Ministry of Education and Science of Ukraine
Dnipro University of Technology
Institute of Economics
Faculty of Management
Department of Foreign Languages
Research and Education Centre “Geotechnical Systems Stability: Processes, Phenomena, Risks”

WIDENING OUR HORIZONS

The 17th International Forum for Students and Young Researchers

May 16-20, 2022

Abstracts

Dnipro
Dnipro University of Technology
2022

УДК 001.371.322(06)
ББК 72:74.58я4
Р 65

Розширюючи обрії: зб. тез сімнадцятого міжнар. форуму студ. і
Р 65 молодих учених, 16 – 20 травня 2022 р., м. Дніпро/ за ред.
С. І. Кострицької; М-во освіти і науки України; Дніпровська політехніка.
– Д.: ДП, 2022. – 184 с.

Подано матеріали міжнародного форуму студентів і молодих учених,
який відбувся 16 – 20 травня 2022 р. в Національному технічному університеті
«Дніпровська політехніка», м. Дніпро (Україна).
Розглянуто нагальні проблеми економіки, інженерії, інформаційних технологій,
охорони навколишнього середовища, наук про землю, гуманітарних наук.
Також приділено увагу сучасному законодавству, спрямованому на вирішення
цих проблем. Матеріали згруповано у розділи, що відповідають секціям форуму
і відображають сучасні тенденції та інноваційні розробки молодих учених,
представників різних країн світу в різних галузях економіки.

TABLE OF CONTENTS

Section 01 Actual Problems of Economy and Sustainability of Economic Development

Eduard Akopov
I.M. Tsurkan, research supervisor
N.M. Nechai, language adviser
Dnipro University of Technology, Dnipro (Ukraine)

A brief analysis of changes in the mandatory publication of audit reports in Ukraine through full-scale invasion and their possible consequences

The temporary cancelation of mandatory financial audit publication in the long term will have a negative impact on companies' performance and Ukraine's economy in general. To minimize these consequences the law «On the protection of the interests of the subjects of reporting and other documents during martial law or war» must be used only for companies, that do not have an opportunity to commit financial audit safely.

Audit of financial statements is a service of verification of an entity's accounting data and financial statements (and/or its consolidated version) in order to express an auditor's opinion on its compliance with national requirements and international standards of reporting or other requirements [1]. As it is stated in the law, the publication of audit reports in Ukraine is mandatory for:

- financial institutions;
- large enterprises (at least 2 of the book value of assets > EUR 20 mln., net income from sales > EUR 40 mln., the average number of employees >250 people)
- medium enterprises (at least 2 of the book value of assets EUR 4-20 mln., net income from sales, EUR 8-40 mln., the average number of employees 50-250 people);
- enterprises, that are issuers of securities, which are admitted to trading on the regulatory capital market or securities, that are publicly offered;
- subjects of natural monopolies on the national market;
- business entities operating in the extractive industries. [2]

An audit report provides reliable information about company performance, which is critical for making the right management, investment, and loan decisions. Additionally, it succors to control the payment of tax revenue and liquidity of the company.

Due to the full-scale invasion, which started on February 24 of 2022, the law «On the protection of the interests of the subjects of reporting and other documents during martial law or war» was passed. According to this law, all the entities are exempt from the obligation to submit financial statements and publicize audit reports, until the abolition of martial law. After this event, all documentation for the period of

non-submission must be given to corresponding government agencies in three months [3].

This law significantly alleviates the situation of enterprises that are under occupation or situated in the area of active hostilities and do not have access to documents, including those required for the audit. Moreover, in the short term, the cost of audit services reduces the running expenses of an enterprise.

On the other hand, in Ukraine financial audit can be provided by an audit company or a self-employed auditor [1]. This law reduces demand for audit services and, consequently, their income. The situation may be especially critical for self-employed persons, who may lose their job because of a decrease in demand. The abovementioned will result in lower tax revenues and higher expenses on social support for people who lost their jobs.

Besides, refusal of audit services will have negative consequences in the long term, including the decline of companies' productivity, caused by inaccuracy in financial statements, and, as the result, wrong management decisions.

Also, without an audit of financial statements, we create an opportunity for sweeping away traces of the crime by changing data in companies' documentation, which may consequently raise the number of fraudulence cases.

Moreover, there will be problems with raising funds. Neither investors nor banks are willing to lend money to enterprises with no relevant audit reports that will confirm companies' ability to repel the contribution.

From all the above, we can make a conclusion, that audit of financial statements is needed firstly for increasing companies' productivity, by providing reliable information and preventing fraud, and only secondly for compliance with the law.

On April 15 of 2022 Audit Public Oversight Body in the information on an event on selected issues of auditing during martial law appealed to the audit community with a call, if possible, not to stop its business, which is important for the economy of Ukraine [4].

On April 27, 2022 Oleg Kantsurov, the Executive Director of the Quality Assurance Inspectorate of the Audit Public Oversight Body, made a statement that in order to accelerate the process of post-war economic recovery, it is crucial that businesses that retained capacity and are able to operate, do not delay financial reporting and publication of audit reports, as this will facilitate timely and quality audit services for enterprises that will resume their work in the postwar period, as well as the performance of other tasks by auditors to establish a market mechanism for the functioning of the national economy and its European integration [5].

From what was mentioned in this work, we can see, that these requests from the Audit Public Oversight Body are reasonable and have sense, as continuing the work will support the economy. In the long run, there may be a need to make alterations to the law «On the protection of the interests of the subjects of reporting and other documents during martial law or war» to make publication of the audit report for companies that have this opportunity mandatory again.

References:

1. Law of Ukraine «On audit of financial statements and auditing» of 21.12.2017 № 2258-VIII. URL: https://www.apu.com.ua/en/zakonproaud/

2. Law of Ukraine «On accounting and financial reporting in Ukraine» of 17.07.1999 № 514-VI. URL: https://zakon.rada.gov.ua/laws/show/996-14#Text

3. Law of Ukraine «On the protection of the interests of the subjects of reporting and other documents during martial law or war» of 03.03.2022 № 2115-IX. URL: https://zakon.rada.gov.ua/laws/show/2115-20#Text

4. Information on an event held by the Audit Public Oversight Body together with the Audit Chamber of Ukraine on selected issues of auditing during martial law. Audit Public Oversight Body: website. URL: https://www.apob.org.ua/?p=3841&lang=en

5. Information notice on the event held on April 27 of 2022 by the Audit Public Oversight Body together with the Audit Chamber of Ukraine to discuss topical issues of the investigation of audit activities during martial law and post war economic recovery of Ukraine. Audit Public Oversight Body: website. URL: https://www.apob.org.ua/?p=3914&lang=en

Anna Bulatova
O. V. Varyanichenko, research supervisor
V.V. Gubkina, language adviser
Dnipro University of Technology, Dnipro (Ukraine)

Computerization of management processes

Computerization of management processes began together with the sixth stage of management development, when the digital revolution (technological and innovation revolution) and the development of computer systems only began their way in the 80s of the last century. New technologies ensure efficient enterprise use of analytical and information resources, establishing better communication between all the balls of the staff, creating conditions for the functioning of data processing systems.

Today, any company can use specialized software for computer-based management of production and management, cash and marketing and analytical processes. The most popular resources for computerization of business processes are the following [1, pp. 86-87]:

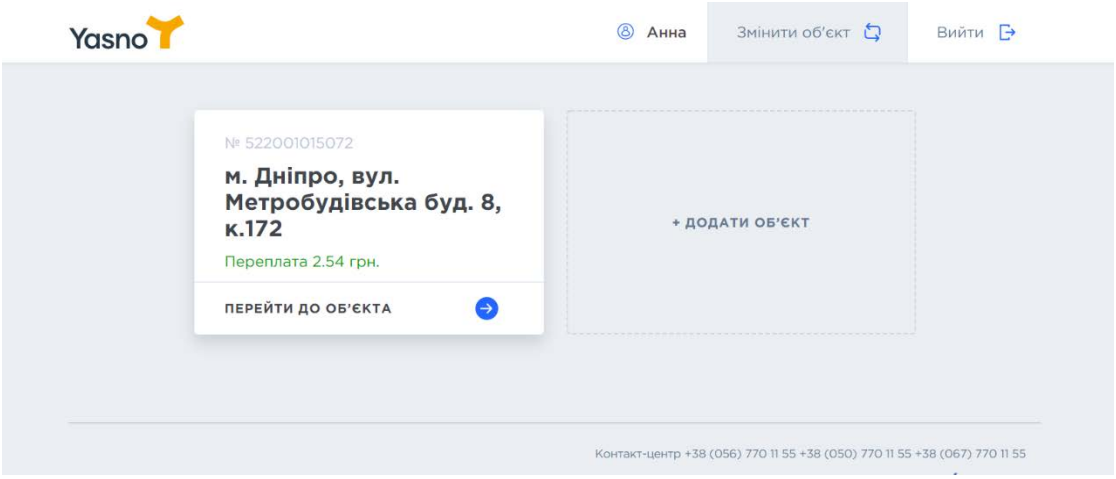
- MRP (Manufacturing Requirements Planning) - production management;
- MRP II (Manufacturing Resource Planning) - production management with elements of financial planning, telecommunication and modeling;
- ERP (Enterprise Resource Planning) - management of all kinds of resources of the enterprise, such as material, financial, labor, information etc. The software also transformed the MRP II system and added such functional modules as demand forecasting, project management, cost, inventory, processing of technological information, etc;
- ERP II (Enterprise Resource and Relationship Planning): management of relations between the company and suppliers, customers, partners, etc. Also, through this software suppliers' mailing can be done, but to support a large number of participants there some need in implementing suppliers' mailing according to their QED;
- System "Galaxy" (business management environment in industry and commerce with the implementation of the complete market cycle: market analysis, macro-planning, business planning, operations planning, execution of business operations, reflection of actions that took place in the accounting and reporting, analysis of business and financial activities);
- Management automation system Delo Pro. v. 1.5 (a comprehensive program designed for the management of purchases, sales, automation of inventory accounting, analysis of cash flow and goods);
- SCALA 5 - software for business management;
- MIRACLE system - an integrated system of accounting, financial analysis and business management;
- "Office" from Microsoft - a package of programs designed to automate the work of the company from the presentation of new projects to databases;

- Program "Project management", which is designed for business planning and investment projects.

Computerization or in other words digitalization is not only able to create new business processes, organizational structures, regulations, and new role models. It is intended to stimulate the entire activity of the companies. But despite this, the implementation of digital technology in the company is a great work and quite a long process.

Digital business transformation is not just a marketing term but is a new reality that requires the business to radically rethink business processes and approaches to work with customers. The ability to adapt quickly to changes and optimize their work "on the fly", adjusting themselves to client expectations and needs are the main challenges that arise with business digitalization.

