	-3° 46' 38.29364"	504.190 m
19	37° 47' 13.90963"	-3° 46' 38.29377"	504.181 m
20	37° 47' 13.90966"	-3° 46' 38.29372"	504.179 m

Table 3 – Geographic coordinates RTK (Max)

ID	E	N	Up
1	37° 47' 13.90969"	-3° 46' 38.29381"	504.171 m
2	37° 47' 13.90967"	-3° 46' 38.29373"	504.168 m
3	37° 47' 13.90966"	-3° 46' 38.29376"	504.170 m
4	37° 47' 13.90956"	-3° 46' 38.29374"	504.176 m
5	37° 47' 13.90960"	-3° 46' 38.29375"	504.170 m
6	37° 47' 13.90961"	-3° 46' 38.29390"	504.176 m
7	37° 47' 13.90964"	-3° 46' 38.29380"	504.178 m
8	37° 47' 13.90959"	-3° 46' 38.29377"	504.176 m
9	37° 47' 13.90956"	-3° 46' 38.29378"	504.178 m
10	37° 47' 13.90961"	-3° 46' 38.29372"	504.179 m
11	37° 47' 13.90965"	-3° 46' 38.29380"	504.180 m
12	37° 47' 13.90960"	-3° 46' 38.29375"	504.185 m
13	37° 47' 13.90974"	-3° 46' 38.29377"	504.189 m
14	37° 47' 13.90965"	-3° 46' 38.29378"	504.181 m
15	37° 47' 13.90968"	-3° 46' 38.29379"	504.179 m
16	37° 47' 13.90967"	-3° 46' 38.29385"	504.182 m
17	37° 47' 13.90966"	-3° 46' 38.29377"	504.172 m
18	37° 47' 13.90963"	-3° 46' 38.29385"	504.178 m
19	37° 47' 13.90964"	-3° 46' 38.29385"	504.176 m
20	37° 47' 13.90965"	-3° 46' 38.29387"	504.178 m

Table 4 – Geographic coordinates RTK (IMax)

ID	E	N	Up
1	37° 47' 13.90957"	-3° 46' 38.29377"	504.175 m
2	37° 47' 13.90960"	-3° 46' 38.29380"	504.175 m

3	37° 47' 13.90961"	-3° 46' 38.29379"	504.174 m
4	37° 47' 13.90958"	-3° 46' 38.29387"	504.174 m
5	37° 47' 13.90962"	-3° 46' 38.29388"	504.175 m
6	37° 47' 13.90963"	-3° 46' 38.29385"	504.174 m
7	37° 47' 13.90965"	-3° 46' 38.29378"	504.178 m
8	37° 47' 13.90959"	-3° 46' 38.29378"	504.180 m
9	37° 47' 13.90964"	-3° 46' 38.29374"	504.175 m
11	37° 47' 13.90958"	-3° 46' 38.29373"	504.179 m
12	37° 47' 13.90964"	-3° 46' 38.29373"	504.179 m
14	37° 47' 13.90959"	-3° 46' 38.29382"	504.182 m
15	37° 47' 13.90961"	-3° 46' 38.29379"	504.182 m
16	37° 47' 13.90962"	-3° 46' 38.29375"	504.182 m
17	37° 47' 13.90965"	-3° 46' 38.29383"	504.174 m
18	37° 47' 13.90962"	-3° 46' 38.29382"	504.174 m
19	37° 47' 13.90970"	-3° 46' 38.29389"	504.176 m
20	37° 47' 13.90965"	-3° 46' 38.29382"	504.175 m

By analyzing the coordinates, it could be seen that the RTK Nearest, Max and Imax methods have similar precision and accuracy. Also, the imagined horizontal distribution curve is relatively straight and fluctuates in the value of 2 centimeters. But with respect to the control point the points are in the distance of approximately 14 centimeters.

With the obtained coordinates, the analysis of the RTK results is done. We calculate the precision and accuracy.

Table 5 – Precision

Solution	σ_N	σ_E	σ_{Up}
Nearest	0.00004867"	0.00005926"	0.0049 m
Max	0.00004432"	0.00004939"	0.0052 m
Imax	0.00003262"	0.00004954"	0.0031 m

$$\sqrt{\frac{\sum (x - \bar{x})^2}{(n-1)}}$$

The attached expression includes the difference of each component with respect to the average value.

Table 6 – Accuracy

Solution	$E_{Horizontal}$	$E_{Vertical}$
Nearest	0.00006758"	0.1431 m
Max	0.00006336"	0.1421 m
Imax	0.00005066"	0.1418 m

$$E_{Horizontal} = \frac{\sum \sqrt{E^2 + N^2}}{n}$$

$$E_{Vertical} = \frac{\sum |Up|}{n}$$

(E, N, Up) represent the differences with respect to the coordinates of the control point.

By analyzing the data of precision and accuracy it could be concluded that the method “Nearest” has the worst results, but they are still sufficient for the measurements. The precision in the vertical plan varies from 0.31 to 0.52 cm while accuracy differs from 14.18 to 14.31 cm. Horizontal precision and accuracy are very low in all the methods. However, to make the comparison, the method Imax has the highest precision and accuracy indicators.

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Tectonic features of the Hrebenivskyi survey site of the Outer Carpathians

The territory of the Hrebenivskyi survey site belongs to two parts of the Skybova zone of the Carpathians, between Parashka and Zelemianka. In general, several thick shares are singled out within this territory: Parashka, Zelemianka, Skolivska, and Orivska. In terms of the right bank of the Opir River, it is well seen that Zelemianka thrusts Parashka being the result of tectonic processes. That thrusting is of arch shape.

Moreover, right bank of the Opir River demonstrates certain fractures of different geological types. Displacements with minor shearing amplitude are clearly seen being equal vertically to zero. Tectonic blocks are at the hypsometric level. The right bank of the Kyivets flow shows the faults which tells about the tectonic activity of that territory.

Walls and benches of the southland open pit (not being developed) are characterized with boudinage of the sandstones; it is of crumbling nature, its fillers are argillites.

Hieroglyphs, bioglyphs, and mechanoglyphs, being the indicators of the rock seam occurrence, are distinct within the whole territory under consideration. We can find either normal or overturned bedding of rocks that identifies both dislocation processes and regional disturbances.

The Zelemianka skyba (the word “skyba” derived from Polish, it is used in relation to nappe) is the anticlinal overturned towards the south-east, which external thrusting zone contains the Yamnenski sandstones. The Korosnenski deposits occur within the rear side of the southern-eastern flank of this anticlinal. The Zelemianka skyba is fixed by the Rebrovach and Magura mountains. Structure of the Parashka skyba is almost the same. It is fixed by the Hzeben, Hreblia, Khomiak, and Syniak mountains.

Detailed study of the suites within the Parashka and Zelemianka skybas in terms of the area of Hrebeniv settlement makes it possible to carry out deeper analysis of the original structure of the dislocated Cretaceous and Paleogene complexes and have certain assumptions as for the mechanism of their formation. Thus, in terms of tectonics, the Parashka skyba is considered as parautochthon while the Zelemianka skyba is studied as allochthon.

The thrusting of the Zelemianka skyba onto the Parashka skyba is observed in terms of two routes: Lisnychy and Kyivets flows.

Structural elements of the Zelemianka skyba are as follows. In terms of the rock composition and nature of the relief changes, the thrusting of the Stryiska suite onto the Menilitova suite is recorded within the bed of the Lisnychy flow upstream, 950 m from the road. The Menilitova suite occurs at the angle of 37° in azimuth 248.

The Stryiska suite thrusts onto it; it has following occurrence elements: strike azimuth is 242, inclination angle is 46°.

Structural elements of the Parashka skyba are as follows. Only rare zone may be observed in terms of the Parashka skyba. Rocks of the Stryiska, Yamnenska, Maniavska, and Menilitova suites occur monoclinaly at the angle of 30-40° in the northern-eastern bearings.

Several outcrops were recorded within the Hrebenivets flow. The rocks are rather dislocated; they are divided by the fissure systems with the polished surfaces. The blocks are displaced over the surfaces along the sub-parallel and sub-meridional directions. Azimuth of rock dip is 230-240°; the angle value is within the range from 30° to 40°.

A shear zone in the form of the minor series, consisting of synclinal and anticlinal faults, was identified within the Kyivets flow. That series was divided by two discontinuous faults. The shear zone is made up by the deposits of the Menilitova suite, heavily dislocated silica, and siliceous sandstone.

During the examination of the routes, it has been determined that the territory is located within two skybas – Zelemianska and Parashka (the first is thrusting into the second one).

Section of the Skybova zone of the Carpathians includes the rocks from the upper Cretaceous to the Upper Paleogene; it is represented by the flysch formation (mostly, three-component one). Each skyba has similar stratigraphic characteristics.

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An analysis of speed influence on exploitation front advance

The influence of speed on exploitation front advance is not widely applied in forecasting on surface deformation of the area and rock mass. Only the subsidence is calculated, depending on the development of the exploitation front, where the differential equation by Knothe is taken into account.

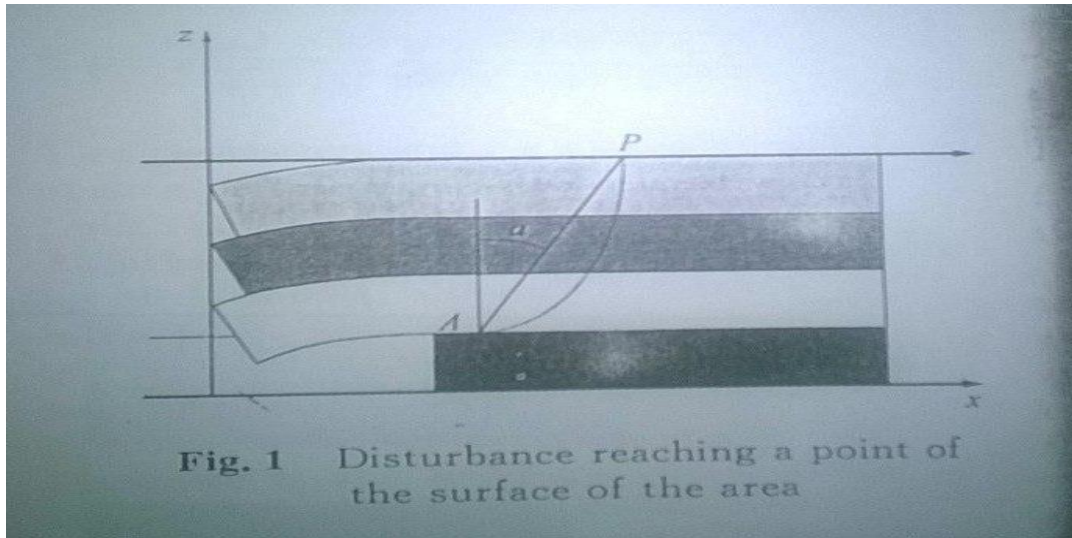
$$\frac{dw(t)}{dt} = c(w_k(t) - w(t))$$

Where $w_k(t)$ – final subsidence, $w(t)$ – point subsidence at the moment t .

This equation shows that, subsidence rate is proportional to the difference between the present subsidence at the moment t , and final subsidence. Depending on the accepted initial and marginal condition the equation of the subsidence function is obtained.

Surveying rock mass dislocations and the surface deformation of the area over the mining, as well as the theoretic studies proved that the equation from Eqn. has great drawbacks and, which is important, do not reflect physical aspect of this phenomenon. To reach more accurate projection of the rock mass movements in time functional variability of exploitation, or new parameters were introduced. The description of the kinematic subsidence is getting more and more complicated when the speed of the progress of the exploitation front is variable and its temporal breaks occur. The experience shows that continuous exploitation with a constant speed, adjusted to the sensitivity of the protected object is the best solution, regarding the aspect of mining damage.

Physical course of the phenomenon shows that halting the exploitation front in seam A and seam B, in time t , causes that the trajectories of the disturbances from the exploitation edge to any selected point P of the rock mass or the surface of the area are different. The time of reaching point P from seam F is shorter than the time of reaching this point by the disturbance from seam B. For small exploitation fields, the influence of the exploitation of seam F can, after time t_0 become visible on the surface, and the effects of selecting a field of the same size in seam B also after time t_0 , do not have to be visible on the surface.



On the other hand, widely applied formulae or calculation do not take into account this fast, e.g. subsidence caused by the exploitation of seams A and B in time t , giving the values that will occur only in the future.

1. Propagation of disturbance in rock mass.

In the neighborhood of the exploited speed is assumed:

- Each point of the rock mass can be found in the two states: disturbance or equilibrium;
- Each point where the disturbance gets into in the moment t , from this becomes the source of the disturbance propagation.

Thus, the propagation of the disturbance in the rock mass, caused by mining exploitation can be defined by Fermat's principle, according to which the disturbance always gets from one point to another on the same trajectory joining these points, so that the time is as short as possible. The speed the disturbance is propagated depends on the situation of the point and the direction towards the exploited element of the seam.

According to Fermat's principle, the disturbance in the rock mass with the velocity $v(z, x, y)$, goes from one point to through is the shortest (Fig. 2). It the line combining two points of the rock mass A and P is given by the equations $y=y(x)$, $z=z(x)$, then time T when disturbance follows the track equals

$$T = \int_b^a \frac{\sqrt{1 + y^2 + z^2}}{v(x, y, z)} dx$$

Writing for this functional the system of Euler's equation we obtain differential equations of the lines showing the propagation of disturbance:

$$\begin{aligned} \frac{dv}{dy} \frac{\sqrt{1 + y^2 + z^2}}{v^2} + \frac{d}{dx} \frac{y}{\sqrt{1 + y^2 + z^2}} &= 0 \\ \frac{dv}{dz} \frac{\sqrt{1 + y^2 + z^2}}{v^2} + \frac{d}{dx} \frac{z}{\sqrt{1 + y^2 + z^2}} &= 0 \end{aligned}$$

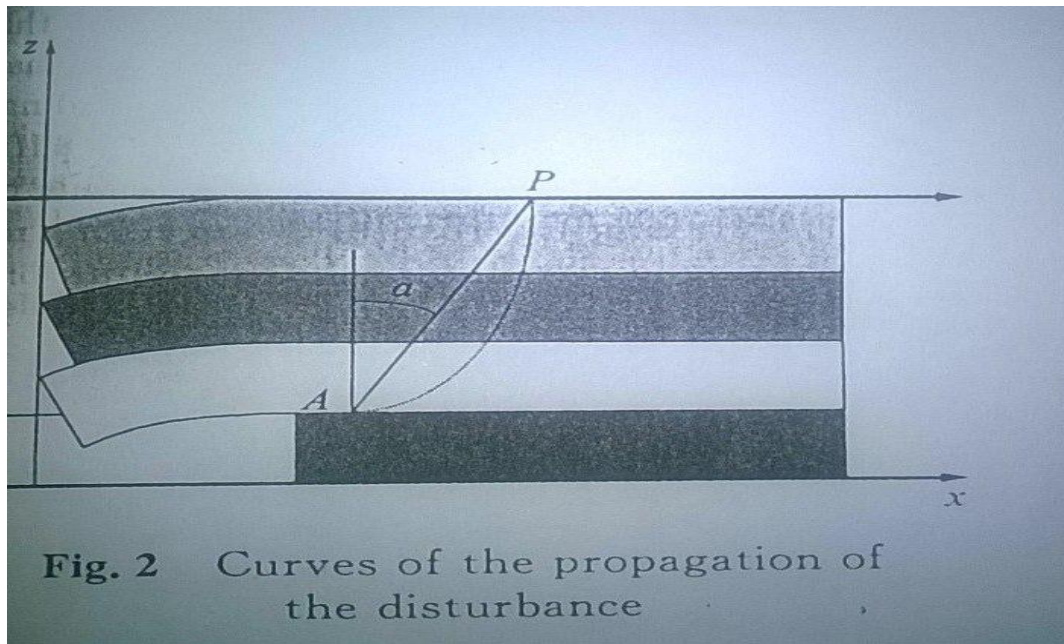


Fig. 2 Curves of the propagation of the disturbance

So, it should be concluded that a proposed kinematical model of the subsidence does not include a time coefficient in the case of replacing above-mentioned parameters. Besides, multipath should be taken into consideration under conditions of applying PPP for mining deformation monitoring. Thus, the outlier detection procedure ensures that the effect of the undetectable bias will not occur at this level after convergence.

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Modern methods of obtaining a high-strength condition of low- and medium-carbon steels by heat treatment

Quenching and separation steel (Q&P) is a term used to describe such steels as: C - Si - Mn, C - Si - Mn - Al, or others that have undergone a recently developed Q&P heat treatment process. Q & P's direction in the context of automotive structures is to obtain a new type of ultra-high-strength steel with good ductility and increased passenger safety. Due to the fine microstructure of ferrite (in the case of partial austenization), martensite and residual austenite, Q&P steel demonstrates an excellent combination of strength and ductility, allowing it to be used in the next generation of high-strength steels (AHSS) for automobiles.

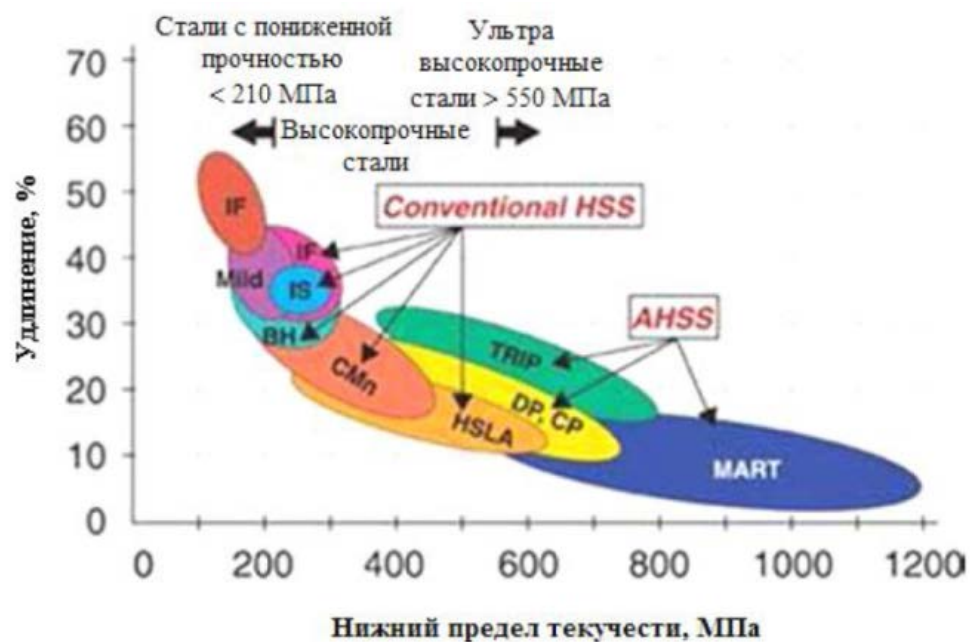


Figure 1 - Classification of automobile steels [3]

This promising type of heat treatment is based on theoretical studies done in 2003 that showed, on the basis of thermodynamics, the possibility of carbon redistribution between quenching martensite and residual austenite prior to equilibrium [1].

The carbon separation process can be implemented in the steel after incomplete quenching with a stop in the Ms-Mf interval, followed by holding for some time at elevated temperature, provided that the release of the martensite carbides as a supersaturated solid solution is completely suppressed. Upon completion of the heat

treatment cycle, residual metastable austenite retains stability and in the conditions of plastic deformation of the material causes the occurrence of TRIP effect, due to its transformation into deformation martensite.

After mechanical testing, an indirect estimate of the tensile strength, which was obtained from the Vickers hardness test (HV), showed that the true tensile strength limit should correspond to 2300 MPa. The level of properties of the 4X13 steel that has undergone Q&P treatment is determined mainly by the temperature and duration of holding at the partitioning stage. In the end, there is a significant increase in strength. The chemical composition of various steels and the results of their temporary resistance after Q&P treatment are shown in table 1.

Table 1 – Chemical composition of different steels and results of temporary resistance after Q&P treatment,% (by weight) [1-3]

C	Mn	Cr	Si	Ni	N	Al	σ_B , MPa
0,54	0,84	0,15	0,9	-	-	-	1907
0,21	4,0	1,0	1,6	-	-	-	1150-1160
0,43	13,6	13,6	0,28	0,16	0,002	-	1500
0,02	15,8-17,9		3,2-3,3	-	-	2.9	2300

Determination of mechanical properties by tensile testing after quenching (1150°C in water) without a distribution operation showed a high brittleness of the material that caused its premature destruction and maximum stress, which withstood the material was 400 MPa.

The mechanical properties of industrially produced Q&P steels are given in Table. 2 for minimum levels of temporary tensile resistance of 980 and 1180 MPa (142 and 170 thousand psi).

Table 2 - Typical mechanical properties ranges for current generation Q&P steels [5]

Steel	σ_T , MPa	σ_B , MPa	Ψ ,%
Q & P 980	650-800	980-1050	17-22
Q & P 1180	950-1150	1180-1300	8-14

After a one-minute holding of tempered steel at 400 ° C (distribution), the tensile strength is determined directly as a result of the tests and is 2000 MPa at a relative elongation of 14%. Increasing the holding time at 400 ° C for up to 30 min results in a tensile strength of up to ~ 1.75 GPa with a simultaneous increase in ductility of up to 23% in terms of relative elongation. A typical strain-strain curve is shown in Fig. 2.

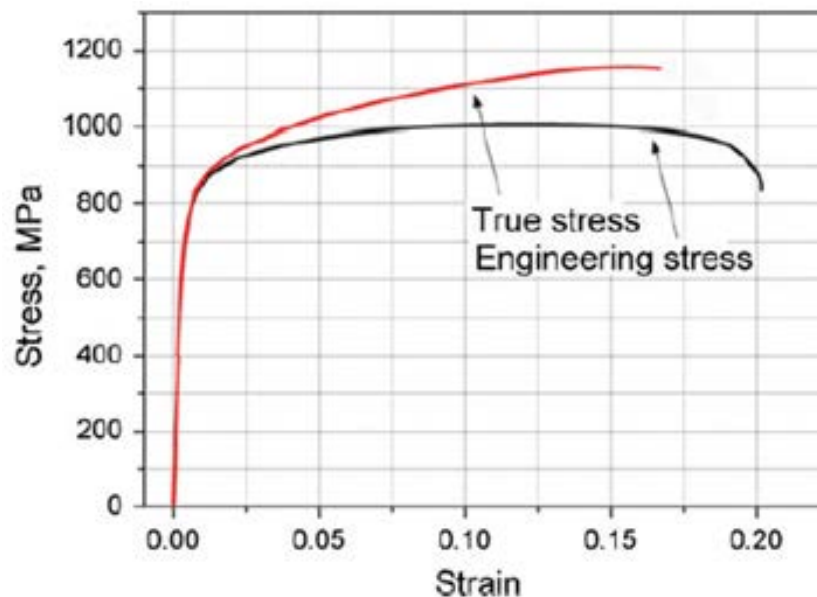


Figure 2 - Deformation-stress curve in industrially produced Q&P 980 MPa steel (142,000 psi) [5]

The high brittleness of the steel hardened to martensitic-austenitic structure is explained by the fact that the residual austenite, which has low stability during loading, easily transforms into martensitic deformation, the structure becomes completely martensitic, which causes high brittleness.

During loading of the samples that have undergone the distribution operation, carbon-enriched and inhomogeneous austenite is transformed into deformation martensite gradually as the load increases, which presupposes the presence of a TRIP effect, which significantly contributes to the deformation strengthening of the material, which interferes with the deformation.

The authors, in particular, attach a special role to the nanoscale layers of reduced austenite, which in the form of thin films are located between the crystals (plates) of martensite. The positive role of these films is, in all likelihood, that they prevent the propagation of a brittle crack from one martensite crystal in the adjacent one, since this crack is trapped in austenite.

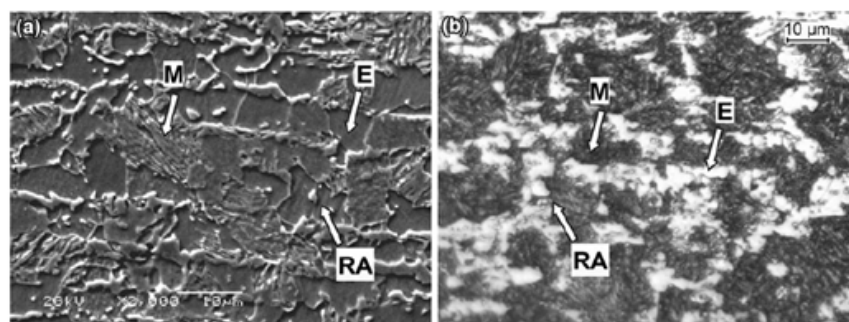


Figure 3 - Q&P steel microstructure obtained by (a) scanning electron microscopy and (b) light optical microscopy. M-martensite, F-ferrite, RA - residual austenite [5]

Thus, Q&P processing is a promising type of heat treatment of steel, which allows to obtain a high complex of strength and plastic properties when using different grades of steels, including inexpensive ones (alloyed with manganese, silicon and in some cases - microalloyed Mo, Nb, V) .

In the process of loading, the residual austenite of Q&P steels undergoes a deformation martensitic transformation causing a TRIP effect with a corresponding increase in the strength and ductility of the steel.

Published in the literature data obtained on steels of different chemical composition with a carbon content of 0.5% and below with the addition of alloying elements (silicon, manganese, chromium and others), which should inhibit carbide formation and thus create the conditions for diffusion of carbon from martensite into residual austenite . It is shown that the use of Q&P heat treatment allows to obtain a high-strength state of steel with sufficiently high plastic properties. In particular, the heat treatment of cold rolled stainless steel sheet type 4X13 in Q&P mode obtained tensile strength at the level of 2000 MPa with a relative elongation of 14%.