Today young businessmen are using more and more new innovations to make their companies' work more efficient. The first such “know-how” was creating a private office on the enterprise sites, which is a part of the site to provide information to the customers and their self-service. Through the computerization of these office bureaucratic processes, the company simplifies the system and algorithms of customer service. The users are able to check the status of the orders or services provided by the company, set up an account, communicate with the support service or make comments in this private office. You can take, for example, the website of the company Yasno (supplier of electrical energy, gas, and energy-efficient solutions for 3.5



million customers in Ukraine), where everyone can monitor the status of electrical services in their apartment or house. Picture of Yasno website is shown in Fig. 1.

Figure 1. Screenshot of Yasno website

Development of high technology has already practically reduced the living participation of people in trading activities on the stock exchange of projects and other activities. Nowadays, most trading is done in virtual mode, and the appropriate platforms are available and constantly being developed. One type of similar projects is the creation of bidding-type sites at the stock exchange. These portals move the usual interconnections in the business to a completely different level, allowing more

and more professionals to join various projects. For example, 5 years ago the company Grape won the tender, which was carried out by "Foxtrot" during the rebranding.

The third mostly requested resource to be used today is CRM system (Customer Relationship Management, that is "relationship management with customers"). CRM is a software application for the organizations designed to automate strategies for relations with customers and is aimed to increase the level of sales, optimizing marketing, and improving customer service by storing information about customers and their history of interaction, establishing, and improving business processes, and further analyzing of the results [2, p. 420].

As the program helps systematize data on clients and contracts, employees are always aware about cases and terms. It results in increasing the conversion of orders in sales, customers' loyalty, and income growth. The manager does not have to be present in the office so the work is carried out as required and more time can be spent on company's strategy.

The rapid development of computerization in a few years will lead to the fact that all companies will retain and manage through the use of digital technology. Thus, computer technology and the Internet are taught not only in customer relationship management, but also in HR-management, which is very closely linked to the management.

To support above mentioned information such examples can be considered:

1) **Uber Technologies Inc.12** is a modern and rapidly developing taxi service in the world that uses online as the basis of the business model both for the sales service through a single mobile add-on, and for the management of drivers. S. Matsotsky who is the Head of the Board of Directors of the company IBS calls the revolution as "uberization". According to his words "The whole company Uber, with its programmers and technology, is essentially one big HR-department, the task of which is to manage a large human resource: recruiting drivers, evaluating the quality of their work, engaging in training, supervising their performance at car meetings, calculating fees, and dismissing them if necessary. All these procedures in Uber are digital, automated, and online" [3].

2) **GLOVO** is an international service that delivers any goods from any store or restaurant in less than a minute. As in Uber Technologies, a person who requires this service can become a customer and the only thing to do is to download the application, use the Internet, spend some time, and provide standard documents.

It should be concluded that applying modern digital technology in one way or another is obviously a very useful thing, and every type of business really demands it. The required minimum for any company nowadays is the presence of the website and valid account in social media (with very few exceptions). The brands that desire to make one step closer to their customers can also be engaged in the development of mobile add-on/chat-bots and use other channels of promotion and this can really bring them to a new level.

References:

1. Fedorova G. Digital Economy // Strategia. - 2017. - № 3 (28). - C. 87.

2. Lebedeva T.E., Egorov O.V. Trends of development in the digital economy // Economic Journal. - 2018. - №5 (3). - C. 430.

3. Popova M. "HR-revolution". RBC + Thematic addendum to the daily newspaper RBC. 17 February 2016 / № 028 (2284). Access mode: http://www.rbcplus.ru/news/56c3e2297a8aa91dc0ad91a4.

Mariia Cherkasova
Kuvaieva T.V., research supervisor
Kostrytska S. I., language adviser
Dnipro University of Technology, Dnipro (Ukraine)

Using benchmarking in modern enterprises

Marketing methods are one of the main business tools of a modern enterprise, which use a systematic approach to its development. However, in today's market relations, competition between companies is becoming fiercer. Therefore, businesses need to thoroughly study and analyze their competitors. It becomes necessary to identify the competitors and find the best way of making profitable results in related industries. Nowadays, marketers use a new function – benchmarking, which will help to increase productivity and competitiveness.

Benchmarking is a systematic activity aimed at finding, evaluating and studying the competitive companies' best methods of doing business and using them for their own strategy. The purpose of benchmarking is to compare the competition processes and strategies with the companies, and to make changes that will improve the company's performance, products, and services.

There are many different types of benchmarking, which fall into three main categories: internal, competitive, and strategic.

If other enterprises use similar practices, internal benchmarking of the company may involve analyzing what the company is doing, and where it can become more effective.

Competitive benchmarking is a comparison of the products, services, processes and methods of the direct competitors. It gives the understanding of what the company needs to do to increase the profits.

Strategic benchmarking determines the best methods globally used that can be adapted to the company’s procedures and processes.

PCMag is the independent company, which reviews different products and services from the world of technologies. They have compared the new Samsung smartphones (Galaxy S22 Ultra and Galaxy S22+) and its previous version (Galaxy S21 Ultra) with the iPhone 13 Pro Max of Apple [3].

Samsung Galaxy S22 Ultra and Galaxy S22+ outpace all other Android phones the company have tested on performance benchmarks, but Qualcomm's Snapdragon 8 Gen 1 CPU lacks the raw processing power of Apple's A15 chip in the iPhone 13 Pro Max. There is a 13% rise in Geekbench single-core scores and a 9% rise in Geekbench multi-core scores. The Qualcomm processor's Geekbench scores beat the Google Tensor chip in the Pixel 6, but do not match Apple's iPhone 13 Pro Max [3].

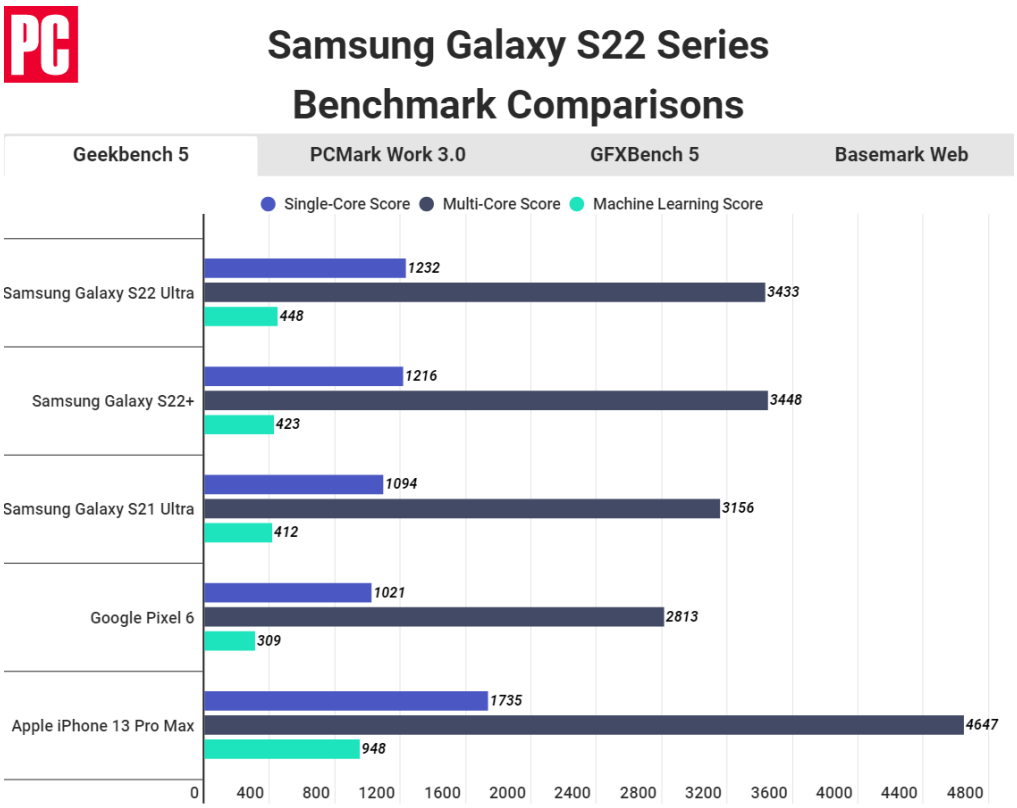


Fig. 1 Benchmark comparisons of Samsung smartphones [3]

The iPhone 13 Pro Max gets 20 % of any Samsung model's score because of the differences between the powers of their processors.

The Samsung Company should use this investigation of PCMag to make the competitive benchmarking and improve their future smartphones for their consumers.

Benchmarking is one of many tools used as a part of any model of marketing strategy in any organization. Consistent benchmarking can help improve processes and procedures, evaluate the effectiveness of past results, and give a better idea of how competition works, which will help identify the best ways to increase efficiency and make businesses more profitable.

References:

1. Lucid Content Team. *8 Steps of the Benchmarking Process.* Retrieved at 4 April 2022 from https://www.lucidchart.com/blog/8-steps-of-the-benchmarking-process

2. Leonova, Y. (2016) *Benchmarking is a modern tool in the competition.* Retrieved at 4 April 2022 from https://economyandsociety.in.ua/journals/5_ukr/35.pdf

3. Segan, S. (2022) *Galaxy S22 Benchmarked: Apple Still Beats Samsung.* Retrieved at 4 April 2022 from https://www.pcmag.com/news/galaxy-s22-benchmarked-apple-still-beats-samsung

Kseniya Krasochenko
O.S. Petrenko, research supervisor
V.V. Hubkina, language adviser
Dnipro University of Technology, Dnipro (Ukraine)

The impact of social media on the image of a company

The growing usage of social media today is affecting many spheres of life including business and the means of running it. It goes without saying that social media is a powerful tool for promoting business, boosting brand awareness, and shaping a positive brand image. The role of social media in building a company image is crucial nowadays. A key feature of social media is its openness. Social media provide a virtual network place where people can enjoy expressing their opinions, exchange opinions, share experiences, and publish and control messages anywhere anytime [4].

Why a positive image is so important for business and how it can boost business? Brand image is the first thought that is formed in the consumers' minds when they hear the name of the company [2]. The image of the company is vital for any kind of business. In today's competitive environment, creating a positive corporate image is key to establishing long-term relationships between the corporation and its surroundings. Image is no longer the subject of marketing but it is a strategic tool that top management has to facilitate [5].

Firstly, a strong brand image provides more profits to the company since new customers are attracted and a desire to buy a particular product or service amplifies. A brand's reputation plays an important role when it comes to taking a purchase decision. Secondly, a positive brand image makes launching a new product under the same brand easier. The more famous a company is the more trust it has among customers. Thirdly, a company with a positive image may increase its value. A strongly established brand may result in receiving more investments [2].

Digital marketing is the most popular way of promoting business as it is not expensive and rather effective. Social media is a great tool to build brand image and reflect brand identity. Active social media presence as a way to build a positive brand image has several advantages. Increased interaction between companies and consumers via social media is beneficial for both parties. Social media platforms provide consumers with the opportunity to have direct communication with the brand and interact amongst themselves. They may feel that they are a part of the community, they are heard and involved. For businesses, it is easier to reach their target audience, receive constant feedback and ask the customer's opinions.

Depending on whether the business is B2B or B2C, there can be used different social media platforms. Some of them may be more effective to increase brand awareness and others may be useful to make connections and build business relationships. For instance, it is considered that Facebook is the most beneficial social media for B2C companies, as its user rate is the largest. Then goes YouTube and Twitter. 58% of B2C companies reported that social media contribute to company

profit and increase sales more than B2B companies [1]. Therefore, the active use of social media has a bigger impact on B2C customers than on B2B companies. As for social media platform for B2B companies, it is more effective for them to use LinkedIn. LinkedIn is popular among B2B, it is used particularly for lead generation and brand awareness increase. It provides a forum for businesses and companies alike and allows them to interact with each other and build relationships.

There are many strategies for creating a brand with a strong image and a high level of trust and loyalty. To begin with, a company has to set its goal and outline its target audience. These steps will help to decide which social platform is more suitable for a particular business, which type of content should be posted, and what content strategy should be implemented for that particular platform. By posting proper content, a brand may have an impact on its image, content should engage an audience and spread useful information to its followers.

One of the ways to provoke customer interest and create a positive image is through entertaining content. Posting interesting and entertaining content on social media may lead to better engagement and cause positive feelings and emotions. Entertainment is a way to hold the attention of the audience and stimulate participation. This being said, many previous empirical studies illustrated that when individuals like the enjoyable content existing on platforms, it will create a positive experience in their mind, which probably will lead them to recognize and recall the brand [3].

However, there is an opinion that social media activity and constant content posting are not an integral part of a marketing strategy. Apple, for example, has 5.8 million Twitter followers, yet has never tweeted; similarly, Apple's Facebook page has over 13.5 million followers, yet only posts to update their cover photo. Their marketing strategy does not involve creating content constantly but emphasizes their launches and their earned reputation as industry leaders through the iconic nature of their product [1].

Overall, using social media as a tool for promoting a company contributes to creating a positive image of the brand. Businesses and entrepreneurs should take advantage of it and include social media in their marketing strategies.

References:

1. Evans M. (2021). The Rise of Social Media and the Impact on Companies. Available at: https://www.mrgpeople.co.uk/news/2021/01/the-rise-of-social-media-and-the-impact-on-companies/ (accessed 05.05.2022)
2. Pahwa A. (2022). What Is Brand Image? Importance & Examples. Available at: https://www.feedough.com/brand-image-explanation-examples/ (accessed 05.05.2022)
3. Masa'deh, R., AL-Haddad, S., Al Abed, D. (2021). The Impact of Social Media Activities on Brand Equity: School of Business, The University of Jordan. Available at : https://doi.org/10.3390/info12110477 (accessed 05.05.2022)
4. Tavleen N. (2013). Role of social media in building image of an organization as a great place to work: ICFAI Business School, IFHE University, Hyderabad, India.

Available at: https://www.researchgate.net/profile/Tavleen-Nagra (accessed 09.05.2022)

5. Fakıoğlu M.T. (2019). An analysis on the impact of social networks on corporate image: evidence from Turkey Istanbul: Marmara Universitesi (Turkey) ProQuest Dissertations Publishing, 2019. Available at : https://www.proquest.com/openview/71d68772b1374b1b6c227e0b06d94ab1/1?pq-origsite=gscholar&cbl=44156 (accessed 09.05.2022)

Oleksandr Mateiko
O.V. Krylova, research supervisor
N.M. Nechai, language adviser
Dnipro University of Technology, Dnipro (Ukraine)

Macroeconomic situation in Ukraine in war conditions and ways to improve it

Today, the macroeconomic situation in Ukraine is difficult because Ukraine is in a full-scale war with Russia. Our country is in difficult conditions now, which it has never been before, even during the hostilities in Donbas and the annexation of Crimea. The consequences of the war that is taking place in Ukraine are felt in various spheres of people's lives and in the whole country.

First of all, the industry suffered. Many factories that are close to the war zone have been shut down now. Most of them are the largest industrial centers, such as Azovstal, Zaporizhstal, and the partially closed Arcelor Mittal Kryvyi Rih. It should be noted that the Azovstal alone contributed up to 10% of Ukraine's GDP. Also, seaports in the south are blocked, so Ukraine's exports drop significantly. Ukraine is one of the world's leading exporters of wheat, oil, and corn, so this could lead to starvation in poor countries in Africa and America. According to UBTA, in 2020 Ukraine exported more than 15% of the world's supply of corn and more than 9% of wheat. Today, due to logistics problems, Ukraine's annual commodity exports are under threat, as well as the supply chains of production components – textiles, fittings, dyes, components for production lines, etc. This has led to the loss of jobs and income for many people. So, due to the loss of income, Ukrainians will have to use their savings, including withdrawing them from banking institutions. This resource will decrease every day. Consequently, the domestic demand necessary for the normal functioning of the economy will also decrease [1, 2].

The macroeconomic situation in Ukraine could have been predicted because the country's leadership understood that the possibility of a full-scale war was quite high, so it increased spending on the defense industry. By 2022 it was decided to increase defense funding for the country. One out of every five dollars of government spending went to the country's security and defense sectors, amounting to $10.5 billion, or nearly 6 percent of gross domestic product. "This is a record amount of funding for Ukraine." "NATO standards are up to 5% of GDP [3]. The country's defense funding increased only when Ukraine was attacked by Russia and annexed Crimea and Donbas. It can also be noted that since 2020, funding has increased significantly compared to previous years, which has affected the country's economy (Fig.1).

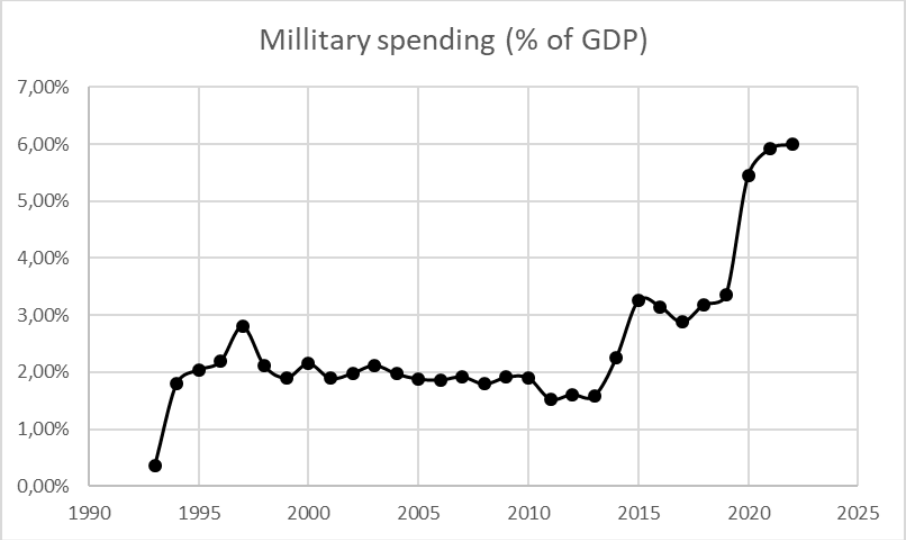


Figure 1. Ukraine Military Spending/Defense Budget 1993-2022

Since the beginning of the full-scale war, unemployment in Ukraine has reached catastrophic proportions, and the labor market has decreased by more than 15 times. In Ukraine, five times more people apply for one vacancy than before the war. Today there is a high demand for doctors, pharmacists, cashiers, drivers, loaders, and production workers, whereas before the war there was not enough demand for these jobs. Also, according to the UN, more than 3.9 million people, including women of working age, have left Ukraine since February 24, which significantly affects the economy. A lot of women were employed in the service sector, but as those who have lost their jobs will not have money to buy goods, the service sector will decrease at a high rate. This sector, according to the Cabinet of Ministers, creates 23% of GDP, 33% of employment, and 17% of tax revenues [4].

Another important factor is domestic investments. They are immensely sensitive to any armed conflicts. The outbreak of conflicts has a negative impact on both financial and real investment. This leads to the fact that investments in capital construction are suspended because of high risks, especially if the objects of such investments are in the zone of hostilities. At the same time, investors refrain from investing in the development of industrial production due to uncertainty in the future [5].

In the banking sector, all financial institutions were allowed to temporarily waive fines and penalties for late loan payments. Also, the NBU ensures compensation of the full amount of bank deposits in case of bank liquidation during wartime and three months after it.

Thus, Ukraine's economy will decrease because of the war, which will lead to a decline in GDP. The World Bank predicted that Ukraine's GDP will fall by 45.1% compared to 2021, and inflation will be 15% in 2022 and 19% next year. Also, the proportion of the country's population living below the poverty line will rise sharply, from 1.8 to 19.8%. (for countries with social incomes the threshold is $5.5 a day)

To improve the macroeconomic situation, it is necessary for Ukraine to receive large-scale financial support. The purchase of Ukrainian goods will be the most effective help of the western countries. It could mainly be processing industry goods, which are usually less heavy and have a higher value. It is also necessary to

temporarily cancel all tariff quotas for agricultural goods from Ukraine. This will benefit both Ukraine and the West. They will get goods at a better price; help resume exports to Ukraine and build new supply chains.

References:

[1] Економічна правда. Економіка війни: щит для промисловості – accessed on: https://www.epravda.com.ua/columns/2022/03/30/684911/

[2] Latifundist.com. Огляд ринку зернових культур 2021 року: експорт, виробництво, тенденції – accessed on: https://latifundist.com/analytics/23-obzor-rynka-zernovyh-kultur-2021-eksport-proizvodstvo-tendentsii

[3] The Kyiv Independent/ Ukraine's 2022 state budget: Defense among top priorities but still underfunded – accessed on: https://kyivindependent.com/national/ukraines-2022-state-budget-defense-among-top-priorities-but-still-underfunded/

[4] Ліга.Бізнес. Через війну кожен другий українець втратив роботу. Що буде далі? – accessed on: https://biz.liga.net/ekonomika/all/article/rynok-vyjivaniya-iz-za-voyny-kajdyy-vtoroy-ukrainets-poteryal-rabotu-chto-budet-dalshe

[5] Openmind Економіка. Як військові конфлікти впливають на економіку – accessed on: https://mind.ua/openmind/20173685-yak-vijskovi-konflikti-vplivayut-na-ekonomiku

Kateryna Mykhailova,
H.M. Pylypenko, research supervisor
V.V. Zabolotnikova, language adviser
Dnipro University of Technology, Dnipro (Ukraine)

Conspicuous consumption: issues, grounds, types

One of the most important characteristics of any society is how people of this society live: what they eat, how they dress, what they do [4, p. 233]. The relevance of the work is that the modern world market is increasingly filled with goods that are relatively expensive and quite popular with consumers, but little different from cheaper ones, and in some cases do not benefit their customers, which would be commensurate with cost. The purpose of this work is to determine the essence of the phenomenon of conspicuous consumption and the causes of its occurrence. The following tasks were outlined: to clarify the basis that contributes to the emergence of the phenomenon of conspicuous consumption in society, and to distinguish between different types of conspicuous consumption.