To date, the scope of Q&P processing is limited by the cross-section of the product, as massive products do not allow a rapid and uniform change in the processing temperature throughout the volume of the product.

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Geological and geographical characteristics of the Hrebenivsky survey site

The object of the research is located within the area of Hrebeniv village, Skole region, Lviv oblast. The village is located within the Skolivski Beskydy – mountain region in the Ukrainian Carpathians, a part of the Eastern Beskydy. It is located in the Stryi – Opor – Mysunky interstream within the boundaries of Lviv oblast and Ivano-Frankivsk oblast. The area borders the Forecarpathians in the north-east; the Upper-Dniester Beskydy in the north-west; Stryi-Siansky Verkhovyna and Verkhovynsky Dividing Ridge in the north-west and south; and Gorgany in the south-east.

A third part of the survey site is occupied by the Opir River. The village is at the elevation of 492 m, 131 km from Lviv and 8 km to the south-west from the town of Skole. Hrebeniv is the railway station along the Lviv – Stryi – Skole – Mukachevo line. All the suburban electric train stop here as well as some long-distance trains. The automobile road to Slavske, famous ski resort, passes through the village. This settlement is surrounded with the peaks of the Skolevski Beskydy. The peaks are dome-shaped, located in rows around the valley and Hrebeniv like a ridge. Zemlianka, Kyivets mountain peaks, and Sviatoslav cliff are within the area of the village.

Hrebeniv is the resort area of Skole region. There are mineral wells at the territory of the village. It is characterized by the low-hill terrain surrounded with the Opir River, hills, and peaks of the mountains. The prevailing altitudes are 500-100 which correspond to a medium-mountain zone. The highest absolute altitude is 1176 m; it is in the east of the area. There are also such mountains as Kycheria Tretia (1020 m) in the north-west, Kreminni (1100 m), and Kyivets (1060 m) in the west. The lowest points are recorded near the Opir River (500 m) flowing along the whole analyzed site from the south to the north in its central part.

There are four left confluent of the Opir River within the area (Zakalivsky, Lisnychy, Kyivets, the River of Oriava) and four right ones (the River of Zelemianka, and flows of Dereshyn, Hrebenovets, and Sviatoslavchuk). The mountain hill is covered mostly with coniferous forests. From the geological viewpoint, the survey site is within the Skybova zone of the Carpathians. In terms of that zone, following skybas (specific geological term for “nappe”) are singled out towards the south-west: Oriavska, Skolivska, Parashka, Zelemianka, and Rozhanka. High moisture of the climate favours the development of a dense river network. The rivers are characterized by the considerable incline, flow rate, and torrential floods. Relatively soft flysch rocks prevents from the formation of large waterfalls. Systems of low-level cascades are formed somewhere in the valleys where the rivers cross the hard sandstones. In the headstreams, the rivers look like the mountain flows with narrow valleys and rock washes. Within the basins, their widths reach several tens of meters;

in terms of foothills, the river valleys are several kilometers wide, and their beds are displaced in the considerable pabble trains. While crossing the zones of rocks with different hardness, the rivers form the widened longitudinal and narrow transversal sites. In terms of the latter, they reach the highest slope and flow velocity. Sharp increase in the water level in the spring and early summer is characteristic for the rivers. The water level increases by 1-2 m. Full-flowing and rapid rivers often flood other terraces, destruct the bridges, and breaks the roads. They bring a lot of debris to the foothill area. The flooding is intensified when the spring snow thawing is combined with heavy rains. In June, the level of the rivers decreases distinctly; however, there are considerable floods in the summer and autumn as well due to the abundant rainfalls. Minimum precipitations are observed in winter; however, winter floods are not rare during the thawing weather. Activity of gills is associated to the areas with loose deposits on the slopes.

Average annual air temperatures reach +9-10°. In this context, annual isotherm of 8.5° separates much cooler mountain zone. An isotherm of -3° is characteristic for January; however, average annual temperatures at the mountain tops are -8-9°. As a result of the cold air flow from the mountains, the Opir River cools down considerably. In some cases, the temperature decreases down to - 28°; in the mountains, it may drop down to -30°. July isotherms fluctuate from +10 to +20°.

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Adaptation of Oh Model for soil parameters retrieval using multi-angular RADARSAT-2 Datasets

Roughness of the soil surface plays an important role in the processes of water conservation of soil erosion and surface runoff in agricultural areas. Basically, the soil parameters are based on point measurements and it takes a long time. Remote sensing makes it much easier to shoot soil. Radar systems (RADARSAT-2) are used to produce very high quality images. These radars are independent of weather conditions. Thanks to these radars it is possible to create an approach to the characteristics of agricultural soils, regarding the sensitivity of soil to moisture.

Recently, a wide range of soil moisture and roughness studies have been performed using SAR polarimetric data. All this data is formed into a model that determines the surface roughness and soil moisture of the RADARSAT-2 datasets. Then all this model data and RADARSAT-2 are compared.

The agricultural area of Brittany-Plain-Fugue, France, was studied. All data were obtained in April 2013 in ascending or descending orbit and in quad polarization mode.

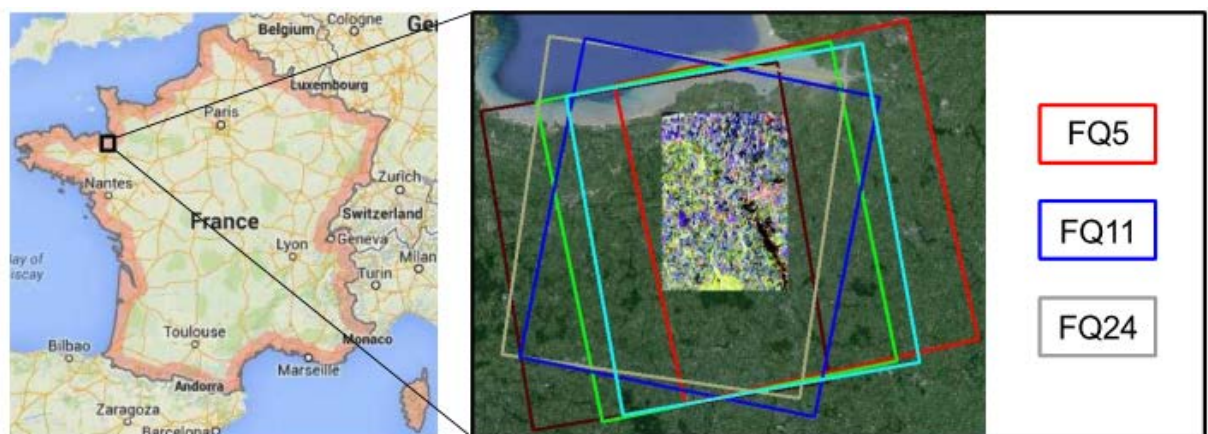


Fig. 1 RADARSAT-2 multi-angular image swaths over the Pleine-Fougères region

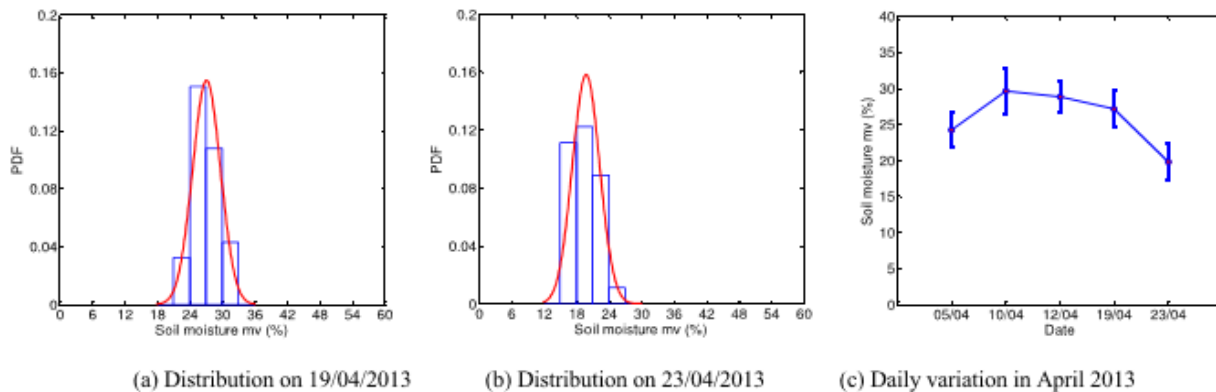
TABLE I MULTI-ANGULAR RADARSAT-2 DATASETS

Date (2013)	Beam mode	Incidence angle (°)	Images orbit (Asc/Des)
23/04	FQ5	24	A
23/04	FQ11	31	D
20/04	FQ24	43	D

All this data is formed into a matrix using PolSARpro4.2. After that, an image is generated using the matrix, with an average accuracy of about 0.8 pixels.

To substantiate this idea TDR has been used to measure soil moisture and based on these measurements, the soil moisture range can be determined as the following:

- from 23% to 32% at standard deviation of about 4% 19.04.2013.
- from 15% to 24% at standard deviation of about 4% 23.04.2013.



In addition to humidity, one of the main parameters of the soil is the roughness, which is described by the deviation of the height of the surface. There are several methods for measuring surface roughness. The first one is dealing with vertical movable steel needles that create a relief of the surface of the earth by means of a scale, and the second one applies laser transmission of impulses that are reflected from the earth's surface and recorded, thus making it possible to measure the surface roughness.

Differences between RADARSAT-2 datasets and scattering models can be caused by several reasons, such as bare soil heterogeneity, the impact of crop residues, and disturbance of agricultural manipulations.

In a given case, the surface roughness is first measured by the chain method as SRF, and then the measured SRF is converted to s . The cross polarized ratio is very sensitive to changes in roughness. To reduce the discrepancy between the Oh2004 and the RADARSAT-2 data, the coefficients are adapted less so that the surface roughness description for the RADARSAT-2 data is reduced by using a high incidence angle rather than a low incidence angle. This unchanged surface roughness term (g_3) means that the dependence of the polarized ratio p on the surface roughness is weak. Thus, while the overall performance of the adapted Oh2004 model is better than the original model, it also has drawbacks.

In this study, we evaluated the original semi-empirical Oh2004 model based on the polygonal RADARSAT-2 datasets. The adapted model maintains sensitivity to changes in the angle of incidence and soil moisture.

Based on the study of these RADARSAT-2 datasets, it has been revealed that the original model with cross-polarization HV overestimates RADARSAT-2 data.

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**Section 06 Humanities: Challenges and Issues (Social Studies, Philosophy,
Pedagogics, Law, Applied Linguistics, Theory and Practice of Translation)**

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E-learning as distance education: benefits and prospects

The intensive development of computer technology in recent years has radically changed the conditions and methods of thinking and learning. Connecting computers in networks and interconnecting various computer networks into the single global system known as the Internet and integrating various resources into a single information system known as World Wide Web have led to the expansion of information communication technologies in all areas of human life, including education. Nowadays, a computer is no longer being mastered as a new knowledge and new value. Instead, traditional knowledge and values are being mastered in a new computer environment. That is why digital literacy: computer skills, the ability to use the Internet etc., becomes one of the most important elements of professional training specialists of any profile. E-learning as an educational technology, its role in the modern education are analysed from the perspective of e-learning potentials and benefits it brings to education.

Most education professionals believe that there is no universally accepted definition of e-learning. But most often one can hear that e-learning is a learning system using information and electronic technologies. However, there is a brief but clear definition given by UNESCO experts to e-learning as learning through the Internet and multimedia.

E-learning includes autonomous and independent work with electronic materials; getting consultations, assessment and feedback from a remote teacher, i.e. those being at a distance, synchronous remote interaction via Skype, Zoom, Adobe Connect etc., providing accessible electronic training materials; forming and improving the information culture of participants of teaching/learning process as well as students' or teachers' groups, known as a Netiquette or Internet etiquette, etc.

E-learning increases efficiency of teaching/training/learning activities; contributes to development and popularization of the innovative pedagogical technologies, their transfer to teachers/trainees. It also gives an opportunity to develop educational web resources and materials and provides an opportunity to get advanced knowledge at any time no matter where it is from.

The e-learning industry is constantly evolving. There are few trends that are currently considered to be the hot topics in modern education. They are concerned with Gamification, Cloud-Based Systems, Big Data, Wearable Technologies etc.

The transitional stage to e-learning can be considered traditional distance or extramural education. With the advent of new technologies, old forms of classroom and extramural work are constantly transforming into the latest ones as soon as new technologies and/or software appear.

E-learning, like other software, is constantly updated that is one of its advantages which can be seen by some traditional teachers as a drawback for the need of ongoing professional development. Updates are caused by various reasons, among which is the development of the society and changes in the needs of students, teacher, educational institutions and the potential employers.

The main strength and benefit of e-learning is that there are no restrictions in time and location, anyone can take an open course either for free or paid for. Activities and tasks at an e-course can be done in various modes: synchronous and/or asynchronous that is rooted in their nature and purpose(s).

The Internet technologies which can be used for students-teacher interaction when learning online are given in Fig.1

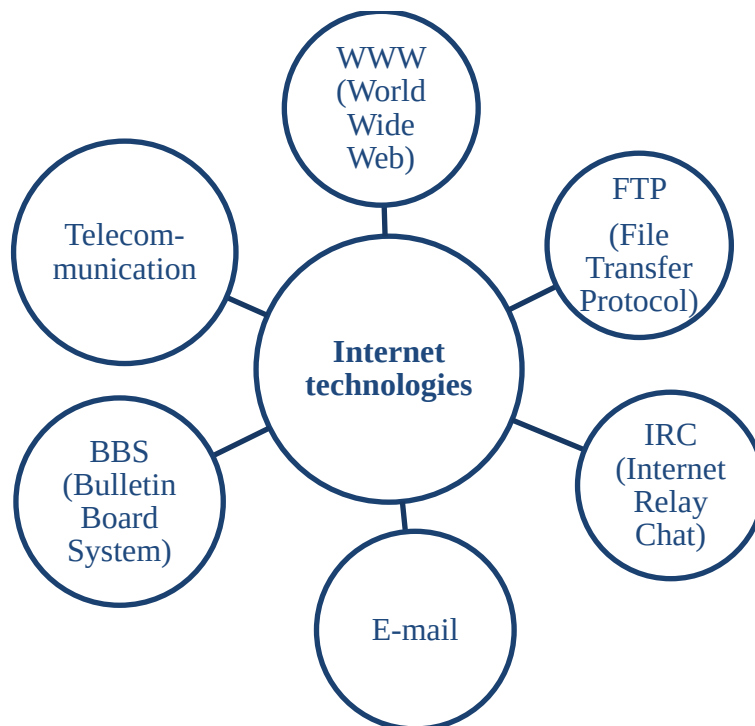


Fig. 1. Internet technologies used for education

The main benefit of distance learning include access to education by any person regardless of their location, gender or age, though sometimes in some countries there is a lack of digital literacy of old people which needs to be developed.

Another indisputable advantage of distance learning is the fact that a student should not break away from their main activities, especially when an e-course is mostly asynchronous. Another positive factor of distance learning is the opportunity to take several courses at the same time.

When learning remotely, usually students do not face the problem of lacking paperback textbooks, teaching aids, methodological recommendations since the majority of educational institutions which have been implementing distance learning, provide each student with a separate virtual learning space in the closed part of an institutional training portal, where the educational process is carried out.

Autonomy in learning and solving problems when performing various tasks, skills to learn autonomously are in great demand nowadays. This demand can be met by e-learning which is rather flexible and gives an opportunity to learners to take decision by themselves what paces to take, to come back to the unit and its materials while the access to a course is opened. Moreover, when working asynchronously, students are not strictly tied to the scheduled time of the lesson or lecture as well as to their teacher, that is, they can study at the time more convenient for them within a period of time defined by their teachers. These contribute to raising efficiency of learning and as a result. to efficiency of teaching.

The ability to continuously improve the level of qualification is seen by the advanced teachers as a stimulus and benefit for their professional growth., and at the same time it is a great challenge for some teachers who are happy with the outcomes of their teaching without ICT use.

It is natural that the fast paces of modern society development lead to the fact that a significant amount of professional information quickly becomes obsolete. Today, a person must replenish and update their knowledge throughout their life, i.e. lifelong learning, to be demanded and up to date. For example, consider one of the first distance learning platforms – edX, where you can find online courses from university professors in various fields and disciplines from around the world. Its courses can be both paid and free. Upon successful completion of the course, a student can receive a certificate. The other example is web 2.0 where everyone can find inexpensive or free platforms for creating copyrighted e-learning courses. The advantage of this service is that any teacher without deep programming knowledge can easily create their own course.

Undoubtedly, distance learning will not be a complete replacement for traditional learning as it is unable to create a specific F2F atmosphere and replace live communication with a teacher. But indeed, it is the most promising form of education especially when e-learning is catered to various courses and when it provides possibilities for e-learners to take classes at any university worldwide, while being at a distance. Moreover, e--learning is constantly changing that makes people to develop professionally lifelong.

The main task for educational institutions, their teachers and students are to imply the latest innovations in teaching/learning process in order to provide qualitative training in various specialism areas. Special attention should be drawn to teacher training and training old-aged people to develop their digital literacy and ability to use various gadgets widely used in various spheres of human life.

Today e-learning as an educational technology can provide high quality and effectiveness of education system. Its fast paces of growing and changing demand continuing professional development, pre-service and in-service teacher training.

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Neoliberalism against populism in contemporary world politics

Being a first-year student specialized in global politics and economics, I have opened for myself various political ideologies, among which the most discussed nowadays are populism and neoliberalism. That is why there is a need to examine and compare these ideologies.

Since neoliberalism and populism are political ideologies, it is appropriate to start with what political ideologies are, how they are defined. Political ideology is known to be a system of conceptually designed ideas, the ideas and views on political life that reflects the interests, worldview, ideals, moods of people, classes, nations, society, political parties. So, political ideology can be seen as a form of social consciousness and as a phenomenon of culture.

As a term, neoliberalism was firstly used in 1938 by the French economist Bernard Laverne, and in the same year the German economist Alexander Rustov proposed to contrast the ideas of classical liberalism with the dominant at that time collectivist and egalitarian tendencies in liberal ideology.

Neoliberal policies center around economic liberalization, principally deregulation of industry, privatization of state-owned enterprises, reductions to trade barriers, reductions in government spending, and monetarism. Neoliberal theory contends that free markets encourage economic efficiency, economic growth, and technological innovation. State intervention, even if aimed at encouraging these phenomena, is generally believed to worsen economic performance.

Nowadays, neoliberalism is used to denote market reform policies which reduce the country's impact on the economy, especially through privatization. Examples of such use are following: removal of control over tariffs, deregulation of capital markets and reduction of trading barriers. It is also commonly associated with the economic policies introduced by Margaret Thatcher in the United Kingdom and Ronald Reagan in the United States. Some scholars note it has a number of distinct usages in different spheres:

As a development model, it refers to the rejection of structuralist economics in favour of the Washington Consensus.

So, today neoliberalism can be referred to as an ideology or as a concept of freedom with the main focus on full social significance coupled with the reduction of state functions to the functions of a minimal political and economic activity.

From the perspective of a public policy, neoliberalism involves privatizing public economic sectors and/or services, deregulating private corporations, sharp increase of government debt and reduction of spending on public works.

Populism belongs to a series of socio-political positions that focus on the idea of “people” and often contrast this category with “elite”. The term was developed in the 19th century and has been applied to various politicians, parties, and movements since that

time, although has rarely been chosen as a self-description. In sociopolitical science and other social sciences, a number of different definitions of populism have been used, while some scholars generally proposed to refrain from the term given above.

A common framework for interpreting populism is known as the ideational approach: this defines populism as an ideology which presents "the people" as a morally good force and contrasts them confront the "elite" who appears to be corrupt and mercantile.

Populists are differed by the key in the populism definition - people. However, they can be formed by a class, ethnic or nationality features. Populists usually assume the "elite" as consisting of the socio-political, economic, cultural and media establishment presented as a whole also condemned in placing their own personal interests, but often the interests of other groups, such as large corporations, foreign states or immigrants - above the interests of the "people". Populist parties and social movements are often led by charismatic or dominant figures who present themselves as the "voice of the people". According to the ideational approach, populism is often combined with the other ideologies, such as nationalism, liberalism or socialism. Thus, populists can be found at different locations along the left-right political spectrum, and there both left-wing populism and right-wing populism exist .

To conclude, it is difficult to compare neoliberalism and populism because populism is not clearly defined, it cannot be located on the left-to-right political spectrum. If refer to the definition of populism as the ideal approach, neoliberalism and populism are almost indistinguishable. However, if to take a closer look, we will see that neoliberalism promotes the idea of economic development through privatization, deregulation, globalization and free trade, while populism aims at emphasizing the idea of the "people" and opposing this group against the "elite".

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Ethnic conflict as a form of political conflicts

Nowadays, the topic of political conflicts is widely discussed worldwide as they bring chaos to stable states and destroy those ones having already been unstable. Political conflicts are referred to as a type of conflicts that occurs in the sphere of public relations and are associated with problems of prevention or weakening the existing power. The main feature of political conflicts, according to Canives that they “do not concern individuals, but groups of various kinds” (2008). There are different normative aspects of political conflicts. They play different roles in democracy and they are consequently seen as either good or bad ones depending on the perspective of an evaluator. The aim of the research is to examine ethnic conflicts from the perspectives of modern globalization processes.

There is a variety of political conflicts: horizontal and vertical ones. Horizontal conflicts are referred to the conflicts between government and Parliament or between different parties. Vertical conflicts are associated with a confrontation of power and the society etc. Ethnic conflicts are defined by Britannica as a form of conflict, where the objective(s) of at least one party are expressed in ethnic terms. Mostly they concern with political, economic, social cultural or territorial matters. However, the majority consider ethnic conflicts closely connected with ethnic differences. It is natural that elements of common culture include language, religion, laws, customs, institutions, dress, music, crafts, architecture, and even food. Usually ethnic communities show signs of solidarity and self-awareness that are often expressed in the name of the group which members give to it by themselves. On the other hand, ethnicity is just much based on intangible factors – namely, on what people believe in, or are made to believe in to create a sense of solidarity among the members of a particular ethnic group and to exclude those who are non-members of the group.

Ethnic conflicts occur more often than they are expected to. Although the world is becoming global, there is still a very strong influence of the national idea. It is natural that 600 nations around the world do not have their own states. So, they are still waiting for their star time. That is why the issue of resolving ethnic conflicts are very dangerous if not flammable, because they can lead to civil wars. A case of Yugoslavian conflict can be used to demonstrate why ethnic conflicts should be avoided or better prevented.

The analysis brings us to a set of typical situations that may help to understand where and why ethnic conflicts should be avoided and/or prevented. Some of them are given below.

1. The nationality of the state where the representatives of different ethnic groups are ambiguous about the prospect of state- building.

2. There is different assessment of the role of national traditions, political, symbols, national idea in the political system.

3. There is external influence on interethnic processes especially by states that use the diaspora to achieve their goals otherwise they may ruin local and global politics.

Fortunately, there are different ways how the ethnic conflicts can be resolved wherein some of them are as following:

- creating conditions for ensuring economic and political independence and sovereignty of regions with compact residence of one or more ethnic groups which are potentially conflict;

- developing various ways of cooperation between different ethnic groups;

- providing optimal combination and harmonization of the interests of the nation and the ethnic it is made up.

To conclude, political and ethnic conflicts are rather problematic in the modern world as they have an ability to destroy entire states by civil wars. The world community should be aware of this problem, its possible consequences for the whole world and develop strategies how to deal with such problem(s) to avoid the ethnic conflicts in the future.

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Students' motivation in the educational process

Motivation is a topic of interest of researchers in a variety of fields including psychology, human development, education, sociology, and business. Though, the philosophical underpinnings and orientations of researchers vary, depending on their key area. Motivation is known as an engine that operates the world. It can be referred to as an impulse which motivates people to act. There is no action without motivation. This paper describes the role of motivation in an educational process.

The problem of motivation and motives of activity is one of the keys in pedagogy and psychology, too. L. Bozovich (1972), B. Annanyev (2008), Ya. Kolominsky's (1999) general-theoretical works are devoted to this subject. A big contribution to the research of the motivational party of the educational activity of students was made by S. Rubenstein (2000), H. Kolesnikova (2010), V. Klimchuk (2006).

Naturally, no motivation inspires people to study everything. It is quite possible that the training program is not of interest to everyone. Most likely, the motivation in training evolves from an interest in a subject or because this knowledge is necessary for learners for something: for our work, travel, passing an examination.

There are two types of motivation: intrinsic and extrinsic motivation.

Intrinsic motivation is observed when people have desired something to do because consider it important, or it gives them a pleasure. Students with such type of motivation will be more interested in the performing of tasks which contain the problem to be solved than in receiving any incentive or remunerating. The intrinsic motivation decreases with age as the interest in study has been lost.

Extrinsic motivation appears when the student wants to carry out a task under the influence of external factors, such as encouragement, assessment or punishment. Nevertheless, it was revealed that punishment does more harm than a praise, and awards or encouragement due to the reason that it can form dangerous dependence. Therefore, it could be recommended to work, gradually reducing awards and learner guidance by developing of intrinsic motivation of trainees.

These two types of motivation are important in the learning process. Intrinsic motivation contributes to higher intrinsic motivation, and extrinsic motivation is responsible for those initial motivations that involve students in learning and helps to strengthen motivation throughout the entire educational activity.

According to Malone's and Lepper's study (1987), seven factors endorse motivation: 1) challenge; 2) curiosity; 3) control; 4) fantasy; 5) competition; 6) cooperation; 7) recognition.