The Institute of Sociology of the National Academy of Sciences of Ukraine conducted a monitoring study, asking respondents the question “What do you think is the most important sign of human success in our country today?” (with the possibility of choosing more than one answer). According to the results, 47% of the population of Ukraine noted wealth [3, p. 72].

The phenomenon of useless consumption was first described and scientifically considered by the American economist Thorstein Veblen. He called it “conspicuous consumption,” that is, it helps to demonstrate the symbols of one’s own wealth as means of enhancing or maintaining one’s reputation. The sociologist expounded this idea in “The Theory of the Leisure Class” (1899). The essence of Veblen’s provisions is that consumers buy the most expensive goods not for the purpose of direct use, but to show their uniqueness, belonging to the upper class. In such cases, the main role is played not by qualitative characteristics, but by the price of goods or services [3, p. 65].

In addition to Veblen, the issue of demonstrative consumption was studied by G. Simmel, J. Baudrillard, E. Fromm, W. Sombart, H. Marcuse, V. Ilyin, Yu. Tsimerman, O. Posypanova, A. Zaluzhnyi, A. Rumiantseva, O. Pakhmanov, Ye. Kucherenko.

Today in scientific circles there is a use of terms that express one phenomenon under different names or highlight certain aspects of the same process of consumption, which helps to attract the attention of others. In addition to the category of “conspicuous consumption,” modern scientific circulation also has the concept of “showy consumption,” “status consumption,” “excessive consumption” and so on. All these terms are both delimited and similar. Conspicuous consumption refers to the use of consumption to prove possession of wealth. Showy consumption characterizes the use of consumer goods to impress others. The concept of status consumption refers to the demonstration of high status due to the high price of demonstratively

consumed things. Excessive consumption is an institutionalization of the "consumption syndrome," according to which living in debt is not a shame, but on the contrary, is prestigious [1, p. 31-32].

Turning to the hierarchy of needs of Abraham Maslow, we can conclude that conspicuous consumption is unlikely to be determined by physiological needs and security needs. On the contrary, it exceeds the level required by the individual for physical survival and conservation as a species. However, some human needs are intangible (social), and at the highest level there are needs for respect and self-expression. It can be assumed that conspicuous consumption stems from these higher intangible human needs. However, these needs must be based on a certain value basis [1, 33]. Thus, the roots of the phenomenon of demonstrative consumption lie in the economic, social, psychological and culturological spheres.

Conspicuous consumption – depending on the means of meeting social needs, self-expression and respect – is realized in various forms, including status consumption (consumption to maintain or suggest feigned status), wasteful consumption (ostentatious consumption of certain goods and services in excess of necessary needs and consumer's own budget, can lead to "debt life"), glamorous consumption (purchase, demonstration of goods and attendance of events that meet the criteria of brightness, relevance and exclusivity in terms of fashion), image consumption (consumption to impress others, and the means of demonstration of this form depend on the level of social environment development) and prestige consumption (consumption goods and services in connection with their external properties, rather than real benefits).

Ukrainian realities show that the behavior of representatives of the political and business elites has remained double standards, the desire to be closed from other members of society who belong to lower social level. In some cases, there is also a desire not to publicize private property, while show business representatives, on the contrary, behave diametrically opposite. In some regions of our state there are separate zones where the vast or absolute majority of estates belong to party representatives and businessmen: for example, Koncha-Zaspa, Pushcha-Vodytsia, Koncha-Ozerna, etc. Wealthy people mostly seem to seek to create a commune of their own kind, a camp, a space loyal to the rich and closed to ordinary people [3, p. 68].

Reasons that motivate people to demonstrate conspicuous consumption:

1) urbanization. During the day, an individual is surrounded by thousands of people he (or she) does not know, and they do not know him (her), so only through the demonstration of consumption it is possible to indicate his (her) socio-economic status;

2) rational grain. Symbolic consumption denotes the real potential which stands behind an individual or a firm. As it is important in business to instill confidence in partners for own financial well-being, buying a Mercedes for the last money is not always economically irrational;

3) quantity as a tool of conspicuous consumption. Showy consumption is often manifested not only by the quality of prestigious items, but also by the number of

items. Thus, in the United States in the middle class is quite common to purchase items with a narrow specialization: for example, sneakers for running, fitness, exercise, walking, etc. [4, p. 239].

To conclude, it is need to be stated that at the heart of the urge to conspicuous consumption is the need to belong to a group of rich and powerful. Unsatisfied, this need for some people can cause feelings of discomfort. Since human actions in the economic sphere are always to some extent conditioned by the attitude to the world around and reflect efforts to change and transform to meet different needs, demonstrative consumption has its origins in the pursuit of social needs, self-expression and respect, and more, decision-making is influenced by the normative component in the forms of socio-cultural institutions, values and beliefs. Conspicuous consumption is realized in the form of actions aimed at the acquisition and use of goods and services in order to establish the individual's (high, or special, or either high or special) social and economic position in society. Demonstrative consumption can occur only if the physiological needs and security needs are sufficiently met, the level of economic development of society is relatively high, and special socio-cultural values are established in certain segments of society.

References

1. Кучеренко Є. В. Сутність поняття «демонстративне споживання». Scientific journal Economic Bulletin of the National Mining University. – 2017. – № 3. – С.28-36.

2. Залужний А. Л. Феномен демонстративного споживання у контексті нової інституціональної економіки. Збірник тез наукових робіт учасників міжнародної науково-практичної конференції для студентів, аспірантів та молодих учених «Соціально-економічні підсумки 2017 року: реалії та перспективи». – 2017. – С. 42.

3. Рахманов О. А. Стилі життя українських капіталістів як демонстрація соціальної суб'єктивності в суспільстві. Український соціум. – 2012. – №. 3. – С. 63-76.

4. Румянцева А. Показное потребление как демонстрация социально-экономического положення. Науковий вісник Одеського національного економічного університету. – 2016. – №. 4. – С. 231-242.

Sabina Shchehlova
O.H. Grosheleva, research supervisor
S.I. Kostrytska, language adviser
Dnipro University of Technology, Dnipro (Ukraine)
ESB Business School, Reutlingen University, Reutlingen (Germany)

Pay equity as a means of motivating employees and its importance for the efficiency of organization

Motivation is an essential part of effective work. Employees who are interested in quality work and their own professional development have a major influence on the overall performance of the company. Employee motivation is a key part of the human resources policy of an enterprise. It is implemented in order to reconcile the interests of the company with those of its employees. The company is interested in qualitative, productive and effective work of its staff. The employees have a vested interest in the satisfaction of their needs. The more effective the motivation is, the less staff flow and the more intensive the recruitment of new employees are.

Motivation is classified into tangible and intangible motivation. Non-material motivation includes career development, involvement of employees in meetings with management, social benefits packages, friendly atmosphere in the workplace etc. Material motivation in turn is monetary and penalty system [1]. This study will look at the importance of financial motivation of employees, why fair pay is an important part of overall motivation and the issue of the gender gap.

In 2022, "Googlegeist" conducted an annual survey of Google workers regarding salary satisfaction (Fig.1). According to the survey in 2022, 53% of employees consider their pay to be competitive (in 2021 – 58%). In 2021, 64% of respondents said their pay was "fair and equitable", and in 2022 the percentage is 56%. 56% of cloud storage workers said that their career development process was fair and equitable in 2021, and in 2022 the percentage is 54% [2]. According to the CNBC team, which analyzed the survey results, the biggest dissatisfaction was with compensation and execution. Competitive pay is a major issue for all companies as they all struggle to recruit and keep their employees.

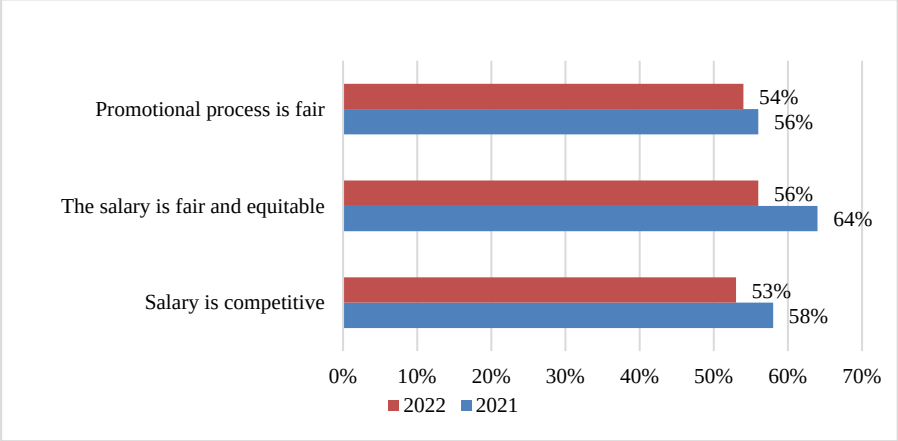


Fig.1 Google staff satisfaction with pay

Motivation affects the employees' sustainable and long-lasting commitment.

Competitive pay and fair pay are not synonymous. Fair earnings are the ones when the amount of pay increases in line with the amount of effort employees put in, regardless of other factors. A positive ratio of pay to effort motivates them to work better. Besides, fair pay is determined by management's equity in the employee and the lack of gender segregation. Pay equity means that management appreciates employees, regardless of gender, race, age or other demographic status. For example, 43% of American employees would leave their jobs, if they found out they were paid less than their co-worker of a different gender or race doing the same job [3].

The gender pay gap is still a problem in the modern world, despite the fact that humanity now stands for gender equality. This gap is measured as the difference between the average gross hourly pay of men and women, calculated as a percentage of the average gross hourly pay of men (without special payments) [4].

"Slovo i Dilo" has analyzed the data of the State Statistics Service of Ukraine about full-time employees (Fig. 2). The results of the survey show that men's wages have been consistently higher than women's wages [5]. The difference between men's and women's wages is between 17% and 27%. An enterprise should create a positive image for itself. This will attract good employees and potential investors for new projects.