Most of these factors can be found in games. Modern psychology of education is interested not only in mental development but also in the motivation and

preferences of students who contribute to successful learning.

Some tips and tricks how to motivate students are given below:

1. The warm and positive atmosphere created by a teacher increases interest in the study, using training materials, manuals etc. For this purpose the teacher should leave all the problems and cares before coming to the classroom, to show positive mood, to establish trusting relationship with students, to prove to be sensitive and understanding, but not indifferent to the problems of others, to use humor where it is possible, but not laughing at mistakes students.

2. Bear in mind that the process is more important than the product. A teacher must encourage not a pursuit of an appreciation but make efforts during the educational process. Having received the desired assessment, the student loses interest in a subject being trained. While the enthusiasm for work in their field of study causes the desire to study a subject even in an afterhours, and assessment becomes only a pleasant bonus for their efforts. For this purpose, the teacher should provide full employment of all pupils, to distribute tasks according to learners and their level of proficiency. Students have to feel useful and take their own responsibility for the tasks.

3. Use of different types of encouragement and remunerations for the efforts made. It stimulates trainees and serves as an additional pleasant bonus during the educational process. As such remunerations can be an opportunity to choose a subject for their work\composition\project independently, administrative instructions, an opportunity to stay a teacher (to prepare and conduct part of the lesson), etc. Such remunerations must be infrequent, otherwise, they lose the value.

4. Different types of activities. The monotony causes accustoming, and then the loss of interest and concentration of attention of students. Non-standard supply of material, use of evident materials, discussions and games will involve pupils in the educational process, which will promote more effective digestion of material.

5. Understanding of the purpose of training. Students should not study for the sake of assessment or the diploma. They should be aware of the importance of knowledge, how to apply it in real life.

6. You should not divide students into active-passive, clever-silly, etc. It is necessary to find an individual approach to everyone, to find its strengths, advantages and develop them, strengthen the confidence of students.

7. The highest degree of motivation is self-motivation. Students need to learn to find independently the advantage which they will receive during education. For example, a trip abroad, receipt in the foreign university, a meeting with an idol, viewing of a movie\performance in an original postscoring, increase at work, new acquaintances, a presentation at the conference, etc.

Thus, for teachers of higher educational institutions, it is very important to create optimal conditions when students will be able effectively to acquire material, to gain skills that further, they will be able to put into practice. The motivation gives the chance to increase interest level to educational to process, awakens creative abilities.

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Manipulation technologies in contemporary politics

Generally, manipulation is known as a kind of psychological influence, the perfect realization of which leads to the hidden motivation in another person intentions that do not coincide with their actual existing internal desires. The question of possible use of manipulation technologies in contemporary politics is widely discussed among political scientists nowadays. The overview of some modern concepts of media manipulation in politics, its main strategies and their possible implication in real life is made to provide some recommendations how to avoid being manipulated.

Manipulation in politics or political manipulation is referred to as a system of means of ideological and spiritual and psychological influence on the mass consciousness in order to impose certain ideas and values; purposeful influence on public opinion and political behavior to direct them in each direction. Simply, this is a hidden political management of the consciousness and behavior of people to make them act or not to act in the interest of manipulators, that is, to impose the will of the manipulator in the form of hidden influence.

Political scientists are exploring political manipulations in two directions:

1. The first one is apologetic, according to which political manipulation is seen as a necessary means of controlling the consciousness of the masses.

2. The second, socially critical, qualifies political manipulation as a fundamentally new perception of social reality.

From our perspective, these two directions make sense, especially in the face of a fundamentally new role for the media in shaping the mass consciousness. The main strategies and technologies of media manipulation are examined in this paper from the perspective of their potential use in politics.

Although, the term "media manipulation" is not well-known and is still under research, there are some valuable contributions of such scientists as Sylvain Timsit, who in 2002 created a list of 10 strategies of media manipulation used by political and economic powers to control the public [3]. There are 3 most effective strategies which are described and examined in this paper.

Distracting. The strategy of distraction consists of deviating the public's attention from important issues. that is done by flooding the news with stories on trivial issues. The result is that people stop questioning why the media is not talking about certain issues and forget about the real issues.

Appealing to emotions. The media specialists know that emotional appeals are more powerful than purely objective ones, and so they appeal to the public's emotions. As a result, people stop thinking critically and their mind is clouded by emotions.

Differing. This is presenting unpopular decisions as "necessary", "for a better future", or "for our own good" that make the public genuinely believe that their sacrifices will lead things being significantly better later. So, the citizens are getting used to a lower quality of life. They start taking it as granted norm(s). As it is stated at Exploring your mind site, ultimately, the people will resign themselves to the current state of things and will stop demanding what they were demanding.

Some recommendations can be given to avoid media manipulation. First of all, critical thinking on and constant filtering all the information being received from printed| /published media. TV, the Internet including social networks.

When doubting, check the information heard or read by finding and processing various sources of information on the same topic to avoid being manipulated not only in the area of politics.

To conclude, media manipulation is widely used in politics. The most common strategies used for this purpose is distracting appealing to emotions, differing. To avoid manipulation, people should be aware of potential media manipulations not taking it for granted but thinking critically and filtering the information heard or seen. Media literacy is one of the remedies that help to withstand possible manipulation.

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Neologisms with prefix Brex-

Neologisms continue to sprout. Thus, word Brexit is so firmly embedded in the English language that the government refers to its Brexit secretary and both its government and Europe Union negotiators discuss the details of Brexit. The British government started a process which aim was to withdraw their country from the Europe Union after the referendum of 2016 in Great Britain. The process is since referred to as “Brexit”, which is used as a shorthand way of saying the United Kingdom leaving the Europe Union – merging the words Britain and exit to get Brexit. It has become usual to hear “Brexit” on TV or conversations, but actually really few people were interested in the word itself.

The problem of neologisms is researched by numerous linguists and philologists, such as I. Arnold, G. Berrios, L. Bowker, R. Fischer, G. Forgue, M. Janssen, O. Jespersen, D. Linder, H. Liu, J. Pearson, M. Picone, F. Sayadi and etc.

The aim of the work is to analyze the neologisms with prefix Brex-, find out their meaning in Macmillan and Collins dictionaries, the context of using in the newspapers such as The Independent, The Guardian, and The Inews.

According to the free encyclopedia Wikipedia, “a neologism is a relatively recent or isolated term, word, or phrase that may be in the process of entering common use, but that has not yet been fully accepted into mainstream language” [9]. Freshly coined neologism is a protologism. This term was invented by American literary theorist Mikhail Epstein “to refer to a word coined by an individual or small group that has not yet been published somewhere independent from the coiner(s)” [9]. A lot of politicians such as Boris Johnson, Theresa May, Denis MacShane have coined the protologisms which became a neologism after being published in the press or on a news website.

Firstly, Peter Wilding, the solicitor in European Law used word “Brexit” in his tweet. Then the PM David Cameron used the same word to announce the referendum holding and after that a real boom of usage of the word “Brexit” was happened. There was almost no news without that brand new word.

However, the word “Brexit” is not the one of its kind. Actually, the first one was Grexit, and then were Frexit, Chexit and etc. Apart from others “Brexit” got the most attention in the media. Also, not only internet users liked those new words, but the commercials too. Thus it is possible to find in Britain shops Brexit board game, Brexit energy drink, Brexit biscuits and other stuff [1]. That was just one word among many associated with the referendum, though, new words appear, existing words develop new senses, and formerly obscure terms move from the political lexicon to that of everyday conversation.

Nevertheless, politicians and journalists have already created other words with prefix *Brex-* and the root form “*Brexit*”. Let us detail the meaning and examples of using these neologisms in the dictionaries and newspapers.

Brexicon – a full dictionary of Brexit-related jargon [4]. The origin of the word *Brexicon*: blend of *Brexit* + *lexicon*. The example of the use: “Drowning in *Brexicon*: the language of the EU debate” [8].

Brextension – an extension to the deadline set for the withdrawal of Britain from the European Union [2]. The origin of the word *Brextension*: blend of *Brexit* + *extension*. The example of the use: “So, what we will get for sure is *Brextension* and also possibly an election” [7].

Brexiteer or **Brexiter** – a supporter or architect of *Brexit* [2]. The origin of the words *Brexiteer* or *Brexiter*: the suffixes *-eer* and *-er* are added to the root form “*Brexit*”. The examples of the use: “A hard *Brexiter* who wants to destroy the PM’s new search for a cross party compromise” [4]; “Jeremy Corbyn is happily helping Britain leave the EU – he is and always was a *Brexiteer*” [4].

Brexiety – a state of heightened anxiety triggered by concerns about *Brexit* [2]. The origin of the word *Brexiety*: blend of *Brexit* + *anxiety*. The example of the use: “London Fashion Week: Is UK fashion suffering from *Brexiety*?” [1].

Brexeternity – the notion that *Brexit* will never in fact be over; that Britain will be stuck half-in and half-out of the European Union forever, condemned to permanent and mind-numbingly awful negotiations until kingdom come (coined by Denis MacShane) [8]. The origin of the word *Brexeternity*: blend of *Brexit* + *eternity*. The example of the use: “The excitement over how many MPs will vote this way or that on the prime minister’s Brexit deal has obscured the fact that whatever words are finally agreed, a *Brexeternity* of difficult, tetchy negotiations lie ahead for at least a decade as the UK and EU try and fashion a new *modus vivendi*” [4].

Brextremist – someone who is in favour of the UK leaving the EU and all associated organizations completely and immediately, regardless of the consequences [6]. The origin of the word *Brextremist*: blend of *Brexit* + *extremist*. The example of the use: “With *Brextremists* like Andrea Jenkyns, the MP for Morley and Outwood, now talking about “going down fighting” – as if they were members of some terrorist cell, rather than a group of responsible politicians putting forward any rational proposals – it’s time the great silent and not-so-silent majority made their feelings known about *Brexit*” [4].

Brexchosis – a feeling of despair among those who voted to stay in the EU [3]. The origin of the word *Brexchosis*: blend of *Brexit* + *psychosis*. The example of the use: “Johnson agrees Theresa May is “the cure” for “*Brexchosis*”; a term he coined in his speech” [8].

Brexodus – a higher than usual number of EU nationals emigrating from the UK [3]. The origin of the word *Brexodus*: blend of *Brexit* + *exodus*. The example of the use: “The business *Brexodus* is beginning and Lloyd’s of London is leading the charge” [4].

Brexthrough reflects sudden progress in UK-EU talks [4]. The origin of the word *Brexthrough*: blend of *Brexit* + *through*. The example of the use: “*Brexit* has

spawned a groaning lexicon all to itself, from Boris Johnson's brexchosis (the feeling of despair among Remoaners) to the long-anticipated but ever-elusive Brexthrough" [5].

Some new words appeared only in newspaper articles and were coined by journalists. Australian professor Dr. David Lenehan defined words that combine with Brexit to make the words Brexplosion and Brextipation and explained their meaning for our research.

Brexplosion – a self-destructive process due to Brexit. The origin of the word Brexplosion: blend of Brexit + explosion. The example of the use: "If the entire process looks likely to self-combust we might happily see a Brexplosion – appropriately enough, given that the first meaning of 'explode' was to hiss and boo a mediocre actor off the stage" [5].

Brextipation – the blocking up of the exit process. The origin of the word Brextipation: blend of Brexit + constipation. The example of the use: "Parliament's severe Brextipation situation is certainly not aided by an antiquated system for the gathering of citizens' votes: ballot boxes and voting booths are rather 1924, are they not?" [4].

Therefore, neologisms are often created by combining existing words or by giving words suffixes or prefixes. Frequently these words don't have definitions in the dictionary and only creators know their meanings. Further research might evaluate the increasing use of words with prefix Brex- and explore neologisms that are created every day by politicians and journalists.

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Racism in Modern World

The problem of racism, unfortunately, is still relevant in the world as a whole and, in particular, in our native country - Ukraine. It would seem strange that in 2020 people with another color of skin can be related hostilely.

So, let us consider the notion of racism, the reasons for its existence and the possible ways to stand up against it.

Racism is a belief in the exaltation of one race over another and convincing discrimination associated with such a belief. Non-mono-ethnic states, on the territory of which representatives of more than several races, or states where one nation dominates, but there is an influx of alien immigrants, are more susceptible to racism.[1]

According to the author of the article [2] racism in society is connected with the fact that those in power want to impose their political goals on the people in this way. The UN High Commissioner for Human Rights, Zeid Raad al-Husseini, warned that inciting hatred for political purposes is already becoming commonplace. According to him, today's ethnic populism is associated with the escalation of the "besieged fortress" effect, when people believe that they are surrounded by enemies, while they are overwhelmed by a feeling of deep discontent, and their rage is easy to direct in the right direction.

Among the main victims of this situation are refugees and migrants, who are completely unfairly represented by the enemies of society in those countries where they are striving. "We must confront those leaders who propagate their dangerous ideas of racial superiority, especially when they mask them with statements directed against migrants and foreigners", UN Chief Antonio Guterres called on.

It is dangerous to give in to manipulations and not to forget that the racist worldview leads to discrimination, slavery and genocide.

The problem of racist discrimination can also be found in Ukraine.

A loud scandal was triggered by the unthoughtful expression made by the representative of some political force, who publicly criticized the choice of singer Gaitana as the representative of Ukraine at the Eurovision Song Contest: "It would have been better if a person who represented Ukraine was in this competition it turns out that we do not want to show our Slavic face. And Ukraine will be associated with another continent, somewhere in Africa", – said Syrotyuk. [3]

The Council of Europe has published a report on Ukraine on the situation of racism and intolerance in the country.

Racism is equated with hooliganism, the Ukrainian Internet is full of xenophobic expressions, and the state itself was deprived of a body that would deal with such issues - this is not all the conclusions of European experts. Acting head of

the commission against racism and intolerance of the Council of Europe, François Sant'Angelo noted that there is some progress, but at the same time there are many reasons to worry.

There is no responsible anti-discrimination legislation in the country. Moreover, while the authorities are trying to strengthen legislation on the provision of shelters, refugee identification procedures have been blocked several times. The commission also noted that the dissolution of the State Committee in matters of nationalities and religions created a certain "vacuum" in the direction of cases against xenophobia and racism. Cases of the committee were transferred to the Ministry of Culture, but in fact, no one deals with them, experts note.

In addition, the situation with the Crimean Tatars and Roma is still not improving. Despite the fact that ethnic issues are not yet the most acute in Ukrainian society, experts are excited to note the rapid development of several negative trends in this area.

In the country there is a problem of relations between people with non-Slavic appearance and problems in migration policy. The moods of "intolerance towards another" in our society are growing from year to year and their manifestations have become large-scale and systemic.

The European integrated state, is trying at the legislative level to protect the rights of social minorities and for this amends laws and regulations. The Criminal Code of Ukraine [4] in paragraph 3 of part 1 of article 67 provides that one of the circumstances that aggravates the crime and therefore the punishment is the commission of a crime motivated by racial, national or religious hatred. Also, imprisonment from 10 to 15 years is punishable by intentional homicide with motives of racial, national or religious intolerance (Clause 14 of Part 1 of Article 115 of the Criminal Code of Ukraine). According to paragraph 1 of Article 161 of the Criminal Code of Ukraine, deliberate actions aimed at inciting national, racial hatred, humiliation of national honor and dignity, as well as direct or indirect restriction of rights or the establishment of direct or indirect privileges of citizens on the grounds of race, color, political beliefs and other signs - are punishable by restriction of liberty up to 5 years.

However, the introduction of amendments to a number of articles of the criminal code still did not radically change the situation for the better. There is a problem of implementing the law in practice and the human factor in the perception of the situation by the executor of the law. By recording crimes committed against foreign nationals, the police are in no hurry to see in them crimes governed by racial or religious hostility. But how can racists justify such an attitude?

Quite often on the Internet you can notice world news about offenses and crimes committed by different people. According to statistics, there are more criminals among people with black skin than among people with white skin. In part, this can be justified by the fact that in countries whose populations are

predominantly African-Americans, the standard of living is rather low, and the inhabitants of such countries may have no choice but to commit crimes (for example, thefts) in order to feed themselves and their families, and this quite reasonably gives reason to fear them, and stay away from them. Concerns are reinforced by articles that put these statistics on the public eye, often embellishing the facts. [5]

To summarize all of the above, in order to more effectively address the issue of racial discrimination in Ukraine, we believe that it is necessary to prepare and support at the national level a basic anti-discrimination law that contains all the necessary definitions, a list of grounds for which discrimination is prohibited, and a protection mechanism against her, increasing the responsibility of the country, as well as introducing an anti-discrimination body.

The state must strictly regulate the mechanism and bring to the officials - law enforcement officers, the implementation of responsibility for actions aimed at discrimination of individuals and segments of the population.

Even in the absence of special laws, it is necessary to exercise tolerance and remain human in relation to all people equally, regardless of their skin color, religion and sexual orientation. After all, in the first place you should always start with yourself.

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Hybrid wars: what are they

Twenty-first century conflicts have changed understanding of ‘a war’ greatly. Thus, in 2005 a term of a hybrid war appeared, though some military institutions call it as ‘a hybrid threat. The hybrid wars are really threatening and dangerous as sometimes no one can even understand whether a war is going on or it is not a war at all. That is why there is a need to clarify understanding of hybrid wars.

There are different concepts of a hybrid war shared by Nathan Freyer, Frank Hoffman, from Philip Carber, wherein each of them determines it in their own way, but all the definitions point out that a hybrid war is a war that combines traditional and non-traditional methods, which can be symmetric and asymmetric, linear and non-linear, military and non-military methods of warfare. From our perspective, the key to understanding what a hybrid war is that such wars combine ordinary and unusual forms of warfare, really intertwined that is rather dangerous.

The specific example of such wars can be an example taken from the current Ukrainian war, its conflict with Russia. The main thing that we as Ukrainians try to solve this conflict applying to the political space. In order to compensate for some actions of proxy forces or even traditional military methods that the Russian side uses. The experience proves it is quite effective. It allows us to still make real resistance to the Russian aggression that lasts for the fourth year. Unfortunately, Ukrainians are not the first and not the last who involved in a hybrid war.

Naturally, a question arises: is it possible to win in such a war? Much depends on what considered to be ‘a victory’ in a hybrid war. As written above, the main thing in a hybrid war is not to lose, because the consequences of losing a hybrid war is a destruction and a threat to disappear from the world map. Here, the next question appears: is there an identity between the occupation of territory and victory? In the framework of the hybrid war, we cannot say that we won the conflict, even some separate local conflict as there are some contradictions in the nature of hybrid wars: if there is a conflict, as such, it can take armed or unarmed forms, more peaceful or more military, with a higher or lower percentage of violence. But if they are prerequisites for a war, the war will continue, and these problems should be treated and solved from a geopolitical perspective. Such conflicts will be active until they are resolved.

One more question that needs clarifying is whether there are classic wars, i.e. army to army, nowadays. The point is not in that army to army. If to look at Syria or Iraq, we will see mainly armed conflicts with the use of all military means being in the disposal of a modern army. But for a political scientist at the same time it is another kind of war - a war for the souls of people, a war on the international

arena, a secret war of diplomats and special services. It should be pointed out that in a specific war, through secret, unconventional methods, the military component is large or vice versa. During the stage of the relative ceasefire, there is a hot and cold war at other levels.

In conclusion, hybrid wars as a combination of ordinary and unusual forms of warfare, intertwined is rather dangerous and threatening for the country existence involved in a hybrid war. To avoid chaos, destruction and other negative consequences of a hybrid war, it is necessary to find compromises to live in peace and tranquility and bear in mind that there is only one world and people must value it instead of destroying it with any wars, no matter classic or hybrid they are.

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Экстралингвистическая информация в переводе произведений И.С. Тургенева на польский язык

Актуальность исследования определяется необходимостью рассмотреть экстралингвистические условия при переводе культурных реалий с русского языка на польский. Целью данного анализа является определение приёмов перевода с русского на польский язык в различных группах, содержащих экстралингвистическую информацию. Предметом исследования являются переводы произведений И.С.Тургенева на польский язык. Объектом – лексико-семантические особенности перевода.

В разные годы многие исследователи, писавшие о семантических особенностях слова, выдвигали тезис о неоднородности смыслового содержания слова. Э. П. Шубин выделял три вида словесной информации: семантическую, паралингвистическую, эмоционально-эстетическую. П. И. Копанев писал о семантической и эмоционально-эстетической информации. Л. А. Киселева выделяла две группы языковой информации: интеллектуально-информативную и прагматическую. К первой группе относятся три вида информации: семантическая (рациональная, интеллектуальная), релятивная и социально-семантическая. Вторую группу образуют шесть видов: побудительная, эмоционально-оценочная, эмоциональная, экспрессивная, эстетическая и контактная информация.

В экстралингвистической информации отражаются понятия и представления: явлениях, фактах, любых объектах действительности, характеристиках, действиях, состояниях, особенностях, качествах, присущих различным материальным и духовным сферам природы и социума. Экстралингвистическая информация имеет шесть видов: смысловая, экстралингвистическая, социолокальная, хронологическая и фоновая.

В смысловой информации, отражаются понятия и представления обо все сущем, реальном, абстрактном. В переводе произведений И. С. Тургенева на польский язык необходимо обратить внимание на различные трансформации: W **zmyśleniu** patrzył w dal [1, с. 5] – тоже глядел куда-то вдаль [2, с. 161]; Wąsy ledwo mu się **sypały**, a **delikatny** meszek okrywał podboródek [1, с. 5] – усы его едва **пробились** и на подбородке вился **легкий** пух [2, с. 161]; Leżał na **brzuhu** [1, с. 5] – лежал на **груди** [2, с. 161]; Coś **ujmująco wetworzonego** w drobnych rysach [1, с. 5] – то-то **привлекательно изящное** в мелких чертах [2, с. 161]; W tych czarnych, **pełnych słodczy** oczach [1, с. 5] – в его **сладких** карих глазах [2, с. 161]; **Tchnął cały szczęściem, weselem, zdrowiem** [1, с. 5] – всё в нем дышало **счастливою веселостью** здоровья [2, с. 161]; **Kapryśnym urokiem** młodości [1, с. 5] –

избалованностью, прелестью молодости [2, с. 161]. Как видим, переводчик прибегает к различным приёмам замены, расширения, трансформации, максимально сохраняя смысл.

Эмоционально-экспрессивная, выражающая человеческие чувства и эмоции, представлена в переведённых произведениях, например: *Wstręt bierze patrzeć* [1, с. 9] – Даже противно смотреть [2, с. 163]; *Pomyśl tylko!* [1, с. 9] – Вот поди ты! [2, с. 163]; *Tak, to niezwykła dziewczyna* [1, с. 9] – Да; она удивительная девушка [2, с. 164]; *Do diabła!* [1, с. 8] – К чёрту! [2, с. 163]; *Dość kaprysów* [с. 28] – полно капризничать [2, с. 177]; *I on upowja się pięknym dniem* [1, с. 6] – и ему хорошо [2, с. 161].

Социолокальная информация, указывающая на социальную сферу функционирования слова: *Rzucił Szubin* [1, с. 7] – брякнул Шубин [2, с. 163]; *Staruszek* (старик, нейт.) [1, с. 7] – старец [2, с. 163]; *Pragnie szczęścia* [1, с. 13] – жажда счастья [2, с. 166]; „*Upolował sobie*” [1, с. 20] – он «подцепил» [2, с. 171]; *Życie wiejskie* [1, с. 20] – Деревенское житье [2, с. 171]; *Zamiłowanie do rzeźby* [1, с. 21] – склонность к ваянию [2, с. 172]. Как видим, слова относящиеся к определённому стилю могут терять эту особенность при переводе социолокальная информативность лексики используется для характеристики социальной среды, персонажей, места действия, а также для создания различных стилистических эффектов: комизма, иронии, сатиры.

Примеры перевода слов, содержащей хронологическую информацию немногочисленны: *Biersieniew na ogół nie grzeszył wielomównością* [1, с. 10] – Берсенева вообще не грешил многоглаголением [2, с. 164]; *Majątek zaś był czynszowy* [1, с. 20] – имение же было оброчное [2, с. 171]; *Na pensji interesowała się muzyką* [1, с. 20] – В пансионе она занималась музыкой [2, с. 171].

Восприятие и перевод слов и выражений, содержащей фоновую информацию сопряжён с некоторыми трудностями. Сохранение в переводе национального колорита подлинника зависит от правильного восприятия фоновой информации, например: *W długich, podgiętych nogach, podobnych do tylnych nóg konika polnego* [1, с. 6] – его длинных ног с поднятыми коленями, подобных задним ножкам стрекозы [2, с. 161]; *Podnieść nogi i uderzać piętami jedna o drugą* [1, с. 6] – поднимешь ноги и стучишь каблуками дружку о дружку [2, с. 162]; *Możesz popatrzeć na jakiegoś pękatego chrząszczyka* [1, с. 6] – смотри на какую-нибудь пузатую козявку [2, с. 162]; *I białych dłoniach* [1, с. 5] – и белых ручках [2, с. 161].

Таким образом, в переводе произведений И. С. Тургенева на польский язык слова и выражения, содержащие экстралингвистическую информацию, передаются различными способами. Переводчики демонстрируют знания об авторе и его мировоззрении, эстетических взглядах, об эпохе, описываемой в данных произведениях, а также об обстановке и условиях жизни общества.

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Migration processes in Ukraine

Migration is a common and normal phenomenon in the modern world. In the context of globalization, it has quite wide prospects for development, because the formation of an international economic system causes not only the inflow of foreign monetary capital, the development of production in other countries, but also the displacement of able-bodied people in search of favorable working conditions outside their country. Migration processes are caused by various factors, including social, political, and economic. In the current demographic situation of Ukraine, when a considerable part of labor and intellectual resources is located outside the country, it is necessary to pay attention to the causes of migration, motives of migration, advantages and disadvantages, and regulation of this process.