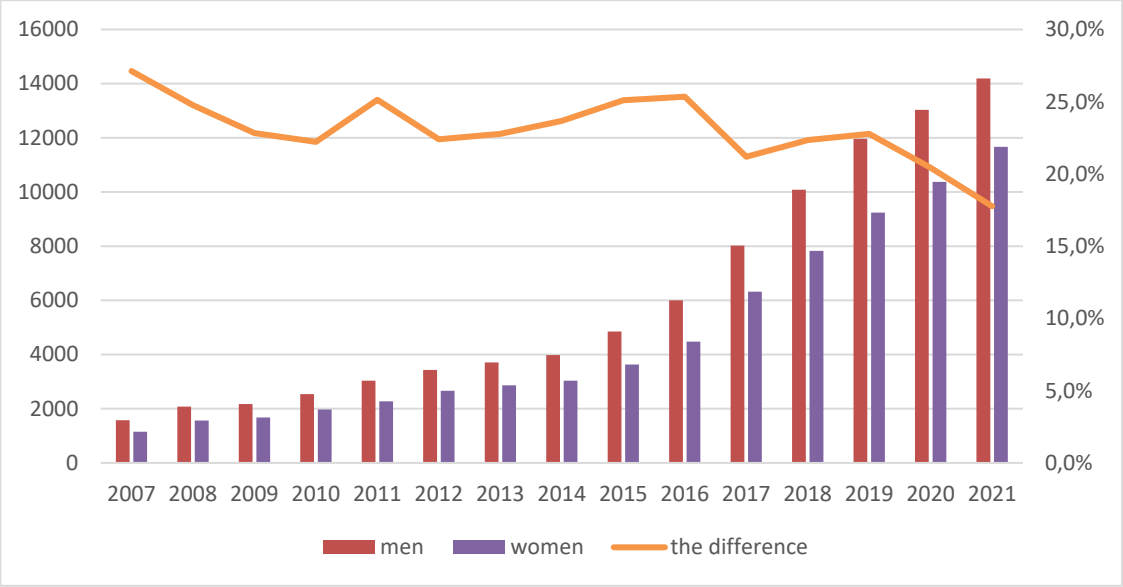


Fig.2 The average monthly pay of men and women in Ukraine

The results of the study show that fair pay plays a huge role in retaining a company's workforce, increasing engagement, satisfaction and helping to reduce brain drain. By fairly valuing the staff performance, the company creates an encouragement for self-improvement of employees. This also gives the organization an image of valuing its employees and rewarding them fairly, which boosts team morale.

References:

1. Мотивація персоналу. Бухгалтерський облік, оподаткування. URL: https://www.audit-it.ru/terms/trud/motivatsiya_personala.html (date of access: 28.04.2022).
2. Lodewick C. 'Googlegeist' survey reveals employees aren't happy with pay. *FORTUNE*. URL: https://fortune.com/2022/03/15/google-googlegeist-survey-employees-unhappy-with-pay/ (date of access: 28.04.2022).
3. Job seeker nation survey. When Change is the Only Constant. *JOBVITE*. p 22 URL: https://www.jobvite.com/wp-content/uploads/2020/05/FINAL-Jobvite-JobSeekerNation-Report1_5-11.pdf (date of access: 28.04.2022).
4. Gender Pay Gap. *Federal Statistical Office*. URL: https://www.destatis.de/EN/Themes/Labour/Labour-Market/Quality-Employment/Dimension1/1_5_GenderPayGap.html#:~:text=The%20gender%20pay%20gap%20is,men%20(%20without%20special%20payments (date of access: 28.04.2022).
5. Гендерний розрив в оплаті праці: як відрізняється середня зарплата жінок і чоловіків в Україні. *Слово і Діло*. URL: https://www.slovoidilo.ua/2021/06/10/infografika/suspilstvo/hendernyj-rozryv-oplati-praczi-yak-vidriznyayetsya-serednya-zarplata-zhinok-cholovikiv-ukrayini (date of access:28.04.2022).

Denis Shinkovskiy
O.V. Krylova, research supervisor
N.M. Nechai, language adviser
Dnipro University of Technology, Dnipro (Ukraine)

Prospective ways of resolving the economy of Ukraine

As a result of the full-scale invasion of the Russian Federation, the Ukrainian economy suffered a severe blow, which as of April 2022 had caused material damage of more than $80 billion. In order to begin a gradual recovery of the economy, it would be appropriate to analyze the Ukrainian economy, consider priority sectors and, as a result, identify promising ways, taking into account the already existing steps that the Government has taken.

Damage to the economy of Ukraine

By the end of 2021, Ukraine occupied a leading position in the export sector of agriculture and heavy industry. In particular, the 4th place in the export of agricultural products in Europe; the 14th place in the world in steel production. However, as a result of the fighting, losses accounted for a significant portion of the potential. [1]

More than 13% of the territory of Ukraine is considered mined by the Russian occupiers. This percentage includes the territory of Zaporizhya, Kherson, Donetsk, Lugansk and Kharkiv, which in turn account for 23% of wheat cultivation, 20% of sunflower and 21% of barley. The Ukrainian metal industry lost about 30% of its assets. Among the most tangible losses are "Azovstal" and MMK Illich, the second and the third largest metallurgy plants in Ukraine respectively. Consideration is therefore being given to how best to recover lost potential. [2]

Priority sectors of the economy

Refining industry

In accordance with the principles of the recovery plan for the economy of Ukraine, the Ministry of Economy and the offices of the Great Four identified promising industries, among which the processing industry occupies a significant place.

As a result of limited logistics, we must optimize the tonnage of exports by converting them into finished products that are much more expensive than primary products. We have already had the experience of processing sunflower into sunflower oil, and as a result, we increased our income in the share of world exports during the period of insufficient quantity in the primary product market. [3]

Financial system and banking

Banks ensure the functioning of branches in a non-stop mode in the absence of threats to the life and health of the population. Some branches of commercial banks are temporarily not working; others are put into special working hours.

The banking sector of the economy has recently become one of the leading directions in the third sector of the economy. This focus will help to stabilize the micro and macroeconomic instability and inflation processes that show high growth rates. In March 2022, inflation was 13.6%.

Dealing in

One of the leading activities of Ukrainian diplomats is gaining free access to the markets of the countries of the Great Seven and the EU countries. The opportunity to participate in trade in markets that account for 54% of all world trade is guaranteed to be a tangible step toward the recovery of the economy. Negotiations are underway with British representatives, who have already expressed support for the initiative. South Korea, whose economy had been devastated after the war, could be an example of this success.

Information technology

Certainly, at the moment one of the most promising directions in the economy is the IT sphere. This is now a priority area that has shown its relative resilience and flexibility in the face of a coronavirus pandemic and during the war.

In particular, it is also worth noting the impact of the IT sphere on other areas, such as the financial system. The introduction of modern technologies will allow the financial system to create innovative FinTech programs.

Steps taken by the Government

Currently, support for the economy is provided together with strategic partners of Ukraine, which provide grants and financial assistance during the war and have declared their readiness to recover the affected regions after its completion. As of April 23, 2022, the G7, the EU, and the United States have provided financial assistance totalling $57 billion. [4]

At the moment, the government is focused on currency intervention to prevent hyperinflation and to keep the hryvnia against the dollar relatively stable.

List of references:

1. MONITORING EU AGRI-FOOD TRADE: DEVELOPMENTS JANUARY-SEPTEMBER 2021
2. Center for Economic Strategy: The Economy of Ukraine during the War: Operational Assessment, April 2022 https://ces.org.ua/ua-economy-in-war/
3. Yulia Sviridenko, first Vice Prime Minister - Minister of Economy: How will Ukraine recover? https://www.pravda.com.ua/columns/2022/04/21/7341214/
4. Serhiy Naumenko, Chairman of the Board of Oschadbank: The National Bank’s strategies and what helps the hryvnia to stand up?

Andrii Shylov
I.M. Tsurkan, research supervisor
N.M. Nechai, language adviser
Dnipro University of Technology, Dnipro (Ukraine)

The adaptability of the tax system of Ukraine under the war conditions

On 24 February 2022 at 5:30 am a martial law regime was declared in Ukraine, which changed not only the lives of all Ukrainians but also the economy of the country. The taxation system of Ukraine was affected the most. In order to stimulate the economy during this difficult period, the decision was made to change many components of the tax system.

The first and most important step was the exemption from taxation of certain categories of business activities and the new criteria for the application of the simplified system. For the duration of the martial law, part of the microbusiness, which includes individuals - payers of the single tax of the 1st and 2nd groups, is exempt from the payment of the single tax and filing of tax returns on this tax. From April 1, 2022, the right to use the simplified system of taxation, which is the ability to become a payer of the single tax of the 3rd group, was received without any restrictions on the number of employees, legal entities of any legal organizational form and physical persons-entrepreneurs, whose total income for 2021 did not exceed 10 billion hryvnias. Yes, it is billions rather than millions of hryvnias, which were previously used to measure the cost criteria for the application of the simplified taxation system. [1]

Changes were also made in the indirect taxation, and the greatest adjustments were made to the surplus value added tax:

- The reduced or surrendered to the territorial defense goods are not subject to payment of VAT duties and the tax credit formed when purchasing them is not taken into account
- For fuel and oil products during the martial law period for import and supply of motor gasoline, important distillates, scraped gas, naphtha and Syrian oil products derived from bituminous minerals (minerals) a flat rate of VAT in the amount of 7% (20% previously) was envisaged.
- If the suppliers of goods/services did not register tax invoices in the Unified Register of tax invoices, the buyers have the right to independently create primary documents in accordance with Article 9 of the Law on Accounting and to include the amount of previously paid VAT to the tax credit on the basis of the appropriate documents.

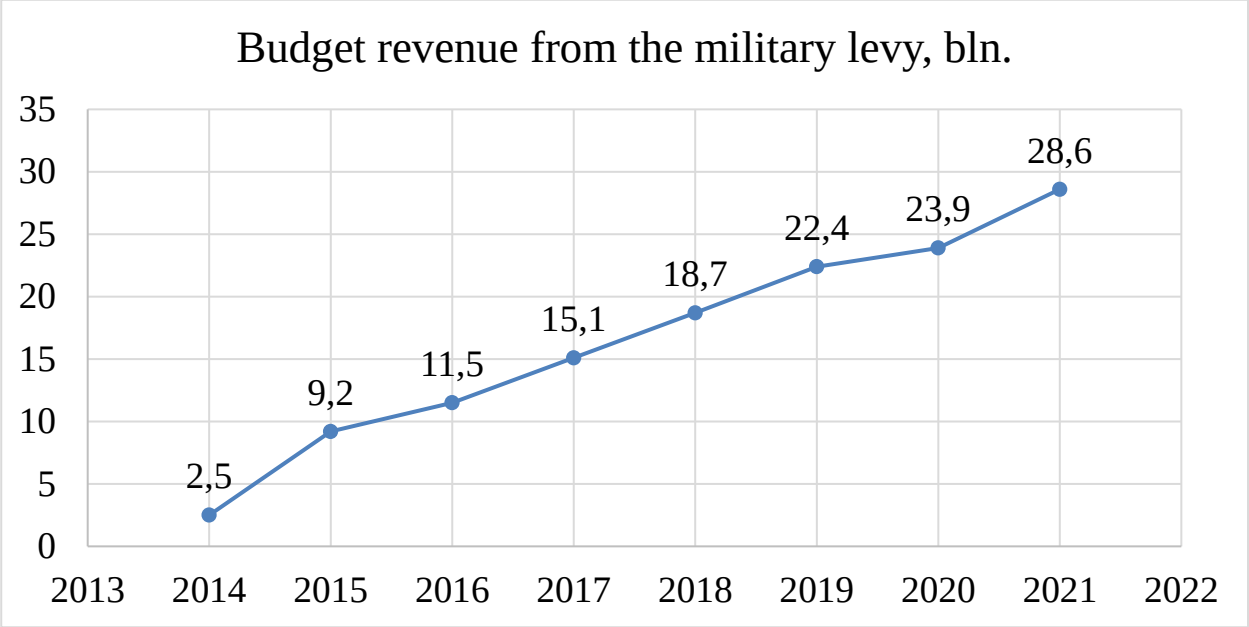
Excise tax for gasoline, other petroleum products, important distillates, scraped gas, propane, isobutane is set at zero excise tax rate.

It does not qualify as sales and does not entail the creation of a tax obligation on the published goods, in particular:

- compulsory transfer for the needs of the state;
- transfer for the needs of the state defense, military and law enforcement agencies or medical institutions without prior or subsequent reimbursement of the cost of goods;
- transfer as humanitarian aid. [2]

The most important tax during the military time was military duty. The military duty is a tax that was introduced in 2014 on an hourly basis to finance the Armed Forces. This tax covers the income of individuals on the territory of Ukraine. The rate of the military duty used to be 1.5% of accrued wages. Despite the fact that this tax was introduced only for one year, it was decided to keep it due to the non-stop operations in the ATO zone.

During the period from 2014 to 2021, 131.9 billion hryvnias were collected



(Fig. 1).

Figure 1 Budget revenue from the military levy, bln.

However, on May 2, there was a draft of changes to the Tax Code of Ukraine, which envisages a doubling of military duty – from 1.5% to 3%. Authorities state that the period of action of the norms on increasing the rate of military duty will be limited only by the period of military or emergency situations. [3]

The minimum wage from December 1, 2021 is 6,500 UAH. Thus, the military duty from this salary is 97.5 hryvnias. If the military duty is doubled, the employee will pay 195 UAH of the military duty from his or her minimum wage. If we take the revenues to the budget in 2021 and increase them twofold, we can expect the approximate revenues this year in the amount of 57.2 billion hryvnias.

Summarizing all of the above, we can firmly state that the tax system of Ukraine is now the most flexible of all the layers of the financial system due to the fact that the stability of the economy of the country during the war depends on it. Without an adaptive tax system, many enterprises would be forced to quit the market. An increase in military duty will lead to increased independence from foreign

partners and will encourage Ukrainian enterprises to continue working because thanks to them not only the economy remains stable, but also their payment of taxes helps our army.

References:

1. Збільшення військового збору: кому доведеться платити більше. Судебно-юридична газета. URL: https://sud.ua/ru/news/publication/236708-zbilshennya-viyskovogo-zboru-komu-dovedetsya-platiti-bilshe .
2. Сушко Д. Податкова реформа воєнного часу: які зміни до Податкового кодексу ухвалила ВР. URL: https://biz.ligazakon.net/analitycs/210044_podatkova-reforma-vonnogo-chasu-yak-zmni-do-podatkovogo-kodeksu-ukhvalila-vr .
3. Татарова М. Податки під час війни: все, що потрібно знати бизнесу. Економічна правда. URL: https://www.epravda.com.ua/rus/columns/2022/04/7/685375/ .

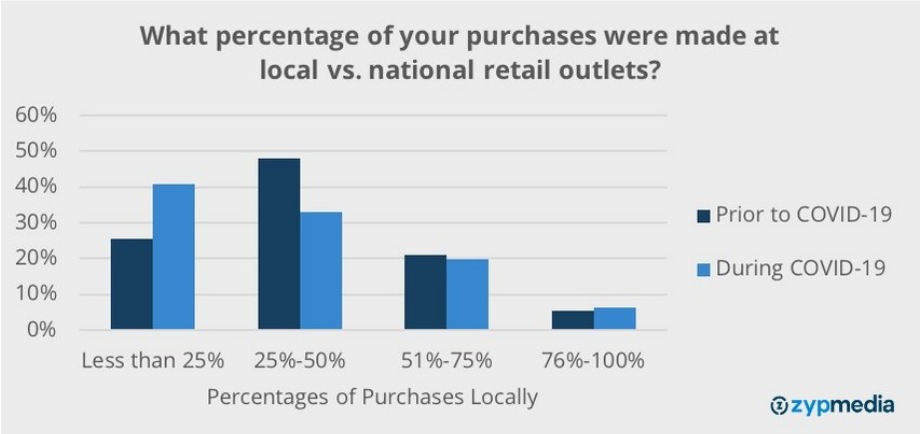
Marianna Surianinova
T. V. Kuvaieva, research supervisor
V.O. Lapina, language adviser
Dnipro University of Technology, Dnipro (Ukraine)

Trends in product consumption caused by Covid 19

Choosing a marketing strategy for a company is impossible without analyzing market and global trends emerged as a result of Covid-19. There are several key factors affecting the search, formation and implementation of an enterprise marketing strategy in the field of marketing.

Covid-19 has forced companies and specialists in different fields around the world to reconsider and adapt to rapid changes in the market, which are fundamentally distinct from the traditional rules of the game [1]. Pandemic is much more than a health crisis – it is a driving force of long-term changes in global consumer behavior and business. In many cases, consumers have used this life pause to reflect on their own consumption. They are striving to shop locally, mindfully and cost-consciously [2].

The first trend to pay attention to is ‘support of the National manufacturer’. During the quarantine period, Ukrainians began to actively support domestic businesses, making purchases unnecessarily. Ready-to-eat services, fast food outlets, restaurants and bars received the greatest support among respondents. According to statistics, 25% of Ukrainians buy more domestic products, even if they are more expensive. 24% of respondents purchase goods mainly from those brands that, in their opinion, responded correctly to the situation with the spread of COVID-19. The article of the Delloitte press service took into account that the majority of Ukrainians (70%) use ‘made in Ukraine’ products, and 56% buy them. Residents of the eastern regions of the country are least aware of ‘made in Ukraine’ products (63%), and 16% of them do not buy such products at all. 56% of consumers shop at nearby stores or buy more local products, with 79% and 84%, respectively, planning to continue this behavior in the long run. The reasons for this vary from actively supporting local stores or national products to finding authentic and artisanal products [3].



Picture 1.1 – Comparison of purchases prior and during Covid-19

Web shopping is the second trend. The popularity of online shopping in Ukraine has increased in recent years, and there is no denying that this trend takes a little longer for us than for more developed countries. However, Covid only reinforces this trend due to the obvious effects of quarantine. According to the data obtained, every third Ukrainian who uses the Internet made an online order at least once [4]. At the same time, almost 100% of these users have made online purchases many times over the past year. The sharp increase in the adoption of e-commerce and multi-channel services, which has been evident since the beginning of our study, shows no signs of weakening. The latest information suggests that after the outbreak, there will be a huge 169% increase in e-commerce purchases from new or low-frequency users. In addition, the vast majority of consumers who are expanding their use of digital and multi-channel services, such as home delivery, roadside pickup, or shopping through social media platforms, expect this activity to continue in the future. [5] Therefore, it is very important to develop online stores and delivery. All companies try to establish uninterrupted, convenient and fast delivery, so this becomes a very important factor for the consumer.

The third major trend reported by McKinsey &Company is Health and hygiene, which leads to an acceleration in the consumption of natural foods and beverages. A boom in natural products is expected, and Ukrainians have become more attentive to the quality and naturalness of products. Today, 35% of Ukrainians are willing to pay more for food and beverages that do not contain unwanted ingredients [6].

According to research by Mintel6 experts, in the next five years, three main trends will be observed in the development of the global market: health and wellness, sustainable development, and food safety. While most consumers perceive, for example, ice cream exclusively as a delicacy, without much attention, there is a huge potential for positioning it in the ‘healthy food’ segment. Currently, the main offer on the market is represented by products with a high fat and sugar content, and consumers pay more attention to the taste characteristics of ice cream than its nutritional value. But the growing awareness of the population is changing the buying habits of consumers, which opens up significant prospects for developing new types of ice cream that will be more useful than traditional delicacies, while maintaining the characteristic taste and texture. One of the new products already on the market in the United States and Western Europe is frozen yogurt, that is, yogurt ice cream with probiotics and low fat content. In addition, the ‘healthy’ segment includes sorbets, sherbets and fruit ice, which contain natural fruits and juices [7].

The last but not the least trend is new taste preferences, which are also directly related to the degree of exposure to the new environment. The main values that the pandemic has brought are flavors based on ingredients associating with organic and immune-boosting ingredients: turmeric, ginger, elderberry, Echinacea herbs, citrus fruits, as well as Berry or fruit flavors. Foods containing vitamin C and zinc are also at the top along with the vegan line. When rationing, it is often easier and cheaper to store canned and frozen vegetables [8]. Almost a quarter (23%) of respondents during the pandemic reported that because of the pandemic, they began to eat more

vegetarian and vegan food. Scientists say that 1 in 3 binge eat junk food due to quarantine (lockdown). There is no denying that since many people are looking towards plant-based foods, this may indicate that we are eating healthier foods. Of the respondents, 31% said that they now choose healthier food due to the time provided by quarantine measures to combat COVID-19. However, slightly more (32%) of those we surveyed said that they were actually eating more junk food due to quarantine measures to combat COVID-19 [9].

Taking everything into account, it becomes clear that the world has changed a lot. Despite the fact that human behavior has also undergone significant changes, people are becoming more mentally resilient in terms of Covid-19, trying to save their lives and build their future, despite all the dimensions and restrictions imposed by Covid-19. Due to the decrease in morbidity, normal pre-pandemic life will return in the nearest future. Entrepreneurs have successfully found the ways to run their business in the pandemic conditions and properly manage the company on the Internet.