As of 2019, the statistics of the State Migration Service of Ukraine give the following indicators: the number of foreign passports issued in 2019 is 3 653 225 units. The number of issued documents for the departure of Ukrainian citizens abroad for permanent residence is 11 311 units, among which 1996 persons returned to Ukraine. Violations of migration law were fined in the amount of 64 976 922 UAH.

One of the first to begin studying migration processes was English scientist Ernest Ravenstein. He explained them through the factors of "attraction-repulsion": unemployment, low wages, lack of legal guarantees, etc. "repulse" an able-bodied person out of the country toward more favorable conditions in another country that "attract".

Therefore, we will take a closer look at the factors of labor migration in Ukraine. The first of these will be the level of wages. Its low level causes an increase in the number of survivors. Due to the lack of sufficient support for their families, able-bodied men and women are forced to go abroad for work. By gender, the majority of female migrant workers are women aged 40 to 50, and among men, men are between 30 and 40 years old. These are usually people who have families with older children who do not require constant care. The second factor in labor migration is unemployment in regions with an over-working population, which cannot be realized due to lack of jobs. The large concentration of labor in the Zhytomyr, Ivano-Frankivsk, Lviv, Ternopil Chernivtsi regions of Ukraine causes its outflow to other countries, especially neighbors, which need skilled and cheap labor, and are ready to pay higher wages. In other countries, the unemployment rate is not always lower than in Ukraine. But at the same time, they have a shortage of workers in the labor and agricultural spheres, which are not attractive to the local population but are carried out by migrants from less developed countries. According to statistics, 51% of the male population are working in the field of mining or mining.

Migration processes are largely influenced by the stability of the economy. The volatility of the economic system and the uncertainty of tomorrow are pushing for earnings where there are stable sources of income. Among social factors, we can distinguish low working conditions, poor social security, etc. Political factors are the country's level of democracy and respect for the rights and freedoms of the citizen. The motivation and purpose of migration are the needs of improving their financial situation, accumulating money to start their own business, raising money for study, travel, and more.

The advantages of labor migration are exchange of experience at the cultural, economic, social levels; cash payments to the budget of Ukraine; raising the standard of living of working families; increasing the number of middle class in Ukraine. Of course, this has its effect, but at the same time, there are negative consequences that need to be addressed. Among them are the complication of the demographic crisis, the lack of adequate upbringing of children in these families, the loss of significant labor potential of the country, crime in the field of migration.

Due to the significant outflow of workers, the percentage of the working-age population in relation to the working-age population is increasing, which leads to a decrease for budget funds, and thus a decrease in social payments.

Most migrant workers have children who are left to care for other members of the family or for some. Through a long-term bond gap, situations are created where children are left unaddressed, supported, and begin to perceive the world in negative vision through psychological trauma.

Among all others, the problem of migration crime is also important. Businesses on illegal migration are quite profitable and reliable, because the punishment is not significant enough, and therefore the whole system of such business is attracted, which attracts with its high wages.

The loss of the best specialists and labor potential in Ukraine threatens the further development of the country, because their existence depends on the functioning of many spheres of state activity. For example, highly qualified doctors are in demand both in our country and abroad, because it is much more profitable to hire a ready-made employee than to do his training.

Here, we will look more closely at the issue of migration of intellectual resources. Intellectual migration also threatens the socio-economic development of the country. Ukraine is one of the largest donors of scientists and intellectual migrants. On the one hand, this is because more developed countries encourage the influx of scientists to their countries, because the presence of such individuals increases the level of economy and social well-being. Encouraging scientific activity and creating a basis for knowledge formation are key points in current progressive development. Other countries offer not only sufficient remuneration for scientific work, but also provide ways for the further development of man as a scientist, his realization, which is a good reason for migration.

On the other hand, this situation has arisen due to the lack of providing scientists with everything necessary in their country. Ukraine is losing its scientific potential due to the problems of attracting scientific personnel to participate in

scientific activities, the lack of sufficient scientific and material base and modern jobs. Demand for Ukrainian intellectual resources is increasing. If at the beginning of the existence of an independent Ukraine the main recipients were Russia and Poland, then in the future, Israel, Germany, the United States, and Canada filled this list. The United States, for its part, offers university studies, scholarships, grants, and further employment opportunities for citizenship.

Although the issue of scientific migration is controversial, it has negative consequences for Ukraine, as the outflow of scientific personnel contributes to the deterioration of labor productivity and scientific and technological backlog. The positive effects can be attributed to the considerable exchange of experience that can be used here. However, such trends need to be developed. Migration cannot be stopped, but at least scientists should be returned home. For this purpose, it is necessary to create mechanisms of regulation of migration processes. The regulation of migration processes should take place at the administrative-legal (establishment of rules and rules, borders of migration), economic (establishment of customs fees, penalties and regulation of migrants' wages) and interstate (regulation on both sides) levels.

The state should actively intervene in the migration processes, ensure the protection of its citizens working abroad and promote them. At the same time, it is necessary to minimize the unemployment rate, increase the stability of the economy, the level of wages and increase their own production in order to reduce the flow of migrants from Ukraine.

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Section 07 German Language Section

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Heutiger Stand und Perspektiven der Entwicklung des deutschen Maschinenbaus

Der Maschinenbau ist eine klassische Disziplin aus dem Ingenieurwesen und beschäftigt sich mit der Konstruktion und Produktion von Maschinen. Der Maschinenbau ist eine große Branche mit einer so langen Geschichte und hat große Perspektiven für die weitere Entwicklung.

Der Beginn des deutschen Maschinenbaus geht zurück auf Johann von Zimmermann. Er gilt als der Begründer des Werkzeugmaschinenbaus in Deutschland. Seine im Jahr 1848 in Chemnitz gebaute Fabrik war die erste Fabrik Deutschlands und des Festkontinents zum Bau von Werkzeugmaschinen.

Der Maschinenbau ist heute einer der führenden Industriezweige Deutschlands, der sehr auf den Export ausgelegt ist.

Er umfasst nicht nur Autobauen, sondern auch Umweltversorgern. Zum Beispiel, Entwicklung erneuerbarer Energie, Forschungen und Produktion der Roboter, die Menschen ersetzen können. Die Aufgabe des Maschinenbaus ist, unsere Welt leichter und sicherer zu machen. Maschinenbau hat einen riesigen Einfluss und bietet eine große Anzahl von Arbeitsplätzen. Zum Beispiel:

- Industriemechaniker überprüft gewisse Maschinenfunktionen, wirft einen kontrollierenden Blick auf den Produktionsprozess und tauscht bei Bedarf Produktionsteile aus.
- Maschinen- und Anlageführer koordiniert Arbeitsabläufe, checkt die Funktionstüchtigkeit von (Groß-) Anlagen und nimmt sie nach erfolgreicher Reparatur wieder in Betrieb.
- Zerspanungsmechaniker widmet sich Metall-Bearbeitungsverfahren. Konkret geht es um das Bohren, Formen, Fräsen und Schleifen von Präzisionsbauteilen.
- Feinwerkmechaniker: Feinmechanische Geräte benötigen Bauteile, die er fertigt. Dabei arbeitet er oft mit computergestützten Maschinen, um Metalle zu bearbeiten.
- Konstruktionsmechaniker fertigt Metallbauteile, montiert Einzelteile für unterschiedliche Gesamt-Konstrukte wie Fahrzeuge oder Schiffe und ist für die entsprechende Wartung und Instandhaltung verantwortlich.
- Elektroniker für Maschinen und Antriebstechnik sorgt für die Antriebskraft elektrischer Maschinen, stellt u.a. Wicklungen her und richtet Leitungen ein.

Maschinenbau nimmt eine große Stelle in der Wirtschaft der Welt. Dieser Bereich hat einen hohen Umsatz. Die Angaben von 2010 bis 2019 sind in Deutschland immer gleich und betragen ca. 220 Milliarden Euro. Und der Umsatz in der ganzen Welt beträgt mehr als 1500 Milliarden Euro.

Rund 60 Prozent des deutschen Umsatzes von 232,3 Milliarden Euro (2018) beruhen auf dem Export. Damit sind in Deutschland mindestens 600.000 Arbeitsplätze direkt vom Export abhängig. Diese Angaben werden noch und noch steigen.

Erneuerbare Energien gehören zu den wichtigsten Stromquellen in Deutschland und ihr Ausbau ist eine zentrale Säule der Energiewende. Energieversorgung soll klimaverträglicher werden und uns gleichzeitig unabhängiger vom Import fossiler Brenn-, Kraft- und Heizstoffe machen. Die Welt soll umweltfreundlicher werden. Heutzutage produziert man nur ca. 35 Prozent Stroms aus erneuerbaren Energien, aber das ist nur Anfang, die Entwicklung für die Zukunft wird immer mehr steigen. Zu erneuerbaren Energien gehören Windkraft, Biomasse und Wasserkraft. Solche Energie sind kostenlos und brauchen keine natürlichen Werkstoffe. Mit Hilfe erneuerbarer Energie können die Menschen fast alle Krankheiten vorbeugen und schützen die Welt vor der Zerstörung.

Das Elektroauto, das ist ein Auto, das ohne Benzin oder Diesel fahren kann. Statt des Benzinmotors hat es einen Elektromotor, der mit Hilfe des Akkumulators arbeitet. Es produziert keine CO₂-Gase, deshalb ist es ein ökologisches Auto.

Das moderne Ingenieurwesen zeichnet sich durch Innovationen und Anpassungsfähigkeit aus. In dieser Situation ist die Entwicklung der Maschinenbauindustrie mit der Notwendigkeit verbunden, den Bereich Wissenschaft und Bildung zu stärken. Zu Beginn des 20. Jahrhunderts war der Maschinenbau mit der Produktion von Förderbändern verbunden, riesigen Fabriken, in denen eine große Anzahl von Arbeitern benötigt wurde. Jetzt können Sie eine etwas andere Situation beobachten, nämlich die Roboterproduktion mit einer minimalen Anzahl von Mitarbeitern, denen häufig technische und Managementfunktionen zugewiesen werden.

Die Hauptindikatoren für die Maschinenqualität sind Zuverlässigkeit und Effizienz, die hauptsächlich durch die Eigenschaften der Oberflächenschichten von Teilen und Verbindungen bestimmt werden (Dauerfestigkeit, Korrosionsbeständigkeit, Verschleißfestigkeit, Reibungskoeffizient, Kontaktsteifigkeit, Landefestigkeit, Verbindungsdichtheit usw.). Jeder Maschinenstopp aufgrund von Schäden an einzelnen Elementen oder einer Abnahme der technischen Eigenschaften unter das zulässige Niveau führt in der Regel zu großen Materialverlusten und in einigen Fällen zu katastrophalen Folgen. Das Erreichen einer hohen Qualität und Betriebssicherheit von Maschinen sowie ihrer niedrigeren Kosten, die eine Voraussetzung für die Gewährleistung einer hohen und nachhaltigen Wettbewerbsfähigkeit des Marktes sind, ist nur auf der Grundlage neuer High-Tech-Technologien sowie wissenschaftlicher und technischer Anweisungen möglich. Ein solcher integrierter Bereich ist die Oberflächentechnik. Er deckt einen Komplex wissenschaftlicher Disziplinen ab, der in folgende Hauptgruppen unterteilt werden kann:

1. Grundlegend, einschließlich hauptsächlich Physik und Oberflächenchemie eines Festkörpers und einer Reihe anderer Disziplinen;
2. Physik und Chemie der Wechselwirkung von Oberflächen mit der Umwelt und der Gestaltung von Oberflächenschichten und der Verwaltung ihrer Eigenschaften;
3. Technologie der Beschichtungen und Oberflächenschichtmodifikation;

4. Oberflächenbehandlungstechnologie.

In den letzten Jahrzehnten hat die Oberflächentechnik in den meisten Bereichen der modernen Industrie zunehmend an Bedeutung gewonnen. Der innovative Charakter der Entwicklung hängt mit einer Reihe von Faktoren zusammen. Dies ist vor allem die rasante Entwicklung der Oberflächenelektronik. Die Mikro- und Optoelektronik der 90er Jahre ist unwiderstehlich bestrebt, den Integrationsgrad von Festkörper- Informationsverarbeitungssystemen zu erhöhen und die Größe einzelner Komponenten dieser Systeme stark zu reduzieren. Die Nano- und Molekularelektronik ist geboren; Die Größe der Elemente integrierter Schaltkreise nähert sich allmählich der Größe kleiner Cluster von Atomen und Molekülen.

Die Erhöhung der Langlebigkeit von Maschinen bedeutet nicht nur eine proportionale Steigerung der Produktivität, sondern auch die Freisetzung enormer Ressourcen an Arbeitskräften, Rohstoffen, Finanzinvestitionen und Kapitalaufbau. Die Betriebsart von Maschinen in verschiedenen Bereichen des Maschinenbaus erhöht tendenziell die Leistung, um eine höhere Leistung und damit Produkte zu erzielen.

So stieg die Kapazität der Einheiten von Kompressorstationen von Gaspipelines um das 20- bis 30-fache, der Durchmesser der Rohre von Gaspipelines von 300 auf 1420 mm und die Produktivität eines Strangs der Gaspipeline von 1 auf 30 Milliarden m pro Jahr. Aus diesem Grund werden die Verschleißfestigkeit, Haltbarkeit und Effizienz der Maschinen verringert und die Unfallrate steigt auch in der Luftfahrt.

Die Produktion von Metallbearbeitungsgeräten konzentriert sich auf drei Hauptregionen der Welt - Westeuropa, USA, Japan. Japan, China, die USA und Deutschland sind führend in der Herstellung von Werkzeugmaschinen.

Der wichtigste Zweig des modernen Maschinenbaus ist die Automobilindustrie. Die Monopole Japan, USA, Bundesrepublik Deutschland und Frankreich haben großen Erfolg. Die größten Monopole, die Autos herstellen: General Motors, Ford Motors, Chrysler (USA), Mazda, Mitsubishi, Toyota, Nissan (Japan), BMW, Volkswagen (Deutschland), Peugeot, Renault (Frankreich), Alfa Romeo, Fiat (Italien), Roll Royce (England), Volvo (Schweden), Daewoo (Republik Korea).

Die Produktion von Dieselmotoren erfolgt in Großbritannien, Japan, USA, Deutschland, Frankreich. Die Elektronik ist derzeit auf die Herstellung elektronischer Komponenten spezialisiert. Wichtige Hersteller: Japan, Frankreich, USA. Trotz der Tatsache, dass Russland unter den zehn führenden Automobilherstellern auf dem fünften Platz liegt, bleibt es in Bezug auf das technische Niveau und die Vielfalt der technischen Produkte hinter den führenden kapitalistischen Ländern der Welt zurück.

Viele Faktoren beeinflussen den Standort des Ingenieurwesens: Die Nähe metallurgischer Stützpunkte in den USA (Industriegürtel), in Deutschland (Rheinbezirk), in der Ukraine (Dnepr, Donbass), die Verfügbarkeit von qualifiziertem Personal, die Nähe von Forschungszentren, die Präsenz und der Standort von Märkten entwickelten sich Verkehrsnetz, Nähe der Verbraucher usw.

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Neologismen der modernen deutschen Sprache: Funktionsbesonderheiten, strukturelle und semantische Merkmale

Der Wortschatz der deutschen Sprache ist ein schnell entwickelndes System, das die Volkskultur jeder einzelnen Epoche widerspiegelt und sich ständig unter dem Einfluss einer ganzen Reihe von inneren und äußeren Faktoren entwickelt. Die neuen Wörter tauchen im Wortschatz der deutschen Sprache auf, die veralteten verändern sich oder verschwinden ganz aus dem Gebrauch.

Die echte neologische Explosion, die einerseits durch die schnell verändernden sozial-politischen Lebensbedingungen und andererseits durch die intensive Entwicklung der Wissenschaften und Massenmedien Ende des XX. – Anfang des XXI. Jahrhunderts verursacht wurde, führte zum Verschwinden der alten und Entstehen der neuen Nominationsgebieten, löste das Interesse bei Linguisten aus und ist somit in den zahlreichen wissenschaftlichen Arbeiten zum Forschungsgegenstand geworden.

Neologismus ist ein Wort oder eine stehende Redewendung, die zu einer bestimmten Zeit in der Sprache aufgetaucht ist, den Kommunikationsbedürfnissen entspricht, gemäß den wortbildenden Gesetzen dieser Sprache gebildet oder von einer anderen Sprache entlehnt wurde und von den Sprachträgern als ein neues Wort im Laufe einer bestimmten Zeit wahrgenommen wird.

Aber es gibt einige lexikalische Einheiten, welche als „einmalige Wortschöpfungen“ gelten – Okkasionalismen, die von Neologismen zu unterscheiden sind. Okkasionalismen sind Wörter, die vom Autor zu einem bestimmten Anlass, unter ganz konkreten Umständen der sprachlichen Kommunikation zum besseren Ausdruck seiner Gedanken gebildet werden. Zum Beispiel: *Biszumfrühstückbleiber*, *Coffeinloserkaffeetrinker*, *Verschlimmbesserung*.

Besonderes Augenmerk sollte auf die Untersuchung der Wege zur Bildung von Neologismen gelegt werden. Die Grundbildungstypen der Neologismen sind:

Affigierung: googlen – die Information in Google suchen; simsen – die SMS senden; spoilern – den Inhalt eines Buches oder Films einer Person erzählen nach, die ihn noch nicht gelesen oder gesehen hat; das Unwort – schlimmes, unangebrachtes Wort; das Minilauschgerät – die Abhöreinrichtung;

Abkürzung: SMS – Short Message Service (entlehende Abkürzung aus dem Englischen); Groko – Große Koalition; ABM – Arbeits-beschaffungs-maßnahmen;

Zusammengesetzte Wörter und komplizierte Wortkürzung: der Nebenchecker – der Nachbar; der Jet-set-Geselle – ein junger Mann aus einer höheren Gesellschaft, die Tellerwäscher-Story – eine Geschichte, in der der

Mitarbeiter, der wenig verdient, reich wird, iFer – eine Person, die in den ersten Tagen nach dem Verkauf dringend Apple-Produkte kaufen muss;

Wörterzusammenziehung:, Netiquette – Verhaltensregeln im Internet (entlehnte Wort aus dem Englischen); der Besserwisser (besser wissen) – Person, die alles besser zu wissen glaubt; Bücherliebhaber (Bücher lieb haben) – Person, die Bücher liebt.

Semantische Neubildungen: lanzen – wörtlich "Kampf mit Speeren", neu gedacht als "argumentieren"; der Cover – erneutes Singen des ursprünglichen Liedes (wörtlich – derSchleier); Einkehrung – am Ziel der Pilgerreise tritt ein dem Meditationsprozess ähnlicher Geisteszustand auf (wörtlich: „Versöhnung“); der Chip – traditionelle Bedeutung: «ein Token für ein Spiel (zum Beispiel in einem Kesselspiel)»; neue Bedeutung: «integrierte Schaltung»;

Entlehnungen: Date; Workshop – der Werkstatt; Telefant – Ein Mensch, der an öffentlichen Orten in einer unangenehmen Situation telefoniert; Self-Tracking – der Selbstkontrolle.

In unserer Arbeit wurde der Wortschatz von verschiedenen Bereichen des gesellschaftlichen Lebens erforscht, in denen die Neubildungen am meisten auftauchen. Das sind folgende Bereiche: Beschäftigungsbereich, Bereich der Politik, Massenmedien, Informationstechnologien, Erholung und Freizeit.

Die Neubildungen aus diesen Bereichen wurden von uns eingeordnet und systematisiert. Deren semantische und strukturelle Analyse wurde durchgeführt.

Die semantischen Gruppen der Neologismen **aus den Bereichen „Beschäftigung, Politik und Massenmedien“** sind meistens von den entlehnten Wörtern und als Zusammensetzungen gebildet:

- 1) Massenmedien: lanzen (*streiten*), interviewen;
- 2) Beschäftigung: Ein-Euro-Job, Elternzeit;
- 3) Politik: Ausreisezentrum (*Botschaft*);
- 4) Terrorismus: Rucksackbomber, Selbstmordanschlag.

Der Bereich „Informationstechnologien“

Die meisten Neologismen in diesem Bereich sind vorwiegend als Entlehnungen aus dem Englischen gebildet. Der Grund dafür ist, dass die Begriffe, die sie bezeichnen gerade in den englischsprachigen Ländern entstanden sind.

- Unter den Entlehnungen in diesem Bereich gibt es diejenigen, die ihre ursprüngliche Form in der deutschen Sprache völlig behalten haben: *Hardware, Imagecenter, Blog, Online-Shop, Home-shopping, Internetportale*;
- Und die Entlehnungen, die mit den deutschen Wörtern assimiliert sind: *Quelltext, Schadprogramm, Seitenaufruf, App-Zocke*, zuvor erwähnte Verben *simen* und *googeln*.

Im Bereich „Unterhaltung, Freizeit, Hobby“ wurde die Tendenz zur Neubildung auf dem Wege der Zusammensetzung und Entlehnung aus dem Englischen festgestellt. Hierfür können wir folgende Beispiele nennen: Slapstick – groteske, unwirkliche Szene im Film; Wohnlandschaft – Platzierung neuer Möbel für die Wiederbelebung der "Heimatswüste", für Komfort und Gemütlichkeit;

Komfortzone – ein Wohnraum, in dem sich eine Person zuversichtlich und sicher fühlt; veganisieren – traditionelle Rezepte in vegetarische verwandeln.

Extra wurde von uns auch die semantische Gruppe der Neologismen ausgesondert, **die zur Bezeichnung der Person und Typen von Menschen** dient. Diese Gruppe hat engen Zusammenhang mit vielen anderen semantischen Gruppen, weil sie fast zu allen Lebensbereichen der Gesellschaft Bezug hat. Strukturell sind diese Neologismen als Zusammensetzungen gebildet. Beispiele dafür sind: Wohlstandsmüll – der Abschaum der Gesellschaft; Schläfer – derjenige, der gerne schläft; Computerwitwe – eine Frau, deren Mann unter Computerabhängigkeit leidet; Dreikantebreit – eine Person mit einer Sportkörperstruktur; Fanboy – ein Fan.

Manchmal passieren im Leben der Menschen die Situationen, für deren Beschreibung es keine passenden lexikalischen Mittel in der Sprache gibt. Zur Erklärung der Sache muss in dem Fall der Redner dann eine große Menge von sprachlichen Mitteln nutzen. Gerade im Zusammenhang damit entstehen im Deutschen die bestimmten Wörter, die dem Redner die Zeit und die Nutzung der weiteren lexikalischen Mittel ersparen und eine sehr genaue Charakteristik den bekannten Prozessen oder Sachverhalten geben. Das gesagte möchten wir an folgenden Beispielen veranschaulichen: bahnhöflich – Rauheit der nervösen Zugpassagiere; fremdschämen – sich für Ausländer schämen; insulieren – wenn jemand tut, als ob er eine SMS schreibt, um von den anderen nicht angesprochen zu werden; Chantalismus – die Tendenz der Eltern im deutschsprachigen Raum, Kindern exotische Namen zu geben; Frusur – schrecklicher Haarschnitt nach dem Besuch des Friseursalons; Erlebnisdusche – man versucht festzustellen, welcher Hahngriff für das kalte und welcher für das warme Wasser gedacht ist, durch die Manipulation kommt plötzlich entweder zu kaltes oder zu heißes Wasser.

Diese Gruppe der Neologismen ist ein gutes Beispiel für unbegrenzte Möglichkeiten der deutschen Wortbildung. Ein einziges neugebildetes Wort kann eine Wortverbindung und in manchen Fällen sogar den ganzen Satz ersetzen.

Die ganze Palette der in unserer Arbeit angeführten Neologismen wurde von uns zu thematischen Gruppen systematisiert. Die genannten Neubildungen verweisen auf einen großen Einfluss der anderen Sprachen und zwar des Englischen auf die deutsche Sprache und verdeutlichen die Tendenz der deutschen Sprache zur Zusammensetzung aus zwei, drei und mehreren Wortstämmen und Wortbildungsaffixen.

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Deutschen und ihre Bücher

Das Buch spielt eine enorme und wichtige Rolle im Leben des Menschen. In früheren Zeiten galt das Buch als unbezahlbare Informationsquelle, die älteste Art der Wissensübertragung, doch nun sind die Bücher nicht so beliebt, es ist heutzutage viel leichter geworden, Informationen zu finden, weil viele andere Quellen entstehen und die Menschen die Existenz von Büchern vergessen, aber doch die Welt der Informationstechnik kann die Bücher nicht ersetzen und verdrängen.

Schon früh, noch aus der Wiege, beginnen die Eltern den Kindern, Märchen zu lesen, machen damit den ersten Eindruck vom Buch deutlich. Das Buch zieht die moralischen Eigenschaften des Menschen auf, entwickelt das Denken, hilft dabei, die innere Welt zu entwickeln, nur mit dem Buch kann man allein bleiben und all die Ereignisse überleben, von denen eine wichtige Informationsquelle so erzählt. Sobald der Mensch beginnt, ein Buch zu lesen, ist er mit allen Sinnen darin, um das ganze Bild des Geschehens zu präsentieren. Jeder um sich herum wird nicht wichtig, wenn man sich beim Lesen des Buches befindet. Es vermittelt Wissen von Generation zu Generation, hat die ganze Geschichte und das Wissen hinter sich. Es beginnt unsere Erziehung ab dem kleinsten Alter. Diese riesige Informationsquelle wird für alle ein kleiner Freund.

Trotz der neuen Technologien findet man bei jedem Menschen im Regal ein Buch, so wie es mit dem wichtigsten Lehrer in unserem Leben ist. In erster Linie stellt jeder Elternteil das Kind mit dem Buch zusammen, angefangen mit Kindergeschichten und Versen, weiter geht jeder zur Schule und macht mit Büchern weiter. Sie eröffnen neue Erkenntnisse, helfen dabei, die schwierigsten Aufgaben zu lösen und interessierende Fragen zu beantworten.

Jedes Buch gilt als wirklich einzigartig, in jedem Buch werden viele Geheimnisse und Antworten gespeichert. Mit ihm kann man in seine kleine Welt eintauchen. Das Wichtigste sei, dass die Leute merken würden, dass eine Art Elektronik die Geschichte nicht ändern dürfe. Das Buch soll seine Geschichte durch die Jahrhunderte weiter tragen und weitere Generationen ausbilden. Das Buch soll nicht nur im Leben eines jeden Menschen eine Hauptrolle spielen, sondern der ganzen Menschheit insgesamt. Jeder, der ein Buch gelesen hat, wird mit der Hauptrolle des Buches einverstanden sein.

Bücher begleiten uns ein Leben lang. Wir lernen die Welt kennen und entwickeln uns durch Literatur. Das Buch eröffnet uns jene unerforschten Grenzen unseres Lebens, die wir selbst nie erkennen, was ihr Wert ist. Literatur ist eine Art Wegweiser im Leben. Das Buch legt jene Asen in uns, denen nur Lebenserfahrung beigebracht wird. Dank ihm haben wir die einzigartige Möglichkeit, aus den Fehlern anderer zu lernen, die unterschiedlichsten Lebenssituationen zu analysieren und

Schlüsse zu ziehen, die wir später nutzen können, um ein sicheres Leben zu schaffen. Die Bücher sind anders, aber sie alle können uns etwas Sinnvolles beibringen.

Wenn wir hinter der Parta der Lehranstalten sitzen, haben wir immer wieder Kontakt zu vielen Büchern. Physik, Geometrie, Chemie... Einige assen sich solche Bücher nicht besonders genießen, aber sie alle haben ihre Wissensarchive vor uns geöffnet. Das ist uns nicht bewusst, aber jeder von ihnen hat seinen Beitrag zu unserer Entwicklung geleistet.

Durch Bücher formiert sich beim Kind die Fantasie und entwickelt sich ein Kreisel. Literatur ist in der Lage, bei einem Kind neue Gefühle und Emotionen zu bewegen, die zur Bildung seiner Persönlichkeit beitragen. Hinzu kommt, dass das Buch auch die innere Welt des Menschen beeinflusst. All das, was uns das Buch erzählt, wird bei uns auf der Kippe verschoben, daraus folgt, dass sich nicht nur unsere seelische Verfassung auf die umliegende Welt auswirkt, sondern auch die Erkenntnis von etwas Neuem, das enorme Auswirkungen auf den Menschen erzeugt.

Das Buch wird Ihnen alles erzählen. Es bewahrt die ganze Menschheitsgeschichte in sich und noch mehr. Viele nennen das Buch den Freund des Menschen, indem sie es nach und nach in den zweiten Plan schieben. In der heutigen Welt ist das Leben so, dass wir es gewohnt sind, alle Informationen auf den Ausfällen des Internets zu suchen, aber man sollte die gute alte Literatur nicht vergessen, sie ist es, was Ihnen viel mehr erzählen kann. Moderne Technologien bieten uns die breitesten Möglichkeiten, aber können Sie auch unter diesen Umständen Ihr Leben ohne Buch vorstellen? Denn eine Ausbildung zu bekommen, basierend nur auf den Erklärungen des Lehrers, ist sehr schwierig, manchmal sogar unmöglich. Deshalb ist die Rolle der Literatur im Leben des Menschen sehr groß. Dank ihr ist der Mann ein interessanter Gesprächspartner im Unternehmen, ein qualifizierter Fachmann in seinem Bereich und eine gebildete Persönlichkeit im Leben. Wir müssen die Bücher schätzen, denn sie geben uns die Möglichkeit, die Vergangenheit zu erkennen, das Aktuelle zu schätzen und eine sichere Zukunft zu schaffen.

Tauchen Sie in die Welt der Literatur ein und entdecken Sie die ganze Magie und Schönheit unserer Welt. Sie wird Ihnen die Möglichkeit geben, nicht nur in die Vergangenheit, sondern auch weit über unseren Planeten hinaus zu reisen. Entdecken Sie die Welt und entwickeln Sie sich mit der Literatur.

Zum Beispiel Goethe, Schiller, Brecht und Hesse sind weltweit bekannt. Aber welche Schriftsteller lesen die Deutschen selbst?

Die Papierbücher sind immer noch hoch geschätzt. Die Deutschen bevorzugen die echten Bücher eindeutig den elektronischen, wobei sie sie ziemlich oft kaufen. Laut dem Portal statista.de lesen 39% der Deutschen fünf Bücher im Jahr und 27% sogar mehr als zehn Bücher. Romane und Detektive sind am meisten beliebt. E-Books liest jeder fünfte, doch die Nachfrage steigt. Gleichzeitig erwerben Bücher immer mehr Leser im Internet und kleine Buchläden, die privaten Eigentümern angehören, werden in den Städten immer weniger.

Buchliebhaber bevorzugen die Kommunikation mit dem Buch zu Hause, auf der Couch. Oder sie lesen ein paar Seiten im Bett vor dem Schlafen. Das sagten sie

selbst in einer Umfrage, die von der Börsen-Union des Deutschen Buchhandels durchgeführt wurde. An dritter Stelle nannten die Befragten die Mittel des öffentlichen Nahverkehrs: Bus und Bahn.

Die faszinierenden Geschichten aus Norddeutschen, die bewegenden Geschichten aus dem Süddeutschland, die lustigen Geschichten über die Tiroler, das offensichtlich unglaubliche aus dem Leben der Bienen und Menschen - die Vielfalt der Themen und Autoren aus der Top 5 der Bestsellerliste ist beeindruckend. Der Börsengang des Deutschen Buchhandels berichtet: 2016 gab es rund 10.000 neue Buchnamen, die aus anderen Sprachen übersetzt wurden (vorwiegend aus Englisch, Französisch, Japanisch).

Im Urlaub bevorzugen die Deutschen immer noch Druckbücher ihren elektronischen Versionen. Das berichtet die Nachrichtenagentur epd unter Berufung auf Erkenntnisse der Börsen-Union des deutschen Buchhandels (Börsenverein des Deutschen Buchhandels). Nach Angaben seines Vorsitzenden Heinrich Riethmüller spielen die E-Bücher weiterhin eine Rolle als Nischenprodukt. Ihr Anteil am Umsatz lag im vergangenen Jahr in Deutschland bei 3,9 Prozent mit 21,5 Millionen Exemplaren.

Seiner Meinung nach stellen E-Books keine Bedrohung für den traditionellen Buchmarkt in Deutschland dar. In den vergangenen fünf Jahren hat sich das Wachstum ihres Umsatzes sogar verlangsamt.

Bei einer Umfrage, deren Ergebnisse im Juni veröffentlicht wurden, gaben 79 Prozent der deutschen Leser an, dass elektronische Geräte keine vollwertige Alternative zu Druckbüchern seien.

Das Buch spielt in unserem Leben eine sehr wichtige Rolle, die man ihm nicht nehmen kann. Gäbe es keine Bücher, gäbe es dann keine schönen Worte, keine Romantik und keine Dramatik. Wäre damals gewesen: Eine Dummheit und Enttäuschung. Es wäre schwer, sich dann vor lästigen Worten und Trauer zu verstecken. Denn die Bücher schützen vor all dem. Sie geben, was niemand geben kann: Gemüter, Ruhe, wenn auch auf Zeit, und die Verwandlung und Fantasie - bunt, hell und schön mit ihren Blitzen von diesen Farben. Bücher machen unsere Welt ein bisschen netter, Bücher schweigen nie, sie schreien der Menschheit um Güte, Hoffnung und wahre Liebe. Bücher können alles schenken, es lohnt sich nur, die richtige Seite zu öffnen. Nur in einem Buch kann man Dinge verstehen, die man vielleicht nie erkennt und auch nicht spüren kann. Man muss nur hören können.

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Entwicklungstrends der ukrainischen kohleindustrie beim beitritt zur Europäischen Union

Die Kohleindustrie nimmt einen wichtigen Platz in der ukrainischen Wirtschaft ein, da sie die Energiesicherheit des Landes gewährleistet und auch ein wichtiger Rohstofflieferant für andere Industrien ist. Die Integration der Ukraine in die Europäische Union wird Reformen, technische Modernisierung und finanzielle Sanierung erfordern, um die Wettbewerbsfähigkeit der Ukraine zu erhöhen. Zu diesem Zweck ist es notwendig, den Mechanismus der Umverteilung der Budgetfinanzierung für die Unternehmen der Branche zu verbessern, damit sie an der Schwelle zum EU-Beitritt normal funktionieren und in Zukunft ihre finanzielle Abhängigkeit vom Staatshaushalt reduzieren können. Es wäre nicht wünschenswert, wenn die Ukraine durch die Integration in die EU die geplante Steigerung der Kohleproduktion aufgeben und ihre Produktionsmengen reduzieren müsste, da dies gewisse Gefahren für ihre Energiesicherheit mit sich bringen würde. Derzeit zielt der Reformkurs darauf ab, die Ausgaben des Staatshaushalts zu reduzieren, die Kohlebergbauunternehmen zu privatisieren und private Investitionen anzuziehen.

Aufgrund des starken Einflusses auf die Wirtschaft wurden Kohle und Stahl als Grundlage für die Stabilität in Europa angesehen. Nach der Unterzeichnung des Pariser Abkommens im Jahr 1951 erforderte der Wiederaufbau Europas erhebliche Energieressourcen. Die Nachfrage überstieg bei weitem das Angebot, was sich nur auf die Entscheidungen in diesem Sektor auswirken konnte, insbesondere durch die Förderung eines erhöhten Angebots durch die Erschließung neuer Minen und langfristiger Verträge. Der Niedergang der Kohleindustrie begann jedoch bereits in den 1960er Jahren, als die heimischen Rohstoffe gegenüber den importierten Rohstoffen zu verlieren begannen und neue Ressourcen für die Wärme- und Stromerzeugung entstanden. Nach einer Reihe von strukturellen Veränderungen in der Kohleindustrie ging die Produktion in 15 EU-Mitgliedstaaten von 600 Mio. Tonnen Anfang der 1960er Jahre auf 86 Mio. Tonnen im Jahr 2000 zurück.

Im Jahr 2016 wurden 6,9 Prozent der Weltkohleproduktion in der EU abgebaut. Die schwierigen bergbaulichen und geologischen Bedingungen und die Sozialversicherungsanforderungen der Regierung machen die europäische Kohle jedoch im Vergleich zu ihren Importen aus Ländern wie den USA, Australien und Südafrika nicht wettbewerbsfähig. Der durchschnittliche Preis der in der EU produzierten Kohle ist um ein Vielfaches höher als der Preis auf dem Weltmarkt. Daher verfolgen die Behörden eine Politik, die darauf abzielt, die Produktion

unrentabler Rohstoffe zu reduzieren. In letzter Zeit hat auch die Rolle der erneuerbaren Energiequellen deutlich zugenommen.

Der Anteil der EU am weltweiten Energieverbrauch beträgt 16% und ihre Abhängigkeit von Energieimporten erreicht 70%, was die Energiesicherheit in den Mittelpunkt stellt. Die Rolle der Kohle in der EU wird durch die folgenden Umstände veranschaulicht:

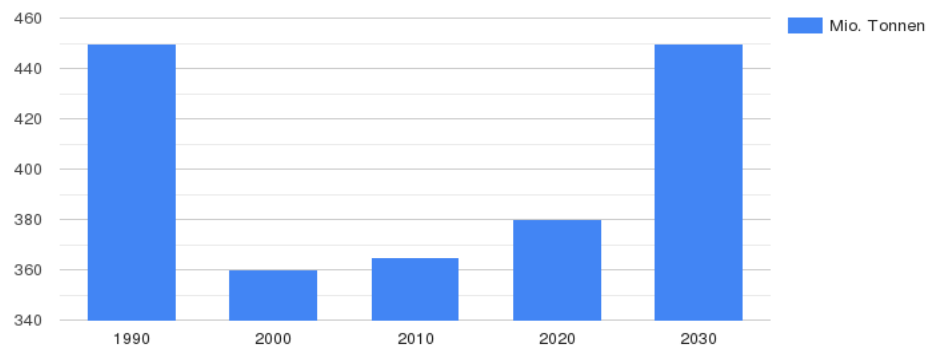
- Die EU ist nach China, den USA und Indien der viertgrößte Verbraucher, Kohle macht 17 Prozent des Gesamtenergieverbrauchs aus (geschätzte 60 Prozent Zunahme der Abhängigkeit bis 2030);
- Die Kohleindustrie ist ein wichtiger Arbeitgeber (260.000 Tausend Arbeitsplätze).

Es sei darauf hingewiesen, dass die Kohle lautstark nach Europa zurückkehrt, und es wird bereits über ihre Renaissance gesprochen. Der Weltenergiebericht 2012 zeigte, dass der Verbrauch von Steinkohle in Europa im Jahr 2011 höher war als in den USA und im Vergleich zu 2010 um 3,3 % und im Jahr 2012 stieg. - im Jahr 2012 um weitere 3% erhöht. Darüber hinaus stieg in einigen EU-Ländern die mit ihrer Hilfe produzierte Energiemenge im Laufe des Jahres um 50%. Der Hauptgrund dafür ist der Rückgang des Preises für Steinkohle in der Welt, nachdem Schiefergas in Amerika populär wurde. Hinzu kommt der Rückgang der Nachfrage nach Kohle in China und die Tatsache, dass amerikanische Produzenten den Europäern billigere Produkte angeboten haben. Viele EU-Länder haben von der Verwendung "schmutziger", aber billiger Kohle statt "sauberen", aber teuren russischen Gases profitiert.

Kohle hat jedoch einige charakteristische Merkmale, die sie gegenüber Öl und Gas benachteiligen:

- Es erfordert große Flächen für die Lagerung;
- hat eine geringere Wärmekapazität;
- Seine Verwendung verursacht eine starke Verschmutzung der Umwelt.

Die natürlichen Nachteile der Kohle begrenzen die Expansion des Marktes. In Ländern, in denen Kohle nicht die dominierende Energiequelle ist, wie Dänemark, Deutschland, Griechenland, Irland und Großbritannien (mehr als 45 Prozent der Elektrizität wird aus Kohle erzeugt), wird sie häufig als Reservebrennstoff eingesetzt. Insbesondere die Schwankungen der Stromerzeugung im Untergrundsektor haben erhebliche Auswirkungen auf den Kohleverbrauch in Ländern wie Österreich, Schweden, Portugal, Finnland, Italien, Frankreich und Spanien.



EU-Verbrauch fester Brennstoffe

In der gegenwärtigen Situation kann man behaupten, dass es eine Frage der Zweckmäßigkeit der Aufrechterhaltung der Arbeit eines Teils der Bergwerke ist, die im Krisenfall Brennstoff liefern (durch die Gewinnung der minimal notwendigen Menge an Kohle) und gleichzeitig die Einführung neuer Technologien in diesem Zweig hervorrufen könnten.

Aufgrund der Tatsache, dass die Kohleindustrie der Garant für die Energiesicherheit ist, muss die Ukraine diese Industrie erhalten. Eine der wichtigen Aufgaben der Energiestrategie ist die Sicherstellung eines rationellen Gleichgewichts zwischen den Energiequellen sowie deren Diversifizierung (nach Energieträgertypen und geographischen Regionen). Um die Energiesicherheit zu gewährleisten, sieht die EU eine Diversifizierung der Energieversorgungsquellen (Erweiterung des Kreises ausländischer Lieferanten, Nutzung erneuerbarer Energiequellen), der Energieversorgung und eine verstärkte Zusammenarbeit mit den traditionellen Energielieferanten vor. Die Liberalisierung der Brennstoff- und Energiemärkte ist einer der wichtigsten Mechanismen, um Sicherheit zu gewährleisten und den Energiegehalt in den Kosten der Produkte zu reduzieren.

Mit der EU-Energiestrategie sollen zwei Hauptziele erreicht werden:

- Gewährleistung der Energiesicherheit;
- Reduzierung der Energiekomponente in den Produktkosten, um seine Wettbewerbsposition auf den globalen Märkten zu stärken.

Es ist notwendig zu verstehen, dass die Frage der europäischen Integration ein Eintritt in ein weiter entwickeltes Wirtschaftssystem ist, das entsprechende Einschränkungen erfordert. Es gibt auch mögliche positive Momente für die Entwicklung der Kohleindustrie. Zunächst einmal verpflichten sich alle Beitrittskandidaten vor dem Beitritt zur EU, eine gemeinsame europäische Politik zu verfolgen, eine funktionierende Marktwirtschaft zu haben und ausreichend wettbewerbsfähig zu sein. Daher wird die Integration der Ukraine in die EU radikale Maßnahmen zur Verbesserung der Wettbewerbsfähigkeit der Kohleindustrie durch eine beschleunigte Umstrukturierung, technische Modernisierung und finanzielle Sanierung erfordern. Der Mechanismus der Umverteilung der Budgetfinanzierung der Industrie sollte verbessert werden, damit sie während des EU-Beitritts normal

funktionieren kann und ihre finanzielle Abhängigkeit vom Staatshaushalt weiter reduziert. Es wäre nicht wünschenswert, die geplante Erhöhung der Kohleproduktion aufzugeben und die Produktionsmengen zu reduzieren.

Die Ukraine muss ihre Kohleindustrie entwickeln. Es ist die Entwicklung der Kohleindustrie, die den Verbrauch von teurem russischem Gas reduzieren wird. In diesem Zusammenhang hat das Ministerium für Energie und Kohleindustrie eine interministerielle Arbeitsgruppe eingerichtet, die Erdgas durch im Inland produzierte Kohle ersetzen soll. Die Hauptaufgaben der Gruppe sind die Organisation der Arbeit an der Vorbereitung von Vereinbarungen über die Durchführung von Projekten zur Substitution von Gas durch Kohle und die Einführung von Technologien zur Umwandlung von Kohle (Wasser-Kohle-Brennstoff, Kohlevergasung). Das Programm zur Entwicklung der Kohleindustrie in der Ukraine für den Zeitraum bis 2030 skizziert die wichtigsten Indikatoren für die Entwicklung der Industrie.

Indikatoren	Vorhersage nach Jahr			
	2012	2015	2020	2030
1. Produktionskapazität am 1. Januar des entsprechenden Jahres, Millionen Tonnen	87,6	107,2	115,6	128,4
2. Rohkohleabbau, insgesamt, Millionen Tonnen	85,31	96,94	108,52	125,45
einschließlich für Koks	20,37	21,80	23,36	30,93
energiebezogen	64,94	75,14	85,16	94,53
3. Durchschnittliche monatliche Arbeitsproduktivität der Beschäftigten im Kohlebergbau	41,07	43,66	46,56	51,61

Hauptindikatoren der Entwicklung der Kohleindustrie der Ukraine bis 2030.

Im Jahr 2014 brach jedoch ein bewaffneter Konflikt im Osten der Ukraine aus, in dessen Folge die Kontrolle über die Minen in den Regionen Donetsk und Luhansk bis heute verloren ging. Es ist erwähnenswert, dass die europäische Integration sowohl die Kohle- als auch die Bergbauindustrie im Allgemeinen tödlich treffen kann. So verlor Polen mit dem EU-Beitritt 90 % seiner Kohleunternehmen, die 300 Tausend Menschen beschäftigten. Unsere Kohleindustrie kann ähnliche Probleme haben, da sie kein perfektes System ist, eine technische Modernisierung erfordert und sich zudem in einer Finanzkrise befindet: So beliefen sich beispielsweise die Verluste der Unternehmen aus der Produktion marktfähiger Produkte im Jahr 2013 für 6 Monate auf 7 Milliarden 236,6 Millionen UAH.

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Digitalisierung - das neue Internet?

Karlsruhe - «Pling». Auf dem Bildschirm erscheint ein ziemlich einfacher Gruß-Text in Englisch und in Deutschland beginnt eine neue Ära der Kommunikation.

Vor einem Vierteljahrhundert saßen der Wissenschaftler-Geek Werner Zorn und sein Team vor einem kleinen Computer-Bildschirm in der Halle der Universität Karlsruhe, als die offizielle Begrüßung aus den USA zu den deutschen Computer-Experten kam: «Michael, es ist Ihr offizieller Empfang in CSNET», - die ersten Worte an Zorn und seine Mitarbeiter. Als die erste elektronische Nachricht an einen eigenen deutschen Mailserver das Land am 2. August 1984 erreichte, begann eine neue Ära.

Der Internet-Pionier Werner Zorn, heute der ehemalige Professor der Universität, hatte zu viele administrative Hindernisse, bevor er sich schließlich durchsetzte. «Und selbst danach gab es einen Schlag auf den deutschen zentralen Knoten durch einen Schlag von den elektronischen Netzwerken der Amerikaner», erinnert sich Zorn. Er spricht von einem «sauberen Krieg», der ausbrach, als klar wurde, was für einen «aktiven» Schatz der Vater des elektronischen Wunders in Karlsruhe in seinen Händen hatte.

Bei der Kommunikation über das Netz ist noch Geduld erforderlich. In den 1980er Jahren dauerte es wegen des Mangels an den gewählten Linien nur wenige Sekunden, bis eine E-Mail auf dem Bildschirm des Empfängers erschien. Die Briefe wurden in so genannten Übertrager wie bei einer normalen Post gesammelt, und von dort weitergeleitet. Der Versand eines Briefes aus den Vereinigten Staaten konnte eine halbe Stunde dauern und mehr. «Dann haben wir Bytes eins nach dem anderen gezählt und gerechnet», sagt Zorn, der vor kurzem am Institut für Software-Systeme Hasso Plattner in Potsdam unterrichtete.

Seine Leidenschaft für Technologie wurde in der Tat in seiner Wiege geboren: der Vater von Zorn unterrichtete Technologie von Schweißen in Karlsruhe, wo sein Sohn ebenfalls Elektrotechnik in den frühen 1960er Jahren studierte und eröffnete dort später die Fakultät für Informatik. Die ersten digitalen Daten wurden heimlich zwischen den NATO - Ländern und dem US-Verteidigungsministerium ausgetauscht. Im Jahr 1969 begann das so genannte ARPANET mit einem Computer-Knoten in vier US-Universitäten – das Internet ist geboren.

Seit über zehn Jahren verändern die Informationstechnologien unser Leben rasant. Das Internet und die mobile Kommunikation sind die Grundlage für neue Formen von Kommunikation, Handel und Unterhaltung. Nicht nur die private

Industrie benutzte erfolgreich neue technische Möglichkeiten, die staatlichen Verwaltungen nutzen jetzt auch moderne Informationstechnologien für die Optimierung ihrer Prozesse und die Bereitstellung von besseren Dienstleistungen für die Bürger. Der Begriff «E-Government» umfasst eine Vielzahl von Online-Aktivitäten und macht viele in der Zukunft viel Behördengänge unnötig.

Jedoch darf man nicht ein grundlegendes menschliches Bedürfnis ignorieren: das Bedürfnis nach Sicherheit. Das Wissen und die Aktionen der einzelnen beteiligten Menschen sind für die Aufrechterhaltung der Sicherheit in der Gesellschaft erforderlich. Dies gilt insbesondere für die Informationssicherheit, da die Sicherheitsrisiken oft auf den ersten Blick unbemerkt und unterbewertet sind. Wie das Bundesamt für Internetsicherheit äußerte, besteht das Ziel des Bundesamtes für Sicherheit in der Informationstechnik (BSI) in der Förderung der Informationssicherheit in Deutschland. BSI ist in erster Linie der zentrale Dienstleister für IT-Sicherheit für die Bundesregierung in Deutschland. Allerdings bieten es auch seine Dienstleistungen an Hersteller der IT, aber auch private und kommerzielle Nutzer und Anbieter im Bereich Informationstechnologie, weil effektiver Schutz ist nur möglich, wenn alle Beteiligten dazu beitragen. Aus diesem Grund ist es erforderlich, noch aktiver in enger Zusammenarbeit mit allen, die im Bereich der IT- und Internetbranche und im Bereich der IT-Sicherheit tätig sind.

Schließlich werden alle Nutzer aufgerufen, vorsichtig im Netz wie im offline-Modus trotz aller technischen Sicherheitsvorkehrungen zu agieren, um Risiken zu minimieren und die Möglichkeit zu haben, die zahlreichen Möglichkeiten von Informationstechnologien und Internet in vollem Umfang zu nutzen.

Nicht so lange her gilt das als modern und zeitgemäß, wenn man eine eigene Website hatte. Heute erwarten wir, dass alle Unternehmen im Internet gefunden werden können - vor allem mit Hilfe von Suchmaschinen. Ist es nicht seltsam, zum Beispiel, wenn ein Unternehmen, ein Arzt oder auch ein Freiberufler keine eigene Website hat? Übrigens speichern wir seit 2002 halten in digitaler Form deutlich mehr Informationen als analog. Wir sind längst nicht in der digitalen Revolution, sondern im digitalen Zeitalter!