References

1. Delloite web-site. URL https://www2.deloitte.com/ua/uk/pages/press-room/press-release/2021/2020-consumer-behavior-in-ukraine.html
2. COVID-19: main trends in consumer behavior web-site. URL https://home.kpmg/ua/uk/home/media/press-releases/2020/07/osnovni-tendentsiyi.html
3. Baranova L.Ya., Levin AI Needs, income, consumption. - M .: Экономика, 2000. 29 с.
4. A Kotler F., Armstrong G., Saunders D., Wong W. Fundamentals of Marketing: Per. with English - 2. Europe. ed. - M .; SPb .; K .: Publishing House "William", 2006. 943 p.
5. Overcoming the impact of COVID-19 on animal welfare: COVID-19 Thematic Platform on Animal Welfare web-site. URL https://oiebulletin.fr/?p=15789&lang=fr
6. Graph of the impact of covid-19 on the purchasing activity of Ukrainians. URL: https://retailers.ua/
7. COVID-19: How consumer behavior will be changed web-site. URL https://www.ey.com/en_gl/consumer-products-retail/changing-customer-behavior-growth-strategy
8. Responding to COVID-19: What’s next for customers and brands web-site. URL https://www.linkedin.com/pulse/responding-covid-19-whats-next-customers-brands-janet-balis
9. How the COVID-19 pandemic is influencing consumer behavior web-site. URL https://www.contentserv.com/blog/how-covid-19-pandemic-is-influencing-consumer-behavior

Section 02 Environmental Problems and their Solutions

Anna Kobtseva
I. O. Zabolotska, directrice de recherche
I. O. Zabolotska, conseilleuse linguistique
Université Nationale Polytechnique de Dnipro, Dnipro (Ukraine)

L’écologie devient politique

Maintenant chaque jour de plus en plus des gens parlent d'écologie et du système écologique dans le monde. Cependant l'écologie joue aussi un rôle politique important.

Dès la moitié du XIX^{e} siècle, avec l'avènement de l'ère industrielle, une écologie plus politique a également émergé. L'écologie, qui s'inquiète de l'impact des sociétés humaines et de leurs activités économiques et industrielles sur l'environnement. Depuis les années 1970, cette écologie vise à protéger les écosystèmes et la biodiversité, l'environnement dans son ensemble pour permettre à nos sociétés de vivre de manière durable.

Aujourd'hui, dans le contexte de crise écologique globale, deux variations du terme écologie coexistent. Le réchauffement climatique est l'une des manifestations les plus marquantes de cette crise. Cependant elle n'est pas seul. À cela s'ajoutent la perte de biodiversité, la pollution des sols et des eaux, la surexploitation des ressources naturelles, etc. Et l'écologie politique se nourrit des travaux de l'écologie scientifique pour imaginer la transformation des modèles de développement à court, moyen ou long terme [1].

On entend constamment parler de crises économiques, militaires, psychologiques, démographiques. Ce n'est un secret pour personne que les 10 dernières années on a de plus en plus parlé de la crise environnementale. Pourquoi la crise écologique est-elle si dangereuse ?

La crise écologique, c’est aussi la destruction des habitats naturels dans le cadre des activités humaines, la surexploitation des ressources naturelles, la pollution des eaux, de l’air, ou la dégradation de la qualité des sols. Ce sont encore nos déchets dont seulement 40% sont recyclés alors que chaque Français en produit environ 500 kilos par an, sans compter les déchets agricoles et industriels. Considérée à la lumière de l’urgence environnementale, l’écologie vise ainsi à ralentir cette crise écologique par le développement à grande échelle de comportements responsables envers les différents écosystèmes globales. Car ce sont aussi nos sociétés humaines qui sont menacées par le changement climatique, celui-ci sera extrêmement difficile à inverser une fois amorcé [2].

Est-il vrai que la politique et l'écologie sont si étroitement liées à notre époque ? La réponse à cette question est un oui évident. Dans l'espace politique, il y a un terme "politique verte". La politique verte est une idéologie politique visant à assainir la terre et à fixer des règles environnementales. La Commission européenne actuelle propose de nouveaux objectifs plus ambitieux pour la période 2021-2027.

La politique environnementale de l'UE repose sur quatre principes fondamentaux :

- le principe de précaution ;
- le principe de prévention ;
- le principe de la correction des atteintes à l'environnement ;
- le principe "pollueur-payeur".

Disposant de peu de ressources européennes, cette politique est surtout mise en œuvre grâce à la création de normes et de réglementations qui permettent un rapprochement des législations nationales afin de lutter contre le changement climatique [3]. L'augmentation de l'information sur la politique verte soulève des questions de l'efficacité d'une telle politique.

Le plan "énergie-climat", adopté en décembre 2008, vise à réduire les émissions de gaz à effet de serre (GES), à accroître le recours aux énergies renouvelables et à économiser 20 % de la consommation d'énergie en 2020. En 2014, le nouveau paquet énergie-climat fixe des objectifs de l'UE pour 2030 :

- réduction des émissions de GES de 40 % par rapport à 1990 ;
- part minimale de 27 % pour les énergies renouvelables ;
- augmenter l'efficacité énergétique d'au moins 27 %.

Le programme LIFE+ (instrument financier pour l'environnement) vise spécifiquement à financer des améliorations et des recherches dans le domaine de la protection de la nature et de la biodiversité, ainsi que la préservation de la qualité de l'air et du climat. Son budget pour 2014-2020 était de plus de 3 milliards d'euros. En décembre 2020, le Parlement Européen et le Conseil de l'UE ont convenu d'allouer 5,4 milliards d'euros à LIFE+ pour la période 2021-2027 [3].

En conclusion nous pouvons constater que l'écologie politique est importante et a une grande influence sur la structure de la vie. Grâce à cette organisation, nous pourrons maintenir et améliorer l'environnement et par conséquent - le niveau de vie.

Bibliographie :

1. Futura planète. Écologie : qu'est-ce que c'est ? URL: https://www.futura-sciences.com/planete/definitions/developpement-durable-ecologie-133/
2. Conservation nature. Comprendre facilement l'écologie quand on est débutant. URL: https://www.conservation-nature.fr/ecologie/
3. Vie publique. Quelle est la politique environnementale de l'UE? URL: https://www.vie-publique.fr/fiches/20412-quelle-est-la-politique-environnementale-de-lue

Milena Mosinian
O.V. Lozhnikov, research supervisor
I.A. Ivanchenko, language adviser
Dnipro University of Technology, Dnipro (Ukraine)

Geodesign of territories on the example of quarry restoration

Geodesign is a trend for the future that is already taking over the world. Traditional methods of quarry reclamation, such as flooding, burying toxic waste, filling with waste from quarrying gullies, cracks, removing the fertile layer of land, and transferring it to the reclaimed land have been used for many years but due to their disadvantages such as environmental and water pollution, danger to people and animals, they are losing their popularity. Geodesign, meanwhile, is being used more and more often.

There are numerous good examples of geodesign in quarry reclamation, such as the Eden Project in Cornwall, UK. The Eden Project is a botanical garden in a reclaimed quarry where kaolin was formerly extracted. The complex consists of two orangeries, each consisting of several connected geodesic domes under which many plant species from around the world are kept.

Another notable example is the Intercontinental Shanghai Wonderland Hotel in China, which is built on the site of an abandoned quarry and some of the hotel rooms are underwater. And also, the Dalhalla summer music venue, an open-air theater located in a former limestone quarry in Sweden, which has unique acoustic characteristics.

The problem of geodesign and revitalization of disturbed territories is very urgent for Ukraine. Over the past 70 years, mining operations have violated more than 200 thousand hectares of land. Hundreds of quarries have been closed without proper reclamation and now pose some threat to the population and the environment. At present, the principles of decarbonization, which is becoming the closure of coal mines with thousands of hectares of technogenic territories that require qualitative changes while preserving the vital activity of the region, are being widely introduced in the country.

Currently, the most common method of quarry reclamation in Ukraine is flooding. For example, the Yavoriv sulphuric quarry in Lviv region was turned into the deepest (up to 70 m) artificial lake in Ukraine.

Geodesign opens up new opportunities for solving the problems of mining regions, as well as for man-made territories in the immediate vicinity of settlements. The result of solving the problem should be the transformation of technogenic territories into places of attracting business and tourists.

These kinds of projects will help in the development of the tourism and economic sphere of the region, in which areas to be reclaimed are located.

The creation of such a project requires the following:

- to find people interested in the development of this project,

- to determine the concept and specification of the project,
- to analyze the territory,
- to predict hazards that may occur,
- to create a design and simulate it,
- to get an assessment of the project from experts.

It is quite a difficult and time-consuming process, but the result of the accomplished work will surpass all expectations. Such a project can become both an attractive place for tourists and an appealing idea for investors. Reclamation of the territory will help to receive profit from the quarry even after its liquidation.

References:

1. https://ru.wikipedia.org/wiki/%D0%9F%D1%80%D0%BE%D0%B5%D0%BA%D1%82_%C2%AB%D0%AD%D0%B4%D0%B5%D0%BC%C2%BB
2. https://ru.wikipedia.org/wiki/%D0%9F%D1%80%D0%BE%D0%B5%D0%BA%D1%82_%C2%AB%D0%AD%D0%B4%D0%B5%D0%BC%C2%BB
3. http://old.ac-rada.gov.ua/img/files/EUROSAI/Presentation_full_text_Zozulia_ukr.pdf
4. http://irbis-nbuv.gov.ua/cgi-bin/irbis_nbuv/cgiirbis_64.exe?C21COM=2&I21DBN=UJRN&P21DBN=UJRN&IMAGE_FILE_DOWNLOAD=1&Image_file_name=PDF/Nplanu_2015_13_27.pdf
5. https://www.researchgate.net/publication/313882932_A_Geodesign_Approach_for_Using_Spatial_Indicators_in_Land-use_Planning
6. http://rekultivacija.ru/sposobyi-rekultivatsii-karerov/

Karyna Reshetar
Yu.I. Cheberiachko, research supervisor
V.V. Zabolotnikova, language adviser
Dnipro University of Technology, Dnipro (Ukraine)

Natural emergencies - storms and hurricanes - on the territory of Ukraine as an example of new challenges in the field of civil security

Until recently, Ukraine was a fairly calm country in terms of weather conditions and relatively rarely suffered from severe hurricanes. Whereas reports from the State Emergency Service of Ukraine show an increase in the number of emergencies over the last decade. In total, 749 classified natural emergencies have occurred in Ukraine over the last 10 years, on average - approximately 75 situations per year. The number of natural emergencies in 2021, compared to 2020, increased by 1.6% [1]. These include sometimes quite powerful cataclysms occur, such as storms or hurricanes, which lead to serious consequences. This growing trend of emergencies can be explained primarily by global climate change on Earth.

To begin with, hurricanes are cyclones with very high airflow velocities, usually similar to tropical cyclones. The hurricane is characterized by a wind of great destructive force and considerable duration, the speed of which reaches or exceeds 32 m/s. The wind speed during a storm also has quite significant indicators – 15 - 20 m/s. The width of the hurricane is usually the width of the catastrophic destruction zone or zone of the hurricane force wind. This area is 20 to 200 km wide. Besides a storm zone with relatively little damage is often add to this zone, and then the width of the hurricane is measured in hundreds of kilometers.