Einkaufen, Bankwesen, Ausbildung und Information - alles wird digital. Dennoch erledigen wir immer mehr alltägliche Aufgaben mit nur wenigen Mausklicks oder Handbewegungen auf dem Smartphone. Erstaunlich sind auch sämtliche Bildungs-Anwendungen, die man nutzen kann, um eine neue Sprache oder Programmierung zu beherrschen. Das Wissen der Welt war noch nie so nah und zugänglich! Und unsere Bedürfnisse und Wünsche als Verbraucher nie so transparent. Für mich ist die Digitalisierung vor allem die Vereinfachung und die Automatisierung von Prozessen. Dies beinhaltet die Präsenz im Internet, denn dort erhalten die Kunden die Möglichkeit, ihre persönlichen oder beruflichen Aufgaben in digitaler Form zu erfüllen, sei es durch den Online-Shop oder die Erstellung eines Support-Tickets. Junge neue Mitarbeiter können sich über ein großes Netz austauschen. Angesichts der derzeit 51 000 vorhandenen Stellen für IT-Experten in der deutschen Wirtschaft ist dringend zu handeln. Die Digitalisierung geht unaufhaltsam. Kundenwünsche ändern sich, neue Geschäftsmodelle und

Innovationen entwickeln sich rasant. Aber die Bedrohung durch alle Arten von Cyber-Risiken erhöht sich ebenfalls. Die Verbraucher wollen die Sicherheit bei der Nutzung der Dienstleistungen, die Unternehmen sollten keine Angst vor hohen Kosten beim Einbruch haben - auch ihrem Ruf zuliebe.

Eine der größten sozialen Umwälzungen im letzten Jahrzehnt wurde der Triumph der sozialen Netzwerke. Sie vereinen Menschen aus der ganzen Welt und eröffnen neue Kommunikationskanäle für Unternehmen.

IT-Sicherheit wird immer bedroht, wenn ein Angreifer eine Sicherheitslücke entdeckt. Also Schwachstellen-Management sollte Mängel oder Lücken in der Sicherheit erkennen und beheben.

Das Bundesamt für Informationssicherheit definiert Cyber-Sicherheit wie folgt: «Internetsicherheit betrifft alle Aspekte der Sicherheit in der Informations- und Kommunikationstechnologie. Dies umfasst alle Informationstechnologien Kommunikation, Anwendungen, Prozesse und verarbeiteten Informationen auf seiner Grundlage».

Andere Experten gehen noch weiter, Z. B. For Sven Janssen, Regional Director für Zentraleuropa bei Sonicwall. Für ihn beinhaltet dieser Begriff auch den physischen Schutz von Gebäuden und Serverräumen sowie Maßnahmen zum Schutz vor Malware, Netzwerksicherheit und Schutz von cloud-Infrastrukturen, Mobile Szenarien.

Der Kampf gegen Industriespionage ist die oberste Priorität, wobei die Obrigkeit sollte ein Vorbild sein. Das Management der Gesellschaft soll ein Konzept und Leitlinien mit einem ganzheitlichen Ansatz für alle Bereiche entwickeln. Die Analyse der Risiken und Schwachstellen ist eine nützliche Grundlage dafür. Arbeitnehmer müssen darüber informiert werden und sich an der Entwicklung des Konzepts beteiligen.

Hohes Maß an Loyalität zu den Mitarbeitern und Interesse an Ihrer Arbeit ist wichtig für Cyber-Sicherheit. Dazu trägt eine gute Belohnung sowie die Anerkennung der Mitarbeiter durch die Führung. Dies ist besonders wichtig für Computer- und IT-Profis, da sie den größten Schaden zufügen können. Die Mitarbeiter müssen informiert werden über die möglichen Gefahren und Risiken im IT-Bereich und Maßnahmen, die sie ergreifen müssen. Sie müssen überzeugt sein, dass sie auch vorsichtig in ihrem sozialen Verhalten gegenüber dem Unternehmen sein sollten. Industriespionage, die auch Folgen für die Cyber-Sicherheit hat, vollzieht sich oft durch soziale Kontakte.

Das Management sollte die Einhaltung des Gesetzes über den Schutz von Daten in Unternehmen bewachen. Zum Beispiel, nach Meinung eines sächsischen Mitarbeiters für den Datenschutz entsprechen unverschlüsselte E-Mails mit professionellen Geheimnisse nicht mehr dem technischen Stand, dies gilt insbesondere für Ärzte, Apotheker, Juristen und Sozialarbeiter.

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Entwicklung des Systems des automatisierten Steuerungsprozesses der Saatgut-Trocknung in der Kondensationskammer

In der gegenwärtigen Entwicklungsphase der Volkswirtschaft des Landes besteht eine der Hauptaufgaben darin, die Effizienz der sozialen Produktion auf der Grundlage wissenschaftlicher und technischer Prozesse zu steigern und alle Reserven voll auszuschöpfen. Diese Aufgabe ist untrennbar mit dem Problem der Optimierung von Entwurfslösungen verbunden, mit dem die notwendigen Voraussetzungen geschaffen werden sollen, um die Effizienz von Investitionen zu steigern, ihre Amortisationszeit zu verkürzen und die größte Steigerung der Produktion für jede verbrauchte Griwna sicherzustellen. Erhöhte Produktivität, die Freisetzung von Qualitätsprodukten, verbesserte Arbeitsbedingungen und Ruhekräfte sorgen für Lüftungs- und Klimaanlage, die das notwendige Mikroklima und die Qualität des Innenraumklimas schaffen.

Der Komplex technischer Mittel und Geräte zur Aufbereitung der Luft mit den eingestellten Parametern und der Wartung des optimalen oder eingestellten Zustands der Luftumgebung im Trockner (unabhängig von Änderungen externer und interner Faktoren) wird als Klimaanlage bezeichnet. Mit der Klimaanlage können Sie die eingestellte Temperatur, Luftfeuchtigkeit, Reinheit, Gaszusammensetzung, aromatische Gerüche, den Gehalt an leichten und schweren Ionen und in einigen Fällen den konstanten Luftdruck automatisch aufrechterhalten.

Das Trocknungsmittel wirkt hier wie bei der konvektiven Kammertrocknung als warme Luft. Im Gegensatz zur konvektiven Kondensation erfolgt die Trocknung jedoch nach einem geschlossenen Prinzip. Die erhitzte Luft wird nicht aus der Kammer entfernt und wird gekühlt und weiter in den Trocknungsprozess einbezogen. Die Luft strömt mit Hilfe eines Ventilators durch die Kammer, tritt in den mit einem Kühler ausgestatteten Verdampfer ein, die Lufttemperatur sinkt, infolge der Feuchtigkeit wird Kondensat durch die Rippen des Kühlers und wird mittels eines Schlauches entfernt. Bei der Kondensation wird Wärmeenergie erzeugt, die zur Erwärmung der Luft zur weiteren Trocknung gesendet wird.

Saatgut-Trocknungssysteme zeichnen sich durch ihre äußerst vielfältigen und komplexen Arbeitsmittel, die Komplexität ihrer Hilfsprozesse, die große Länge des Bereichs, die großen Abmessungen der Geräte und die große Anzahl von Wartungspersonal ohne Automatisierung aus.

Die Saatguttrocknung ist die Erzeugung und automatische Unterstützung (Regulierung) aller oder einiger Parameter (Temperatur, Luftfeuchtigkeit, Bewegungsgeschwindigkeit) der Luft auf einem bestimmten Niveau im geschlossenen Raum, um optimale meteorologische Bedingungen zu schaffen, die für

das Trocknen am günstigsten sind, um den technologischen Prozess durchzuführen und kulturelle Werte zu bewahren .

Auf dieser Grundlage sollte das Steuersystem Folgendes umfassen: Temperatursensor des Trocknungsmittels (Luft) am Einlass der Trockenkammer, Feuchtigkeitssensor am Auslass der Trockenkammer, Verflüssigungssatz, Lichtmaschine, die die Heizleistung des Heizgeräts steuert, Steuervorrichtung, die die Heizleistung einstellt Temperatur des Trocknungsmittels (Luft) und steuert die Kondensationseinheit und die Fernbedienung des Bedieners, mit der der Systembetriebsmodus eingestellt wird.

Da das System eine Visualisierung und Steuerung des technologischen Prozesses bereitstellen muss, muss es ein Teilsystem zur Informationsunterstützung für die Arbeit des Bedieners enthalten. Dieses Subsystem besteht aus einer Mensch-Maschine-Schnittstelle, der Registrierung von Prozessparametern und der Signalisierung, dass die Parameter eingestellt sind.

Darüber hinaus muss das System die Archivierung laufender technologischer Prozesse bereitstellen, sodass es über ein Subsystem zur Archivierung von Parametern und Ereignissen verfügen muss, einschließlich einer Datenbank und eines Sicherungsspeichers

Die Automatisierung thermischer Prozesse erhöht die Zuverlässigkeit thermischer Geräte, erhöht die Effizienz der Installation (durch Reduzierung von Transienten und Aufrechterhaltung stabiler Parameter auf einem bestimmten Niveau) und ermöglicht durch die Steigerung der Produktivität die Freigabe einer großen Anzahl hochqualifizierter Servicemitarbeiter für die Arbeit in anderen Bereichen der Wirtschaft .

Die Aufgabe des Entwurfs von Kontrollsystemen für die Saatgutd Trocknung wird durch die Wahl eines rationalen Automatisierungsschemas bestimmt, das einen zuverlässigen unterbrechungsfreien Betrieb in allen Phasen eines bestimmten technologischen Prozesses mit maximaler wirtschaftlicher Wirkung gewährleistet, indem die Produktivität des Wartungspersonals erhöht und die höchste Klarheit beim Betrieb automatisierter Geräte erreicht wird.

Im Prinzip unterscheiden sich Kondensationstrocknungskammern nicht von herkömmlichen konvektiven. Sie gehören zur gleichen Klasse mit Konvektions-, Kammer-, Luft- und Trockenmittel, das warme, feuchte Luft liefert. Der Hauptunterschied zwischen einem Kondensatortrockner besteht darin, dass die erwärmte feuchte Luft nicht wie in den meisten konvektiven Trocknungskammern aus der Kammer entfernt wird, sondern zu einer Kondensationsanlage gelangt, wo sie gereinigt, erwärmt und erneut in den Trocknungsprozess einbezogen wird. Dies spart Wärmeenergie, die normalerweise für die Entfernung des verbrauchten feuchten Trocknungsmittels aus der Kammer aufgewendet wird.

Die Steuerkarte analysiert jede Sekunde Hunderte von Daten und Parametern, zum Beispiel: Umgebungstemperatur; Freontemperatur am Einlass und Auslass; Lüftergeschwindigkeit; Kompressortemperatur usw. Unter Berücksichtigung all dieser Optionen passt das Board den Klimaanlagenmodus und die Einstellungen an,

um die Energieeffizienz zu maximieren, ohne den Verbraucherkomfort zu vernachlässigen.

Die in der Laufzeit erzeugten Steuerungsauswirkungen werden von physischen Einheiten in einen digitalen Wert mit einem Bereich von 0 bis 27648 umgewandelt und über einen Kommunikationskanal an ein entferntes E / A-System übertragen. Ein entferntes E / A-System mit einem Digital-Analog-Wandler wandelt es in einen elektrischen Wert mit einem Bereich von 4 bis 20 mA um, der dem Aktuator des Steuerobjekts zugeführt wird. Der Istwert am Steuerobjekt wird von einem Sensor mit einem Bereich von 4 bis 20 mA gemessen. Der elektrische Wert wird in einen Digital-Digital-Wandler des Remote-E / A-Systems in einen Digitalwert mit einem Bereich von 0 bis 27648 umgewandelt, der über den Kommunikationskanal der Laufzeitumgebung übertragen wird, der ihn in physische Einheiten umwandelt und über eine Mensch-Maschine-Schnittstelle visualisiert.

Der Hauptparameter, der beim Trocknen von Samen direkt gesteuert wird, ist die Restfeuchtigkeit. Es ist schwierig, diesen Parameter zu messen. Um Informationen über den Trocknungsgrad der Samen zu erhalten, wird am häufigsten der Parameter Feuchtigkeit (Luft) am Auslass der Trockenkammer verwendet. Die Trocknung wird mit einer Trockenmittelfeuchtigkeit von 10% abgeschlossen.

Das Prozesssteuerungs-Subsystem besteht aus Informationserfassungsgeräten (Lufttemperatursensor am Einlass der Trockenkammer, Feuchtigkeitssensor am Auslass der Trockenkammer), Standards und Gerätezuständen (Temperatur- und Feuchtigkeitssollwerte sowie Grenzwerte dieser Parameter). Steuerprogramme, die die Bildung von Steueraufprall, Notfallschutz, das Umschalten des Geräts in den manuellen Steuermodus und Ausführungskörper (Lichtmaschine) implementieren.

In Übereinstimmung mit den Anforderungen des Steuerungssystems muss das Teilsystem der Informationsunterstützung für die Arbeit des Bedieners den technologischen Prozess auf der Grundlage von Daten visualisieren, die von einer speicherprogrammierbaren Steuerung erhalten werden. Das Informationssystem wird auf der Basis eines Personalcomputers und der Kommunikation mit der speicherprogrammierbaren Steuerung über die Ethernet-Schnittstelle implementiert.

Die Prozessautomatisierung ist eine der komplexesten Aufgaben in der Technologie, deren Lösung nicht immer zur Qualitätskontrolle des Prozesses führt. Dies liegt an der Tatsache, dass der Entwurf des ACS eines Objekts die Auswahl von Automatisierungswerkzeugen, das Zeichnen eines Strukturdiagramms, die Auswahl und Berechnung der Übertragungsfunktionen der Verbindungen des Systems umfasst. Die Schwierigkeiten hängen auch zusammen, da häufig die Übertragungsfunktion des Steuerobjekts unbekannt ist. Daher ist es notwendig, seine Forschung durchzuführen und die Übertragungsfunktion und ihre Parameter beim Entwurf der ACS-Einrichtung zu bestimmen.

Section 08 French Language Section

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Néologismes de l'époque de la Révolution française

Les événements historiques de la Révolution française (1789-1799) ont non seulement changé radicalement l'ordre social, économique et politique en France, mais ont également exercé leur influence sur tous les domaines de la vie publique de l'époque, sans exception. La langue française reflète les grands changements qui se sont produits dans la société française à cette époque. De nouveaux concepts ont trouvé leur expression dans de nouveaux mots, la situation des années révolutionnaires a donné naissance à de nouveaux termes, des changements dans les conditions sociales ont entraîné des changements dans le sens des mots.

Toute une série des mots, qui existaient dans la langue, a pris à l'époque de la Révolution de nouvelles significations, qui sont devenues dominantes, ou de nouvelles connotations sémantiques. C'est, tout d'abord, le mot *révolution* proprement dit (dans le dictionnaire de 1694 il apparaît comme un terme astronomique, dans le dictionnaire de 1718 il a la définition «un changement dans les affaires publiques», dans le dictionnaire de 1798 il signifie, tout d'abord, la révolution survenue pour le moment, puis «coup d'État social, qui conduit à un nouvel ordre public»). De plus, ce sont les mots *patriote* (dans le dictionnaire de 1762 il est défini comme synonyme de mot *sujet*), *citoyen* (dans le dictionnaire de 1694 c'est simplement *un citoyen, bourgeois*), *peuple*, *aristocrate*, *liberté*, *constitution*, *réaction*, *commune*, *décret*, *convention*, *terreur* (le terme *terrorisme* vient d'ici) et beaucoup d'autres, ainsi que des verbes comme *moraliser* (auparavant il a eu la définition «moraliser qqn, lui faire la morale», verbe neutre, maintenant se transforme en verbe actif: *moraliser la société* - «assainir la société»), *niveler* (auparavant «mesurer ou vérifier avec un niveau», après la Révolution prend le sens de «égaliser»), *spéculer* (un terme philosophique, qui signifie «méditer, se livrer à la spéculation», désormais s'appliqué à la fraude financière), etc.

Un grand nombre de néologismes apparaissent également. Beaucoup de nouveaux mots avec le préfixe *contre-* apparaissent. Tout d'abord, bien sûr, le mot *contre-révolution* et ses dérivés. Plus abstraits à première vue, les néologismes de l'époque révolutionnaire, comme *agitateur* (le mot était purement négatif et signifiait «instigateur»), *alarmiste* («sèmeur de panique»), *vandalisme*, *propagande* et *propagandiste*, *journalisme* et *journaliste*. Mais ils ont bien sûr été engendrés par une atmosphère révolutionnaire.

L'histoire d'origine de certains termes est particulièrement intéressante. Ainsi, par exemple, le terme *polytechnique* est le nom donné en 1795 à l'école créée en 1794 pour former les ingénieurs des divers services de l'État et les officiers de certains

armes. Aujourd'hui on applique ce mot aux établissements d'enseignement supérieur où l'on enseigne un ensemble de disciplines, généralement scientifiques.

En ce qui concerne les verbes, pendant la Révolution dans ses différentes périodes, un grand nombre de néologismes ont été créés. Les verbes comme *députer* («déléguer»), *décréter* («promulguer un décret»), *fractionner* («créer des fractions») sont directement liés aux réalités politiques de la révolution.

Selon les mêmes modèles, à l'époque de la Révolution, de nombreux autres verbes se forment qui ne sont pas liés directement à la question à l'ordre du jour: *utiliser*, *idéaler*, *activer* («mettre en activité»), *urbaniser*, *caméléoniser* ou *caméléoner* («changer de couleur»), *coquiner* («tricher»), ainsi que *démoraliser*, *dépopulariser*, *centraliser* et beaucoup d'autres.

Enfin, s'il est vrai que l'époque de la Révolution française dans une grande mesure créé la langue de la politique et du journalisme modernes. Le dictionnaire de la révolution, la rhétorique révolutionnaire, la conscience révolutionnaire, la mentalité révolutionnaire et les formes de son expression, le symbolisme et la sémantique de la Revolution attirent l'attention aujourd'hui et sont l'un des plus populaires et prometteurs domaines de recherche.

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Méthodes et modèles mathématiques en économie

Énoncé du problème. Une augmentation de la concentration des opérations minières peut être due à l'influence de facteurs à la fois intensifs et extensifs. C'est cette circonstance qui sert de frontière qui sépare l'intensification de la concentration. Par conséquent, le recherche des composantes des entreprises du complexe minier est une tâche scientifique urgente.

Analyse des recherches et publications récentes. Les questions liées au maintien de la capacité des mines, à l'utilisation efficace des ressources technologiques de l'exploitation minière ont attiré l'attention d'un certain nombre de chercheurs bien connus. Parmi eux tels que Astakhov O.S., Bondarenko V.I., Burchakov A.S., Vorobyov B.M., Gryadushiy Y.B., Hrinov V.G., Ilyashenko V.G., Kolokolov O.V., Kuzmenko O.M., Kurnosov A.T., Kukharev V.N., Salli V.I., Sapitskiy K.F., Khorolskiy A.O. et d'autres. Dans cet article, une tentative est faite pour résoudre ce problème à travers le prisme de la nécessité d'assurer la production de charbon non subventionnée dans le Donbass par une coordination et une interaction efficaces des projets d'extraction du charbon avec des processus innovants. Sur la base d'une analyse rétrospective de la situation de l'industrie [1], les auteurs ont fait l'hypothèse que sans l'évaluation du potentiel des entreprises et la recherche de réserves internes, l'industrie ne peut pas se retirer de la crise.

Le but de l'article est d'étudier les lois et de développer un système d'évaluation de la gestion des ressources de production de base pour augmenter le potentiel des schémas technologiques de production de charbon, réduire le niveau de perte des mines de charbon de l'État.

Aperçu du principal matériel de recherche. Aujourd'hui, lorsque volumes de production de charbon dans de nombreuses mines sont beaucoup plus faibles que celles prévues lors du processus de conception (que ce soit en raison de facteurs économiques, où de changements dans les conditions minières et géologiques, etc.), la question se pose de l'utilisation irrationnelle de grandes ressources de production, capitalisées dans les mines. L'organisation de la redistribution de ces ressources recèle un potentiel considérable d'amélioration de l'efficacité économique de la production de charbon. Étant donné que l'exploitation minière est étroitement liée aux conditions naturelles, la mienne est un système stochastique complexe. Par conséquent, les schémas technologiques qui en découlent ne sont pas si uniques, comme ils sont dotés de profondes réserves internes (potentiel) générées, y compris, et la topologie du réseau inhérente à ce zone spécifique du dépôt [2, 3].

La caractéristique la plus complète et la plus générale du système de production est son potentiel. Le potentiel doit être compris comme la capacité de la mine à atteindre un résultat lorsqu'il est jugé approprié de continuer à exploiter le

système. Le résultat qui détermine l'efficace du système peut avoir différentes caractéristiques quantitatives et qualitatives. La triple nature de la mine en tant que système naturel, industriel et économique et objet d'introduction d'innovations permet de conclure qu'un indicateur qui évalue le schéma technologique de la production de charbon dans un certain nombre d'autres devrait résumer sa triple essence. À notre avis, le potentiel du schéma technologique de la mine peut être suggéré comme tel indicateur [4].

Le potentiel minier est un indicateur quantitatif qui détermine l'emplacement d'une mine dans un certain nombre d'entreprises charbonnières en donnant la priorité à l'investissement d'une reproduction simple ou étendue selon les principes du marché. La définition proposée combine les facteurs technologiques (volume de production ou débit des liaisons), le potentiel économique et le degré d'approvisionnement. Étant donné que la mine est un système dynamique, elle ne peut pas avoir d'estimations "éternelles", chacune d'elles n'est valable que pour un certain intervalle de temps [5].

En conséquence, un système scientifiquement solide pour évaluer la gestion des ressources de production de base a été créé afin d'augmenter le potentiel des schémas technologiques de production de charbon et de réduire le niveau de perte des mines de charbon de l'État.

Pour ce faire, les tâches suivantes ont été résolues:

- quantifier l'état de la mine du point de vue de la minimisation de l'impact d'entropie sur le potentiel d'innovation de l'entreprise;
- développer des approches analytiques pour l'évaluation multicritères du niveau des composants internes des schémas technologiques des mines pour gérer les processus de conservation de l'énergie;
- créer des dépendances sur l'évaluation de la rationalité d'extraction de sections complexes d'un gisement selon les principes de l'entreprise et développer un système de paramètres d'estimation sur une caractéristique de l'utilisation de la mine;
- offrir les bases de la certification des schémas technologiques des mines de charbon dans le contexte de l'évaluation des flux de production qui constituent le niveau d'innovation de la mine et qui ont le plus grand impact environnemental;
- effectuer les calculs du potentiel des schémas technologiques du groupe des mines d'antracite.

Selon le concept ci-dessus, la politique de gestion optimale du maintien de la capacité des mines en exploitation devrait être basée sur l'évaluation des réserves restantes, une bonne planification de la reproduction de la ligne de traitement et la conformité des équipements d'excavation aux conditions d'exploitation. L'augmentation de la concentration de la production passe par la redistribution des réserves restantes et l'unification des mines avec les opérations minières, ce qui permet de concentrer les ressources sur les parties du gisement où l'effet sera le plus important. La base de la modélisation de tels problèmes devrait être un système de contraintes, qui n'a pas été obligatoire dans le passé pour assurer la charge prévue sur la mine [6,7].

Toutes ces questions sont d'une importance capitale lors de la planification du développement des mines dans la région et du maintien parmi les parties opérationnelles des entreprises qui fonctionnent de manière extrêmement inefficace. Le terme développement implique la modernisation des unités technologiques du groupe prometteur de mines, l'amélioration de l'efficacité de la production à l'équilibre, le maintien de la compétitivité de l'antracite de Donetsk sur le marché de l'énergie [8].

Dans les conditions actuelles, l'inefficacité des mines est exacerbée par l'absence de changements fondamentaux dans le système de gestion de l'innovation. Tout aussi importants sont les paramètres limites du développement, qui déterminent non pas la durée de vie résiduelle d'une entreprise charbonnière, mais la limite, dont la réalisation nécessite la transition vers des méthodes plus efficaces de développement de circuits technologiques dans le temps et l'espace. Les estimations obtenues de la transformation de la structure du fonds minier et à court terme sont les données initiales pour déterminer les limites de coût pour un groupe de mines d'antracite non rentables recommandées pour transmission à la concession [9,10].

Conclusions de la recherche. La catégorie "potentiel de schéma technologique" est largement déterminée par la propriété principale de la mine de charbon - le développement dans l'espace. Cette propriété est de nature objective, car elle est due à la propriété fondamentale du charbon - sa non-reproductibilité. Le rythme de développement est déterminé par des facteurs industriels (activité humaine) et dépend de nombreuses raisons, y compris le niveau de progrès scientifique et technologique, mais le besoin de développement est donné par la nature et ne peut être exclu ou remplacé, même si la technologie du processus de production est modifiée.

Le moyen le plus efficace de résoudre le problème de l'évaluation de l'état de la mine est la méthode de Pareto multicritères, c'est-à-dire qu'on ne peut pas construire le concept d'extrema pour eux, mais on peut introduire le concept d'une situation qui ne s'améliore pas. Atteindre les valeurs optimales des paramètres du schéma technologique signifie réaliser pleinement le potentiel économique de la mine, c'est-à-dire le niveau maximum réalisable (de référence), car atteindre ce niveau rend le schéma technologique de la mine favorable à l'innovation.

Il convient de noter qu'en ce qui concerne les mines de charbon, il n'existe pratiquement aucun système d'évaluation quantitative de l'état des systèmes technologiques et les caractéristiques disparates existantes des schémas ont des erreurs fondamentales. Par conséquent, l'article propose un mécanisme pour corrélérer la qualité du schéma technologique de la mine par rapport aux innovations, en tenant compte de l'intensité des flux productifs formés pendant l'extraction du charbon. Ce faisant, ces flux ont souvent une intensité variable, qu'il s'agisse d'un changement de la demande de charbon ou d'une reproduction extensive au détriment d'avantages innovants.

Il est établi que la perte de stocks peut entraîner un raccourcissement de la durée de vie de l'entreprise ou une diminution de sa capacité de production. Les conséquences de chacune de ces options diffèrent non seulement par leur impact sur

les indicateurs techniques et économiques de la mine, mais aussi par le moment de l'impact, et les conséquences dans le second cas sont éloignées en l'avenir et se manifesteront généralement en dehors de l'entreprise dans des conditions complètement différentes.

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Communication non verbale en langue française

Il est prouvé que pendant la communication, environ 80% des informations sur une personne proviennent de la communication non verbale, puis à l'aide de gestes, de regards, de posture corporelle et d'expressions faciales. Nous voulons faire attention à l'étain avec nos mains, car chaque nation a ses propres caractéristiques, et elles peuvent nous aider à mieux comprendre la culture de la société. Ce sujet est un élément important de la communication orale, mais lorsque l'on étudie une langue, c'est précisément elle qui n'y prête pas suffisamment d'attention. Dans différents pays, les gestes qui sont à la base de la communication non verbale ont des significations et des interprétations différentes: dans un pays, un geste spécifique peut être inoffensif, et dans un autre il peut être interprété comme vulgaire et offensant [3].

Dans notre travail, nous voulons nous focaliser sur le langage corporel français. Les gestes sont fréquemment utilisés lorsque l'on parle français. Certains gestes impliquent de toucher d'autres personnes, ce qui n'est pas surprenant car les Français sont délicats. Selon la publication française "Le Figaro Madame" (3 mai 2003), une étude sur les couples hétérosexuels assis en terrasse a établi le nombre de contacts à 110 par demi-heure, contre deux pour les Américains [2].

Commençons donc par un baiser. La bise / le bisou: les amis échangent des bises sur la joue lorsqu'ils se rencontrent ou se séparent. Deux personnes qui sont présentés l'un à l'autre par un ami commun peuvent également échanger des bises, en particulier les enfants et les jeunes. Le nombre de bises et le côté de la joue pour commencer cette «procédure» varient selon la région et de nombreux autres facteurs, mais l'option la plus courante est deux bises (un sur chaque joue), pris entre des membres de la même famille et des amis, quel que soit leur âge.

Un autre geste intéressant c'est «Mon œil» montre une méfiance à l'égard de ce qu'il a entendu. Le mouvement de la paume au-dessus de la tête signifie «j'en ai ras le bol, j'en ai ras la casquette, j'en ai pardessus la tête, j'en ai ma claque, j'en ai jusque-là». Une gifle sur le poignet signifie «je pars, je me casse, je me tire, je m'en vais, je m'arrache...». Reliez les doigts des deux mains, les pouces tournent, ce geste signifie «se tourner les pouces». Une main simulant la bavarde (les doigts sont droits, le pouce est en dessous des 4 restants d'en haut, nous les fermons et les ouvrons) signifie «ferme ta bouche, la ferme, boucle-la, ta gueule, tais-toi». Mettez un poing sur votre nez et tournez-le autour de son axe - cela signifie «être bourré, être pété, être torché». Si vous voyez qu'un ami a mis sa main à son oreille, comme la façon dont ils ont mis un coquillage pour «écouter la mer», répétez à nouveau votre dernière phrase. Ainsi, un ami a montré qu'il n'avait pas entendu ce qui avait été dit. Et le dernier geste que nous voulons mentionner est «Quelle barbe! Comme c'est

ennuyeux! Quel raseur!». Du dos de la main, le Français tient plusieurs fois la joue de l'oreille au menton et au dos. Ce geste montre que l'interlocuteur est très ennuyé.

Bien sûr, ce ne sont pas tous les gestes que les Français utilisent pour communiquer, il y en a bien d'autres. Mais nous avons décidé de prêter attention aux principaux. Comme on dit dans l'article «On parle avec les mains»: «Je travaille en contexte multiculturel, et je remarque en effet que mes élèves me disent souvent des choses avec leurs mains... qui m'échappent et auxquelles j'essaie de donner du sens. Certains gestes sont bien internationaux (avec des petites variantes parfois dans la façon de les faire), mes élèves ont découvert quelques nouveaux gestes et, surprise, certains gestes sont bien connus mais ont une autre signification dans d'autres cultures» [1].

Par conséquent, afin d'éviter les malentendus, il est important de comprendre le langage non verbal.

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Automatisation du processus de support micro-climatique

Agriculture est une industrie économique qui est conçue pour fournir de la nourriture à la population et pour obtenir des matières premières industrielles. Cette industrie est présente dans presque tous les pays du monde et emploie environ 1,1 milliard de personnes. Selon le Comité des statistiques de l'État en 2018, 1,8 million de personnes sont employées dans ce secteur.

En raison des conditions climatiques, en l'Ukraine cultures agricoles ne peut pas cultiver toute l'année, aussi des produits frais sont dans les entrepôts. Actuellement, cette dernière méthode est utilisée dans les régions méridionales de l'Ukraine.

Les produits sont dans les différentes étapes de la production: préparation des semis pour la saison, développement de la saison, préassemblage des produits finis, obtention des récoltes pour la saison. De plus, l'utilisation de serres permet une récolte tout au long de l'année. Sur la base de cette problématique, le développement de systèmes de contrôle pour le support du microclimat dans les serres est pertinent pour l'agriculture.

La figure 1 montre la structure typique d'une serre de pièce. En tant que Power Data Control: air, eau, sol, humidité, niveau d'eau, lumière initiale.

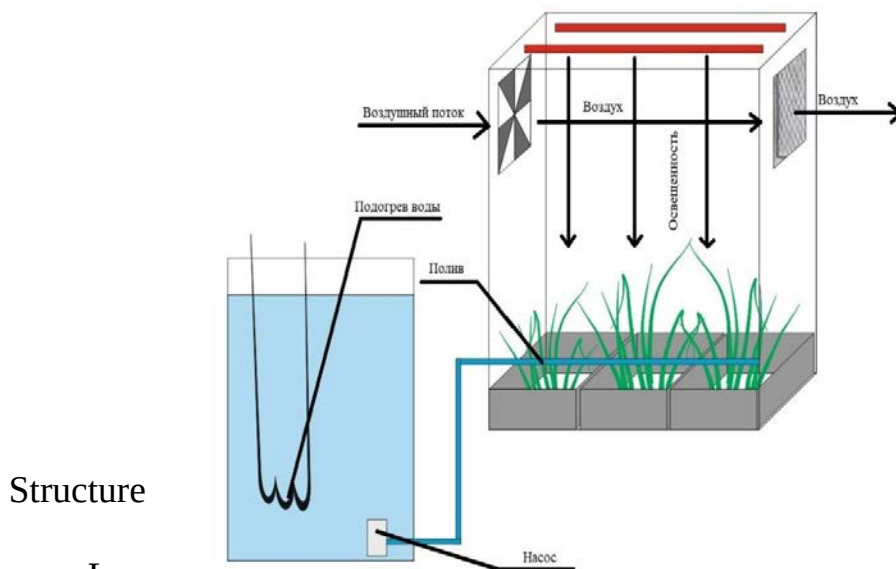


Figure 1 -
d'une serre de pièce

La chambre à coucher fonctionne correctement selon deux modes - «nuit» (de 22 à 6 heures) et «jour» (de 6 à 22 heures), qui sont sélectionnés en fonction de l'heure du jour. Sur la mode «nuit», les lumières sont éteintes. Les paramètres du microclimat en fonction de l'heure sont indiqués dans le tableau 1.

Tableau 1 - Paramètres de climat ambiant d'une serre

Paramètre	Mode jour	Mode nuit
Répéter la température	20÷25 °C	15÷20 °C
Répétabilité	80÷90 %	70÷80 %
Vologda	90÷95 %	80÷90 %
Température de l'eau	20÷25 °C	
Température du sol	15÷20 °C	

En fonction des exigences du fonctionnement de l'installation, le système de contrôle du support du microclimat dans une serre devrait fonctionner selon deux modes: manuel et automatique. Dans les deux modes, l'interface homme-machine doit afficher la température de l'eau, de l'air et du sol, leur humidité, la présence d'eau dans le réservoir d'irrigation et sa température. L'accès à l'interface homme-machine doit être implémenté à l'aide du Wi-Fi sans fil. L'interface homme-machine est censée être implémentée dans l'application mobile du système d'exploitation Android. En outre, dans le mode manuel de l'utilisateur à l'aide d'applications mobiles doit pouvoir contrôler l'éclairage, l'alimentation en air et en eau de son chauffage.

Le système de commande doit pouvoir fonctionner dans deux modes automatiques «nuit» et «jour», et alterner entre eux en fonction de l'heure du jour. En cas de faible humidité du sol en mode «jour», la pompe doit être irriguée au goutte-à-goutte avec de l'eau à une température de 20 à 25 ° C. L'eau doit être chauffée lorsque sa température descend en dessous de 18 ° C. Lorsque l'eau est chauffée, la pompe ne doit pas fonctionner. Lorsque le niveau d'eau est bas, une alerte d'avertissement doit être déclenchée dans le réservoir. Ce message est émis via l'application mobile sous forme de message, tandis que le chauffage ne doit pas se produire.

En raison du large éventail de paramètres pris en charge pour les serres et de la nécessité de les modifier, ce contrôle peut être classé dans un type discret et, par conséquent, le matériel et le logiciel permettant de contrôler le climat de la serre sur la base desquels développer un système de contrôle approprié.

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L'introduction à la carrière du minier

Quand on parle du métier du minier, il s'agit non seulement des mineurs-charbon, minerais, métaux précieux, mais aussi des constructeurs de mines, des réparateurs et des installateurs de mines.

L'exploitation minière est née dans les temps anciens et s'est développée en liaison directe avec la structure socio-économique de la société. Historiquement, il existe deux types d'exploitation: l'exploitation ouverte et l'exploitation souterraine. Il existe également une méthode du minier par forage et une technologie d'exploration des gisements en mer. Depuis le dernier tiers du XXème siècle, l'exploitation minière est une production complexe à grande échelle pour assurer la société des matières premières.

La massivité et le caractère unique de la profession sont évidents. Les spécialistes de mines sont traditionnellement en demande dans tout le monde entier. Cependant, il faut se rappeler que travailler dans cette spécialité n'est possible que dans les régions où se déroule l'exploitation minière. En outre, la spécificité du travail du mineur réside dans son danger potentiel, par conséquent, le travail du mineur nécessite un maximum de responsabilité et de soin.

Pour obtenir la profession, les travailleurs mineurs engagés dans des travaux peu qualifiés suivent souvent une formation directement sur le lieu de production. Vous pouvez acquérir des qualifications dans les domaines de l'exploitation minière dans les établissements d'enseignement secondaire technique spécialisé, dans les facultés minières des universités techniques, ainsi que dans les universités minières spécialisées.

En concluant, je crois que dans mon état il y a assez de gisements perspectifs à examiner et peut-être réexaminer. C'est pour cette raison que j'ai choisi le métier du minier et je voudrais me perfectionner et devenir un vrai spécialiste dans ce domaine.

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Auchan en Ukraine: l'analyse du fonctionnement

La chaîne de distribution française Auchan est représentée en Europe, en Afrique et en Asie et a été créée en 1961 au sein du groupe Auchan. En 2015, la structure du Groupe Auchan a été transformée en Auchan Holding, qui comprend trois domaines d'activité: le commerce de détail, l'immobilier commercial et les services bancaires.

En Ukraine, la chaîne de magasins Auchan a été ouverte en 2007. AUCHAN Ukraine présente un nouveau concept pour l'Ukraine - "hypermarché discounteur". Ce sont les prix les plus bas pour toute la gamme du magasin. L'objectif est d'améliorer le pouvoir d'achat de leurs clients. AUCHAN est représenté à Kiev, Krivoy Rog, Zaporozhye, Lviv, Odessa, Chernivtsi, Dnipro et Kharkov.

AUCHAN offre à ses clients le choix le plus large:

- La nourriture. En général, ce sont des produits frais de haute qualité qui répondent aux exigences les plus élevées.
- Les articles pour la maison.
- Les produits pour les loisirs, les ordinateurs et les téléviseurs - du plus simple au plus moderne, ainsi qu'une large sélection de livres et de jouets pour enfants.
- Les vêtements pour toute la famille et pour tout portefeuille.
- Biens saisonniers, biens pour donner et se reposer en plein air.

Le principal objectif d'AUCHAN en Ukraine est d'ouvrir ses nouveaux magasins conceptuelles dans toutes les régions du pays, tout en privilégiant la coopération avec les fabricants et fournisseurs ukrainiens, contribuant ainsi à la création d'emplois. À ce jour, AUCHAN Ukraine a fourni des emplois à plus de 3800 employés qui ont suivi une formation préliminaire conformément à la méthodologie et aux valeurs de l'entreprise.

La société Auchan se concentre sur les clients moyens et leur permet d'acheter les bons produits à un prix abordable. Une direction relativement nouvelle est spécialisée dans les produits de jardin, la décoration et les produits pour animaux de compagnie. Le 20 juin 2017, la société Auchan Ukraine a annoncé le rachat de la chaîne d'hypermarchés Karavan, ce qui permettra à Auchan d'étendre sa représentation dans les villes ukrainiennes.

Je crois que l'hypermarché Auchan est très pratique pour les gens, car il y a des produits non seulement pour la maison mais aussi des aliments et des appareils électroménagers. Il existe également des produits de production propre, tels que des petits pains frais. Et c'est toujours délicieux! L'assortiment de ce magasin satisfera les besoins de tout client. Il y a aussi un personnel très serviable, et c'est important pour les acheteurs.

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The Concept of an Environmentally Friendly Enterprise in the Field of Effective International Marketing Policy in Poland and Ukraine

Special approach to the international logistic providing has to be concerning use of streams of alternative energy sources. In the international logistic ensuring innovative activity it is necessary to use widely technologies of logistic reengineering in combination with the supporting virtual logistic procedures. Expediently thanks to system increasing logistics service to develop wind power and to support construction of solar power stations in Poland and Ukraine, using the leading innovative technologies of energy saving.

In the modern virtualized and globalized economy use of synergy effects at resource management of the industrial enterprise is very importance. The synergy as the scientific tool generalizing and aiming the movement of economic processes is important in e-economy. It is necessary to investigate the mechanism of network structures creation of financial, marketing activity management. In modern conditions the efficiency of financing and investment of capital in fixed and current assets of the enterprise production divisions promoting the international electronic trading and business is estimated.

The institutional and innovative directions of integration processes are allocated in the system of effectively constructed the enterprises international logistic strategy. It has the implementation during marketing interaction of economic agents of Poland and Ukraine in the EU united innovative space. Separate stage it is necessary to analyze features of carrying out market researches, processing's of primary and secondary marketing information when determining extent of the competition in the market, market barriers of an entrance and exits.

Stoyan Koyev investigates communication aspects of marketing interaction within the subject of housekeeping, defines the main barriers in business communications. It appropriate allocates barriers and defects in communication, business communications of the modern organizations such as: traditions, the environment, features of information channels, culture, perception of a certain role, efforts influencing contents of messages, image of participants [Koyev, 2017, p. 80-83]. According to us competitive capacity of the industry on the basis of complex use of competitive condition of the industrial enterprise economic processes matrixes is defined.

Technological changes in modern automobile building assembly production which are formed on the basis of progressive change of technological ways provide widespread introduction of technological and marketing innovations on the basis of Toyotarity conception. Stanisław Borkowski understands Toyotarity as evidence-based interaction in a "human – machine" and "human – human" plane with use of process approach in style of the Japanese culture, practices of the Toyota company

[Borkowski, 2017, p. 9]. At the same time there are economic and technological innovations which constantly improve the content of technological and logistic service and work of workers. Such noted attributes demonstrate optimality of the Toyota model in a modern turbulent business environment. At the same time instant reaction of an economic and technological system of manufacturing enterprise to instant changes and calls of an external marketing environment is necessary.

Jan W. Wiktor investigates a goods definition in the context of free movement of its international logistic streams within united European space. He notes about broad interpretation of goods category within free market and logistic regulators of the EU. At the same time the moved objects which are available in a turn in all EU countries are defined; agricultural products; the waste directed to the subsequent redoing that can be a component of the enterprise market offer. In Eurointegration Marketing Communication Interaction of the Virtual Logistic Enterprises of Ukraine and Poland energy resources, gas streams in pipelines taking into account power networks of distribution are also significant. Specific productional flows of such goods as coal, iron, steel, uranium, radioactive materials, weapon are considered in limited volumes [Wiktor, 2005, p. 63, 64].

In our opinion, special approach to the international virtual logistic providing in business interaction of market agents of Poland and Ukraine has to be concerning use of alternative energy sources flows. These flows are generated and distributed at consumption of biogas, wooden sawdust, industrial and household garbage, collateral heat of housekeeping subjects [Kasian, 2016]. At the same time it is necessary to care systemically for application of high-tech thermal insulation in energy networks.

We offer the methodical approach to capital and quality of produce of enterprise, based on analysis of elements of quality. The methods of performing the dynamic analysis of movement of enterprise capitals elements are worked out. Within this research there were carried out an analysis of forming processes of capital structure dynamic characteristics; analysis of modern approaches towards financing characteristics management; there was created a conceptual scheme of model of quality managements of technological process of the industry enterprises.

The model consists of four directions: investment of the capital, the politician of financing, the marketing, quality and ecological policy, each of which contains three levels: economical, regional and operational; such structurization of the modelling scheme leads to breakdown of investigated set of processes on 12 blocks. The basic idea of a submodel of investment policy is the choice of the most meaning elements of industrial stocks, studying and the analysis on the selected works i a kind of material resources of the corresponding market with the purpose of definition on it of a level of a competition. Depending on which in the raw market and values forecasting parameters of conditions of the offer of a resource the economic substantiation of the conclusion of optimum conditions of supply with suppliers is developed [H. Mruk, 1999; J.W. PETTY, 1994].

Therefore, effective virtual modeling of the international logistic ensuring implementation of innovative technologies is an important factor of increase in level of competitiveness of the industry of Poland and Ukraine. Use of modern marketing

communication and logistic technologies in the world for improvement of psychological perception and economic, social support of the maximum use of renewable energy resources is significant. At the same time the leading innovative technologies of energy saving which are based on generation of alternative energy sources in a complex take. It is expedient to apply innovative technologies of a logistic recycling, to carry out sorting of garbage.

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How the “perfect storm” influences on modern economy and management

It took only a few months of the new 2020, and the world has already changed beyond recognition. One after another, events that no one could have predicted follow, and together they add up to the so-called “perfect storm”.

The Cambridge English Dictionary defines this phenomenon as “an extremely bad situation in which many bad things happen at the same time” [1]. The Oxford English Dictionary has published references for "perfect storm" going back to 1718, but the first use of the expression comes from the issue about the meteorological circumstances in Texas in 1936. [2].

Nowadays scientists tell about a combination of problems such as extreme weather, climate breakdown, species loss, water scarcity and a food production crisis. Each of these crises individually could be dealt with, but they all complement each other. Moreover, a crisis in one area leads to problems in another. For example, excessive heatwaves can increase the global heating, because they release huge amounts of stored carbon from affected ecosystems. It has been clearly seen in the Australian bushfires, which are already substantially influencing the amount of carbon in the atmosphere. The interconnections do not stop there: as the heatwaves damage natural ecosystems, killing off wildlife and flora, they also bring to greater water scarcity, and in turn damage agriculture. These combined effects exacerbate the harm done to people struggling with food and water shortages, in a vicious cycle [3].

Another important factor affects both political, economic and environmental issues: Saudi Arabia — the largest oil exporter in the world — cut its prices to levels not seen in 30 years after it could not convince Russia to decrease their oil production. The 13 members of OPEC (the Organization of the Petroleum Exporting Countries) along with some non-members had met to deliberate on how to react to the falling demand caused by the spreading coronavirus. When airlines do not have passengers, for instance, planes do not need fuel and oil companies lose revenue from some of their biggest purchasers.

After conversations fell apart, Saudi Aramco, the Saudi state-owned oil company, said it would give great discounts to win over buyers. It is planning to increase its own production to more than 10 million barrels a day to undermine competitors. Oil prices lost more than 20% on Monday, March 9 because of the unexpected supply shock. Due to the oil surplus on the market at a price that is too low, other manufacturers will not be able to compete with Aramco; smaller firms could even fail [4]. During flagging demand, the price of WTI crude oil plummeted 25% on March 9th to \$30/bbl. Although this will be good for customers, it will substantially damage shale oil producers [5].

Perhaps the main factor in this “perfect storm” is the coronavirus COVID-19. The unease in the market has been growing since at least February when concerns

around the coronavirus began to strengthen. A few weeks ago, it looked like the impact of the virus would be restricted to enterprises with exposure to China where business activity in factories and retail shops had stopped. Starbucks, for example, closed all its stores in the region for a period.

Now though, the virus has got around to more than 100 countries, infected more than 114,000 people all around the world and killed more than 4,000 so far. That public health crisis has now hurt the world stock market and economy [4].

Since the coronavirus began late last year in Wuhan, China, global commerce has slowed down substantially as factory closing causes supply chain failures, nervous tourists and business travelers stop flying, and customers stop eating out, shopping, and going to the movies.

United Airlines began suggesting flight cancellations, and Delta, American, and JetBlue have refused fees. Airlines have cut or reduced flights to cities affected by the outbreak. According to the International Air Transport Association, the spread of the virus could cost the airline industry \$113 billion.

Hundreds of companies have also published warnings that the virus spread may affect their financial results this year. Apple closed factories in China in February (they've since reopened), as did Honda. According to Dun & Bradstreet, more than 51,000 companies all over the world have at least one supplier in the region affected by the virus. In February, Wynn Resorts said the epidemic was costing the company \$2.6 million per day. However, this question is rather ambiguous. The fact is, the regular (ho-hum) flu kills about 4,000 Americans per week during "flu" season. Nevertheless, because the media does not make a sensation of the ho-hum flu, only 5%-20% of U.S. residents even bother to get a flu shot. The Coronavirus is not a joke, but the response to it seems quite exaggerated comparing to the annual flu.

On a daily basis, we see the total number of cases (118,905). Although this data is nice to know, it is not the information that is significant. Some of those cases originated in December and January. Most of those who had it then have recovered and are no longer infectious. The relevant data is the number of "active" cases, and worldwide it reached 58,747 on February 17th and, by March 4th had fallen to 38,501. As of March 11th, active cases stood at 49,521. This is about 42% of the headline number. Only 6,046 (12%) of those active cases are severe (43,475 are mild). It is also important to know that the quantity of recoveries in China are much higher than the quantity of new cases there, and most of China is now back to work. New cases numbered 26 in China on March 10th, and only 7 on March 11th. On the other hand, because the virus which permeated to other countries originated much later than in China, now new cases in the rest of the world are higher than recoveries.

Moreover, the media inform, sometimes hourly, the number of deaths (4,270). Should we suppose that all age groups are equally receptive? There are almost no dooms in younger populations with most of the danger being in the elderly cohorts, those over 70. Not only is the chance of contact low, but the death rate in the working age population from the virus is also rather low. The public reaction appears to be "overreaction" [5].

The probability that markets will survive the coronavirus without going into a financial crisis and recession is minimal. The situation is aggravated by the fact that everyone has long been waiting for the crisis. Now the effect of a self-fulfilling forecast can work. Economics is to a large extent psychology. Moreover, if a critical mass of economic agents decides that the time has come for a crisis, they will begin to make decisions that will make this crisis inevitable.

At the same time, due to the same problem, interruptions in the supply of goods began. First of all, we are talking about antiseptics for hands, cleaning products and some food products. People do not go to work, so factories close. That is why the supply of goods by default will decline.

While demand is not slowing, but growing, the appearance of empty shelves in stores indicates a panic among the population buying up goods in larger quantities than required. Empty shelves in stores are explained by the disproportionate reaction of the population to what is happening. When you come to the store and do not find something, you begin to react inadequately. Since you are now worried that you will not find this product in the future, go ahead and buy more. People do not need so many goods, but they are worried that they may not be available in the future, so they want to buy as much as possible now before the situation worsens. This complicates matters.

After the collapse of oil prices and a sharp drop in quotations on the European and Asian exchanges, trading on the New York Stock Exchange opened with a fall of more than 7%, and they even had to be suspended so that the players could "recover."

It is important to understand that we are not responding to a specific event, but to a whole set of factors that led to a widespread fall in market asset prices: global stocks lost more than \$2.5 trillion over Monday. In 2019, international trade declined for the first time since 2009, largely due to US duties, and the trade war exacerbated the situation in China and other export-oriented economies [7].

Against this backdrop, the impact of these factors is going to differ across companies depending on their business model. Oil-producing companies are likely to suffer; fracking companies with high leverage are highly defenseless. On the other hand, this may come as a respite to the airlines. Lower fuel prices will naturally provide them with some ease while collapsing travel demands since the COVID-19 outbreak.

Unluckily, the positive and negative effects are not symmetric, and they do not cancel out. Those who get affected by the price fall are likely to file for bankruptcies, and that may create a chain of cascading events: unfavorable events are amplified. If there is a wave of corporate default and bankruptcies, it will reflect through the whole economy through inter-linkages in the financial sector and supply chain. It is this anxiety of systemic collapse that firms need to map out.

How should an enterprise think about its corporate financing policies in a time like this? Maybe it is a good time for every manager to overestimate the company's corporate leverage policy. Despite the embarrassment in assessing the costs and benefits of debt financing in today's uncertain world, some basic factors should help to make decision. A determinative such factor is the operating leverage of the firm. Operating leverage, roughly defined as the extent of fixed cost in a firm's cost structure, exposes companies to large fluctuations in cash flows as the demand for their product

changes [8]. Finding a firm's optimal leverage is not an easy goal in the best of times. It is greatly more difficult when macroeconomic uncertainty is high. Managers have a troublesome job, no doubt. Nevertheless, adhering to the basics of value creation can go a long way in making a provident leverage decision.

Faced with these problems in nature separately, it could be possible to fix the problems causing them. However, collided with various interlinked emergencies that in total amplify one another's impacts, people are facing unprecedented hazards and many communities cannot manage. Trying to solve the problems individually, without taking account of the "cascading" impacts, was likely to be inefficient, the scientists said [3]. While the risks are intensified when they are interconnected, the solutions are related, too. Every time when action is taken to eliminate environmental problems, the benefits also cascade: for example, nurturing wildlife and flora in a wetland can also reduce soil erosion and water pollution, and protect crops against storm damage, decreasing water scarcity and enabling more food production.

There are also social problems that scientists identified as potential major risks for the future. These included the rise of populism and fake news, trends in migration and the rise of artificial intelligence.

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Modern tanks for the storage of oil and petroleum products

Modern tanks for the storage of oil and petroleum products have always been of particular interest, which is not surprising. It is quite difficult to create ideal conditions for storing petroleum products of various kinds and natural gas. This is due to the fact that such substances are characterized by qualities that complicate the process of extraction, transportation and storage.

It is important to consider basic requirements for fuel tanks and storage. Oil and gas reservoirs may contain hundreds of tons of fuel. Depressurization of such a construction can have negative consequences including a major catastrophe. In general, the requirements for the tanks were created on the basis of what conditions should be provided when storing hydrocarbon materials.

The development of small containers is a fairly straightforward operation, but when dealing with large capacities, this task can be solved only by skilled professionals who understand all the intricacies of the process and can provide a special approach.

It is worth noting that small repositories are created in series and stamped by whole lots. But large gas storage tanks are often designed on an individual plan, which complicates the process of their development and production. It is important that the basic requirements for large-scale oil and gas storage tanks are followed and adhered to more rigorously than for small-capacity ones. This is due to the fact that the load on such containers is several times higher than that of small containers. The type of location and design features of the tanks play an important role. [2]

Metal gas storage tanks can be classified according to:

- volumes (from a couple of cubic meters to several thousand tons);
- location (structures of ground and underground types);
- type of assembly (there are ready-made solutions and tanks that are assembled directly on the site);
- type (now conveyor variations and custom designs are available to solve specific tasks).

Oil and gas storage tanks should be optimally protected against corrosion and have high durability. To ensure the tightness of the containers they can be made either of high-alloy steel or synthetic materials. Also, various engineering developments and solutions are available nowadays.

There are several different classifications of tanks, each with its own characteristics. For example, depending on their location, the containers may be:

- Aboveground with the entire tank located on the ground surface.
- Semi-underground, with the bulk of the tank located in the ground and only the neck extended outwards.

- Fully underground tanks, designed for longer storage.
- Underwater oil storage.

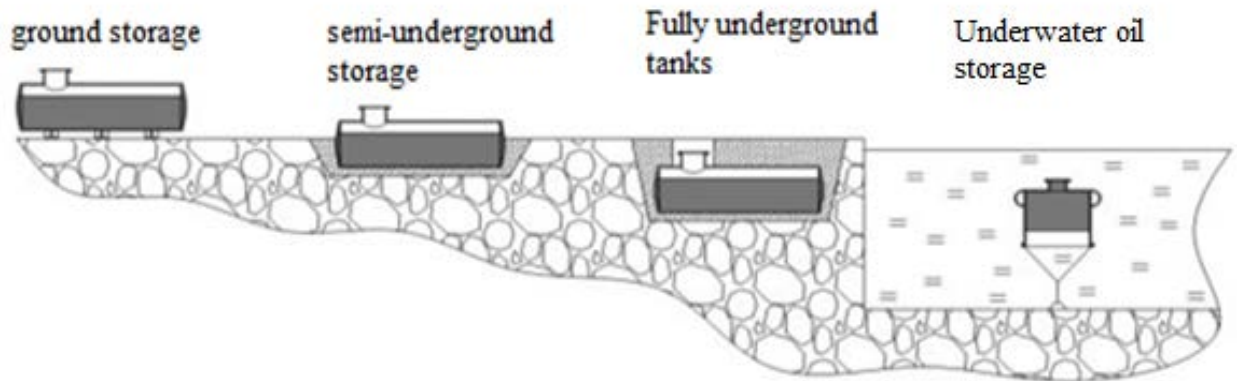


Fig. 1 Modern tanks for the storage of oil and petroleum products

The most common to date are aboveground tanks, which should be located in open space. They have a number of requirements, the main among which is the stability of the material to atmospheric phenomena.

Underground structures are more preferable: they are built at the depth of freezing ground, which ensures the preservation of fuel in the winter; they do not require heating; and the container itself is out of range of atmospheric influences.

Tanks for oil are formed in full accordance with the existing quality standards.

The main advantages of oil tanks are as follows:

2-wall design of containers for the storage of petroleum products ensures the leakage-proof storing. To increase the level of safety of the vertical tanks the space between the walls can be filled with a chemically inert gas or liquid. Controlled pressure in vertical tanks for storing petroleum products makes it possible to specially create pressure gauge or tank with pressure indicators.

Oil tanks fully meet such requirements as corrosion resistance to mechanical processes, as well as mechanical damage, economy, environmental safety, impermeability, high reliability. The design of horizontal steel tanks can often involve the creation of several containers equal in volume, as well as various compartments, which can be used to store all types of oil refining products. [1]

The manufacturing of petroleum product tanks is a difficult process, especially considering that the products must meet the highest quality standards and stringent requirements. This is due to the fact that the finished tank structures are used in hazardous production facilities and inside them there is an explosive and toxic product. Poor quality can cause an accident and leakage of toxic oil, which is extremely dangerous for the environment.

Oil storage facilities may also have a serious economic impact. In 2015 leading economic media reported the decrease in oil prices which was caused by the lack of oil storage capacities. In the US, storage capacities were 70% full, the highest level in 80 years. In Europe, tanks were filled by 90%, in South Africa, South Korea and Japan this amount was 80%. These estimates made by Citigroup were called

approximate by the company itself. [4] On a national level, governments use storage tanks to increase energy security.

China, which in 2013 developed as the second largest shopper of crude oil, plans to construct extra 245 million barrels of oil storage capacity. China is using storage as a means of stockpiling oil in preparation for supply disruptions, a major issue for the country since half of total consumption is from imports. Despite headways in innovation, critical wellbeing, security and natural concerns stay. Oil capacity tanks can be threatening for the environment because they can spill rough oil into the soil and water. To prevent any accidents, oil storage tanks can be constructed horizontally with double walls or vertically with double bottoms. [5]

The production of containers for petroleum products is a complex process, especially taking into account the highest quality standards and stringent requirements the products must meet. This is because ready-made tank structures are used at hazardous production facilities and an explosive and toxic product is stored inside them. Poor quality containers can cause an emergency and leakage of toxic oil, which is extremely dangerous for the environment.

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Benefits and relevance of the Python programming language

In the world there are many different programming languages that are used mainly to solve a particular problem. For example, PHP is used in the field of web programming, and Swift is applied in developing mobile applications. Python is a universal programming language, and clear as well.

This programming language appeared in February 1991; it was invented by Guido van Rossum, the Netherland programmer, but Python gained special popularity only relatively recently and during this time it managed to win a huge audience.

Here are the main advantages of Python, which make it one of the most demanded programming languages at the moment. And according to the forecasts of popular portals and electronic magazines (for example, GitHub or "IEEE Spectrum"), this trend will not change in the next few years

Python is one of the clearest high-level languages useful for rapid development. It has a relatively small kernel, which is supported by many libraries. It is also a multi-paradigm language - the style of constructing the structure and elements of a computer can be: procedural, object-oriented, functional.

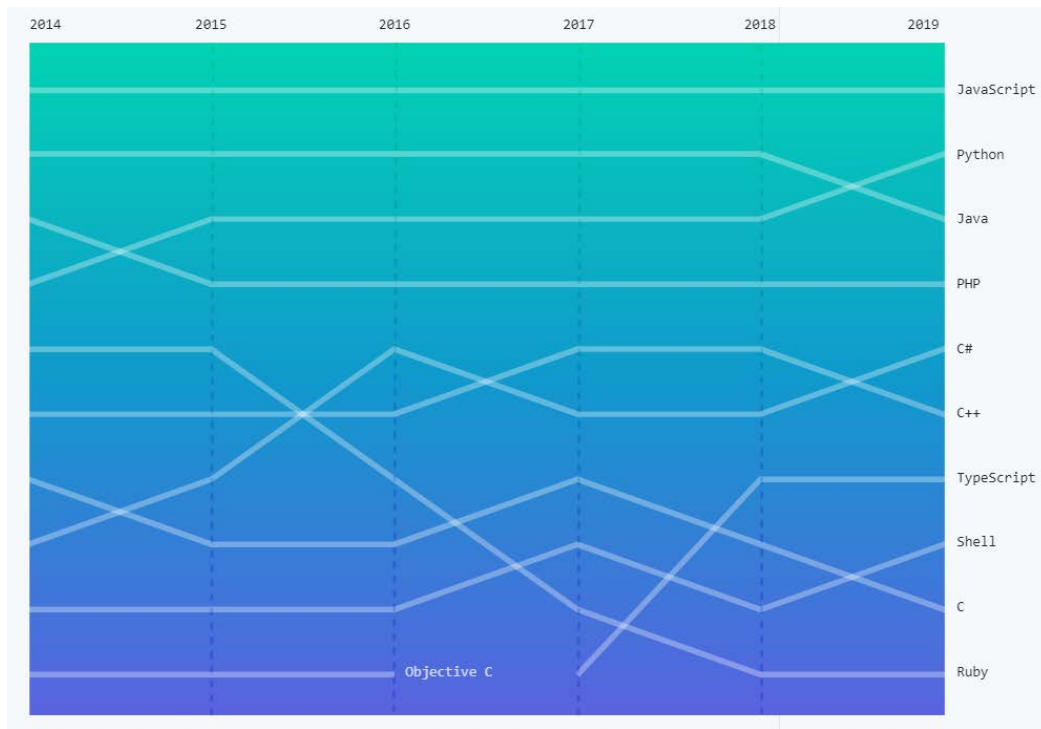
The specific structure of the language, the mass of auxiliary components - all this helps to quickly understand the basics of Python. The program code is easy to read - even inexperienced programmers will be able to quickly understand all its nuances and features.

An important factor in the usefulness of Python as a computational language is its clear syntax, which can make the code easy to understand and maintain. This language also contributes to the creation of supported code by dividing the code into logical groups, such as modules, classes, and functions, in addition to offering pure syntax.

Python libraries include a module system that allows you to easily expand it, excellent graphics (Python module); there are tools for working with many network protocols and Internet formats, for example, modules for writing HTTP servers and clients, for parsing and creating mail messages, for working with XML, etc. A set of modules for working with the operating system allows you to write cross-platform applications, excellent online documentation.

According to the statistics from GitHub, the largest web service for hosting IT projects and their joint development, since 2015 Python has been one of the three top-ranked programming languages, displacing PHP and in 2019 it substituted for such a giant as Java.

Below you can see a graph of the popularity of different languages over the past 5 years according to the information provided on the GitHub portal.



Due to the above-mentioned advantages, Python is currently a reliable integration platform for all types of research in the atmospheric sciences, from data analysis to distributed computing and graphical user interfaces to geographic information systems. Also, today it is one of the best languages for artificial intelligence. In addition, thanks to the clear syntax, it is very easy to learn. Owing to these factors, according to the IEEE Spectrum magazine, from 2015 to 2018, Python became one of the most popular programming languages along with such giants as Java, C ++, C #, JavaScript, PHP and others. And today it does not lose its relevance, but only continues to gain its audience.

Resources:

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- 2) <https://www.sciencedirect.com/science/article/pii/S0010465507000732>)
- 3) <https://journals.ametsoc.org/doi/full/10.1175/BAMS-D-12-00148.1>)
- 4) <https://www.cse.iitk.ac.in/users/swaprava/courses/python/python.pdf>)
- 5) https://www.researchgate.net/publication/3422935_Python_for_Scientific_Computing)
- 6) https://www.csee.umbc.edu/courses/undergraduate/202/spring16_marron/lectures/l01/the_2015_top_ten_programming_languages.pdf
- 7) <http://swlin.cgu.edu.tw/wad2/The%202018%20Top%20Programming%20Languages%20-%20IEEE%20Spectrum.pdf>
- 8) <https://octoverse.github.com/>

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Cartoons as visualization in education

Technological progress and a new visual culture have found their implications in modern education. Visualization is the process of presenting data in the form of an image aimed at maximizing the ease of understanding, giving a visible form to any conceivable object, subject, process. etc. It is widely used in education, though cartoons as visualization is considered to involve minimal mental and cognitive activity of students, and as visual didactic tool to perform only an illustrative function. That is why it would be appropriate to examine the role of visualization for education in general and use of cartoons in particular.

The first result obtained from using visualization in education was the effect of use of visualization in teaching Social Studies topics that demonstrated its positive influence students' achievements. It was proved by comparing achievements of two groups of students: an experimental and control one. The results showed that the scores of achievements of students in the experimental group where teaching was done by using the cartoons were higher than the students' achievement scores in the control group where teaching was done without using a cartoon as visualization teaching/learning materials..

Another interpretation of visualization is reflected in various pedagogical concepts such as circuit theory (Anderson and Bartlett); frame theory (Falker, Minsky, etc.), where visualization is understood as the removal in the process of cognitive activity from the inner plane to the outer plane of thinking patterns, the form of which is spontaneously determined by the mechanism of associative projection [1].

The process of learning a new education material can be represented as the perception and processing of new information by correlating it with concepts and methods of action known by a learner using intellectual operations mastered by them. Information coming into the brains through various channels is conceptualized and structured forming conceptual networks in the learner's mind. The new information being embedded in existing cognitive schemes transforms them and forms new cognitive schemes and intellectual operations. In this case, links are established between well-known concepts and methods of action and new knowledge, a structure of new knowledge arises. So, in such a way, students construct their own knowledge.

Cartoons are interpreted as sensory perception of small details that carry a definite meaning. This specific meaning has evolved over time. Thus, in the 21 cartoons are referred to series of images intended for satire, caricature, or humor. It is also referred to motion pictures that relies on a sequence of illustrations for their animation.

Cartoons have been used in education for a set of reasons among which closeness of plot to the real life, images of their characters which make students to have fun and relax, but in the same time to think them over. Cartoon visual aids can be used for

discussions, especially where the plot provokes thinking or some characters and/or their actions are disputable.

One of the advantages of cartoons is the comfort and joy they give to students, making them feel secure and safe during the lesson that resulted in students' engagement into the lesson and the topic being learnt. When the students are given lesson using cartoons, they better understand the facts visualized and especially the knowledge of a subject illustrated in the easy-to-follow way (Grünewald: 1979). The function of the cartoons which press firmly on the ground of getting the students to instruct and to think, increases the effect of cartoon in education (Özer: 1998).

Cartoons can also be considered as viewing small details, which eventually merged into solution of existing education problem. It is an optimum learning method of training the communication skills of the students, and it helps an educator to avoid frustration, disinterest and motivation lost within the educator recipients.

Cartoons contribute to developing students' problem-solving skills. Students' perspective for cartoon will be different that will bring a bunch of ideas. If to consider a productive cognitive activity as a process of interaction between the external and internal plans, a removal of future products of the activity from the internal plan to the external, an adjustment and implementation of the plans in the external plan, then visualization acts as the main mechanism for ensuring the dialogue between the external and internal plans of activity. Therefore, the level of activation of students' mental and cognitive activity depends on the properties of didactic visual aids,

These results suggest that the teaching supported by cartoons is more effective than teaching based on traditional methods. There are some benefits cartoons bring to an educational process. They increase students' academic achievements. Students can understand educational materials faster and easier.

Recommendations can be given to use visualization and cartoons for teaching various subjects as they help to develop key skills in communication and problem-solving, provide a sound basis for future employment. As visual messages have been configured in minds easier than reading (Örs, 2007), students should be involved in the process of producing visualizations of their own that will contribute to the development of their critical thinking, creativity and conceptualizing for themselves the materials given by a teacher or found in the Internet.

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Problems of vocational education in Ukraine

After Euromaidan, under the leadership of the profile minister S. Quit, large-scale changes in the education system began, and under his successor L. Grinevich. And on September 5, 2017, i.e. 3.5 years after the start of reform activity, a new law on education was finally adopted. At the same time, individual experts, evaluating the significance of the law, called it the “Constitution in the field of education”, it is so significant for the industry.

In general, changes in the field of education over the past 4 years boiled down to the following:

1. Closing universities (a total of about 80), reducing budget places at universities and the number of scholarship recipients (up to 30-50% of state employees - in the horizon of several years it is planned that no more than 10-15% of state employees will receive scholarships). However, in this case, responsibility should be assigned not only to the Ministry of Education, but also to the Ministry of Finance, and the Cabinet of Ministers as a whole.
2. Closing schools and reducing the number of teachers. According to the State Statistics Committee, in the period 2014-2017 (excluding the ARC and the ATO zone), the number of general educational institutions decreased by 700 units - from 17.6 thousand to 16.9 thousand. The number of teachers decreased by 16 thousand - from 454 thousand to 438 thousand. The load on the infrastructure of educational institutions and teachers, respectively, increased, which leads to a deterioration in the quality of education (the number of students in schools increased from 3.777 million to 3.846 million people). The processes of “optimization” are especially painful in rural areas, where, due to decentralization, schools are closed, leaving only supporting ones within the united territorial communities. At the same time, the distance that some students of such schools have to overcome every day is 50 km or more. And the number of school buses in the countryside is not enough for transporting children to educational institutions.
3. 3. Reduce funding. The traditional problem of Ukrainian education is insufficient funding. So, for example, the state budget of Ukraine over the past 10 years until the second Maidan (2003-2013) for various scientific programs, scholarships, grants, etc. 6-8 times less money was allocated than for the armed forces, which, as we know, were in a disastrous state all the years of Ukrainian independence.

In connection with the armed conflict in the east of the country, government revenues to the army piggy bank increased significantly and amounted to tens of billions of hryvnias, but this did not increase in proportion to the incomes of Ukrainians working in the field of science and education. On the contrary, under the pretext of financing and modernizing the army, subsidies to other areas of the country's social and economic life were reduced.

Not so long ago, the Cabinet of Ministers of Ukraine initiated a sharp reduction in student scholarships. So, the government proposes to reduce the cost of social scholarships by more than a third - from 992 to 631 million UAH., And the cost of an academic scholarship for students studying in universities under the Ministry of Education, suggest reducing by 21% - from 3.98 to 3 , 16 billion UAH. This despite the fact that in dollar terms the scholarship of a university student of the 1-2 level of accreditation (colleges, technical schools) is about \$ 30, and a university student of the 3-4 level of accreditation (universities) is about 40-45 US dollars. For a European country, this is negligible, but to make the contrast more striking, the 2013 scholarships should be quoted - over \$ 100, and, for example, the 2007 scholarships (before the global economic crisis) - almost \$ 140.

At present, the Ministry of Education and Science has developed a draft Regulation on the Institutional Form of Vocational (Vocational) Education. The draft document was published for public comment.

The document defines the procedure for obtaining vocational education by the institutional form of education, which is organized in the institutions of vocational education in order to secure the right to obtain vocational education.

The purpose of the proposed project is to establish uniform approaches to the procedure of obtaining professional (vocational-technical) education by institutional form in vocational education institutions, regardless of their subordination, types and ownership.

The regulation contains definitions of full-time, correspondence, distance and online forms of education, which can be used to train students and students.

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Some recommendations to overcome common mistaken expectations of adults in learning English

Learning English is not such a difficult and impossible task as it might seem at the first glance. In order to achieve the desired success, it is necessary to organize properly the workflow of new knowledge and skills and try to avoid common mistaken expectations for learning English. Recommendations how to overcome these expectations of adult English language (false) beginners are given taking into consideration the results of academic research available online as well as experiential learning of the author, who is focused on the analysis of reasons why even the most diligent learners do not achieve good results, and their roots.

1. Too high expectations. Unfortunately, today, each of us is adversely affected by advertising, which for the most part sounds rather absurd. For example, new “super foreign language school” has been opened in your city, which promises to significantly improve your level in just a couple of weeks.

However, an EFL teacher knows that it is impossible to do in a short time. You can bring your knowledge to a decent level from scratch, at least for 1 year of intensive training. Moreover, there is a need in 300 hours of learning to reach the next level of language proficiency, especially in English.

2. Incorrect goal setting. If you learn the language just because it is in fashion or “there is no way without English”, then your intrinsic motivation won’t be too high. The most often goal is to learn the language to get a new and more promising job, a complete change of qualification, admission to a prestigious educational institution in Ukraine and abroad or travel.

One must be clearly aware of the benefits that new knowledge will bring to them.

3. Concentration on Grammar is the most popular and dangerous mistake. Studies show that too active study of grammar only negatively affects speech abilities and fluency of speaking. English grammar can be difficult to understand and is a theoretical study whereas real-time communication needs language skills. It turns out that you as a student will not have enough time to remember hundreds of learned rules just to speak out.

It is advisable that a learner develop their knowledge of English grammar at a subconscious and intuitive level by learning it in context. The best way out is active communication with native speakers, listening to good examples of English speech using podcast etc., and reading.

4. Learning formal English mostly from books. This approach to training is justified only if you intend to pass a serious international test in General English or English for Academic Purposes.

However, if one needs to improve their English significantly, they should be aware of a variety of methods to be used. It is doubted that native speakers of English

use those complicated phrases from academic textbooks or coursebooks. To make one's language "live", it is necessary to study and use idioms, phrasal verbs, modern functional exponents of a variety of language functions and even slang, using extensive reading and/or watching videos.

5. Too strong desire for perfection. Students as well as teachers, sometimes too worried by their possible mistakes, because errors make them scared. It is caused by the fear to lose their face, though people learn from their mistakes and some errors are the reflection of the language proficiency level, i.e. there is a set of mistakes common for English proficiency level. Unfortunately, when you try to speak as a native speaker, you may not know that even native speakers make small oversights in their speech, slips of the tongue etc.

Instead of focusing on the negative/ i.e. "do not's" and "can not's", focus on the process of communication and your "can do's" and language learning itself. When learning a foreign language, the goal is to learn how to convey own thoughts in the way followed and understood by others. Over time, the mistakes typical for the initial level will disappear.

6. Hope for schools and tutors. Many people who study English unnecessarily rely and even shift responsibility to teachers or courses in language schools. This is completely wrong, because it is the shared responsibilities on the outcomes of teaching/learning process.

However, a good tutor who organizes your learning process and aids when necessary, who encourages autonomous learning every day may bring a learner to better result(s).

7. Learning single words. Instead of studying separate lexical units, you need to focus on remembering ready-made phrases, chunks of language or typical cliché just like little children do it when mastering their native language as means of communication.

Here, the best assistant is reading. The more you read, the better.

8. Insufficient consolidation of the studied material. When learning any language, you should be guided by the rule "less, but better.", so called Pareto rule 80/20, where is 80% of the output is determined by 20% of the input. Sometimes people think that they won't be able to recall a phrase learned yesterday in a month.

Fortunately, this opinion is wrong. Over time, human brain forgets unclaimed and unused information. It will be great if you take the time to repeat the material studied several times at a certain interval so-called "interval repetition" (spaced repetition) used to remember better and forever. For example, the first repetition in a day, the next in 3-4 days and one more in a week. This technique will allow learners to consolidate important knowledge in a long-term memory which is easily got out of there if necessary.

9. Premature speaking. Many fans of particularly fast methods of learning foreign languages argue that you need to start speaking English from the very first lessons.

It is useless to force a child who has just begun to get acquainted with the speech to talk immediately. Moreover, there are different learners' types and learning styles. It is unlikely that something sensible will come of this. Without a certain amount of

knowledge, you will not get anything but frustration. That is why it is so important for a competent teacher to give students an audition recording, is recorded by native speakers.

10. Disorganization and self-discipline. Missing classes, the lack of a specific teaching methodology, constant changes of tutors - at this pace, you certainly will not be able to quickly and accurately learn English.

Firstly, you need to plan your own time correctly. If you decide to study on your own, then try to make sure that the lessons are held at least 2-3 times a week. The more often, the better. Otherwise, tangible progress will be difficult to achieve.

Secondly, write a schedule with an exact indication of the start and end time of classes. Identify short-term goals that you intend to achieve in learning a language. Follow the established plan and do not miss classes.

11. Lack of concentration on pronunciation. Everyone has heard that the pronunciation of English and Ukrainian is significantly different. You can have a good vocabulary (both active and passive), have excellent knowledge of grammar, and even be able to apply your skills in a conversation, while having a strong accent.

For the occurrence of this phenomenon there may be a reason from a number of reasons, the most important of which - the lack of open communication in English. Ignoring audio courses, neglect perfect your pronunciation, or simply choosing an incompetent tutor can also make a stronger affect. The main problem is that over time it becomes more difficult to eradicate pronunciation.

12. Unwillingness to read in English. Reading foreign newspapers, magazines and books is a rather difficult task.

However, there is no need to understand literally every written word. It is important to understand the general meaning of the text and learn how determine the meaning of lexical units by context. Regular reading helps not only expand your own vocabulary, but also learn how to properly build a learner's own speech. Without noticing it, they will learn more than a dozen rules of English grammar.

From our perspective, all these tips will help adult learners to overcome their wrong expectations on the learning process and common mistakes of learning English. Awareness of these most common expectations of adult learners and the results of needs analysis to be done at the beginning of a course will help EFL teachers and tutors to organize effective friendly and secure learning environment,

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Розширюючи обрії

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