Hurricanes cause enormous devastation and material loss, amounting to millions of hryvnias, and often claim many lives. The relief and season, the nature of the economy of this area, the degree of its construction and strength of buildings, the presence of people and animals in the area of natural disaster, preventive and precautionary measures influence on the value of the losses caused. A striking example is the windstorm Xanthippe-Yulia, which passed through the territory of a dozen European countries from February 22 to February 24, 2020, also reaching Ukraine. After rescuers announced a storm warning and introduced the second "orange" level of danger, they responded more than 275 times to incidents of falling trees, branches and the destruction of various structures. According to the press service of the State Emergency Service of Ukraine, one person died and four others were injured, 504 settlements in 12 regions remained de-energized, strong winds damaged about 150 houses and other social facilities in 9 regions, because of raging storm [2, 3]. Thereby, the storm wind causes not only accidents, damages and destroys buildings, but also agricultural lands, power lines and communications, highways, including various types of transport.

After this, it should be noted that the accompanying hydrological phenomena are no less frightening than the hurricane - they are huge masses of tidal water on the coast and prolonged downpours that cause large floods. This is confirmed by Kevin

Reed's research, which shows an increase in hourly rainfall in tropical storms and hurricanes by 5 to 10%. From statistics only on hurricanes or severe storms, the increase was from 8 to 11% [4]. Obviously, all of this is from the impact of global warming.

The negative impact of storms, hurricanes, tornadoes is assessed by the destructive power of air masses. Depending on the drag coefficient and speed, the action of the force of dynamic loads of air flow on the surface of the building leads to destruction. Owing to the Saffir-Simpson Hurricane Wind Scale that based only on a hurricane's maximum sustained wind speed, it is possible to estimate hurricane from 1 to 5 and to establish potential property damage [5].

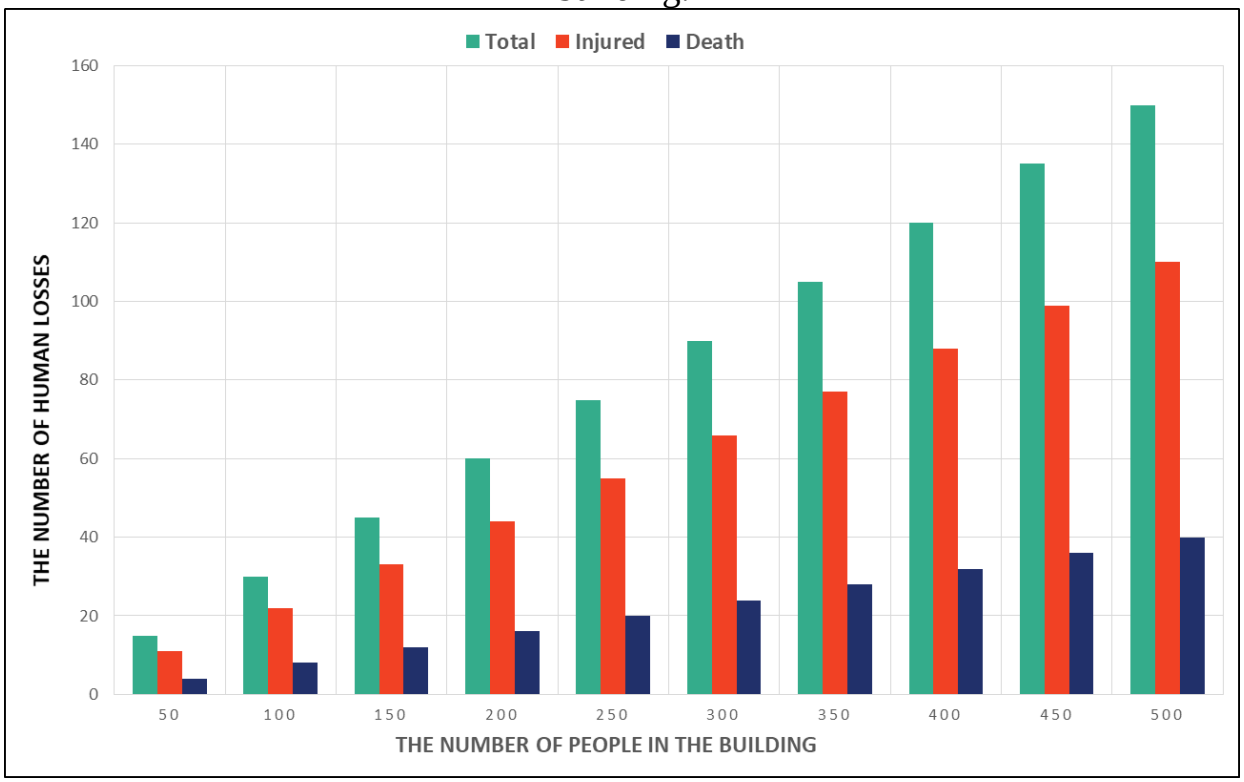
Table 1. The degree of destruction of buildings on the Saffir-Simpson Hurricane Wind Scale.

Category	Sustained Winds	Types of Damage Due to Hurricane Winds			
		Mobile Homes	***Frame Homes***	***Apartments, Shopping Centers, and Industrial Buildings***	***High-Rise Windows and Glass***
1	**33 - 42 m/s** *(119 - 153 km/h)*	Removed shingle or metal roof coverings, lost vinyl siding, carports.	Damaged roof shingles, vinyl siding and gutters.	Partially removed roof coverings, lost roofing and siding from windward side, faulty overhead doors and unprotected windows.	Broken windows due to flying debris.
2	**43 - 49 m/s** *(154-177 km/h)*	Very high chance of destroyed, shredded nearby mobile homes by the flying debris.	High probability of broken unprotected windows due to flying debris damaged and removed unanchored roof structures and siding.	substantial percentage of damaged roof and siding, collapsed unreinforced masonry walls	Broken windows due to flying debris.
3 (major)	**50 - 58 m/s** *(178-208 km/h)*	Potentially full damaged roof and collapsed walls.	Broken unprotected windows due to flying debris, removed roof decking, gable ends, and exterior walls.	High percentage of damage roof covering, siding and isolated structural wood or steel framing, possible complete failed older metal and unreinforced masonry buildings.	Numerous blown out windows of high-rise buildings.
4 (major)	**58 - 70 m/s** *(209-251 km/h)*	High percentage of destroyed.	Extensive damaged roof coverings, windows, and doors, lost most of the roof structure and some exterior walls or complete collapsed all walls and the roof structure, broken most unprotected windows and some protected windows.	High percentage of structural damaged top floors and collapsed older unreinforced masonry buildings partly collapsed old steel frames.	Most blown out windows of high-rise buildings.
5 (major)	**70 m/s or higher** *(252 km/h or higher)*	Almost complete destruction of all mobile homes, regardless of age or construction.	Severely damaged roof covers, windows, and doors, high percentage of total failure, broken nearly all unprotected windows and	Lost roof sheathing, completely collapsed many older metal buildings, destroyed buildings due to failed unreinforced	Nearly all blown out windows of high-rise buildings.

			many protected windows due to wind-borne debris.	masonry walls.	

In turn, the probability of human loss depends on the degree of destruction of the building. This, when multiplied by the number of people in the building directly during the emergency, gives the number of human losses. Therefore, it is regularly that the graph in Fig. 1 shows exactly a linear increase in the number of casualties.

Fig. 1 Dependence of the number of human losses on the number of people in the building.



Thus the consequences of a natural emergency are characterized by the number of dead and injured (including those left homeless), the number of destroyed and damaged industrial and civil infrastructure, the area of affected agricultural land with lost crops, harvest, etc.

In conclusion, climatic changes in the world condition the increase in the number of natural disasters, including those that can strike Ukraine. This is one of the reasons, why storms and hurricanes together with their accompanying phenomena lead to even greater property damage, human casualties and changes in ecosystems. Such emergencies of varying proportions caused by environmental change pose new safety challenges and bring the work of civil security specialists to a new level. At present, it is simply impossible to ignore such a threat that will force a move in the direction of preparing for natural disasters, revising and preparing a new regulatory framework and at the same time working to prevent emergencies.

References:

1. Публічний звіт Голови ДСНС про результати діяльності Державної служби України з надзвичайних ситуацій у 2021 році. *Державна служба України з надзвичайних ситуацій.* URL: https://www.kmu.gov.ua/storage/app/sites/1/17-civik-2018/zvit2021/zvit2021-dns.pdf (дата звернення: 21.04.2022).

2. Надзвичайні події. *Державна служба України з надзвичайних ситуацій*. URL: https://dsns.gov.ua/uk/news/nadzvicaini-podiyi?date=2020-02-25 (дата звернення: 11.04.2022).

3. Одна загибла та 4 травмованих: що відомо про наслідки негоди в Україні. *24 Канал*. URL: https://24tv.ua/odesa/odna_zagibla_ta_4_travmovanih_shho_vidomo_pro_naslidki_negodi_v_ukrayini_n1286953 (дата звернення: 11.04.2022).

4. Reed, K.A., Wehner, M.F. & Zarzycki, C.M. Attribution of 2020 hurricane season extreme rainfall to human-induced climate change. *Nat Commun* **13,** 1905 (2022). URL: https://doi.org/10.1038/s41467-022-29379-1 (date of access: 06.04.2022).

5. Saffir-Simpson Hurricane Wind Scale. *National Hurricane Center*. URL: https://www.nhc.noaa.gov/aboutsshws.php (date of access: 19.04.2022).

Sofiia Serhiienko
L.V. Pavlenko, language adviser
Dnipro University of Technology, Dnipro (Ukraine)
Slovak University of Technology in Bratislava, Bratislava (Slovakia)

Bioaugmentation as the most efficient and significant disposal strategy

In the 21st century activities by a human is raising major environmental issues like global warming, imbalance in soil ecological processes leading to lower agricultural yield, drastic climate change, etc. With the rapid increase in population, urbanisation and industrialisation, the environment is on the verge of ecological damage. The pollution of nature's elements such as the aquatic and terrestrial ecosystems by the industrial production of chemicals, mostly used for protection against weed, insects, and fungal attacks, is of serious concern. Most of these pollutants are recalcitrant in nature and persist in the environment for long periods of time.

However, there are several methods for disposing of pollutants but the most efficient and significant disposal strategy is bioremediation. This process is been coupled with two other approaches named bioaugmentation (introduction of efficient microbial strains) and biostimulation (addition of rate-limiting nutrients to the soil to enhance the remediation process significantly).

Bioaugmentation is the addition of microorganisms that have the ability to biodegrade highly complex compounds in the polluted environment. (Figure 1outlines the process of bioaugmentation). An environment will already have a microbial population in most cases, but bioaugmentation is designed to enrich this population and make it more effective in reducing the level of contamination. This approach is less-costly and friendlier to the environment compared to the physicochemical approaches.

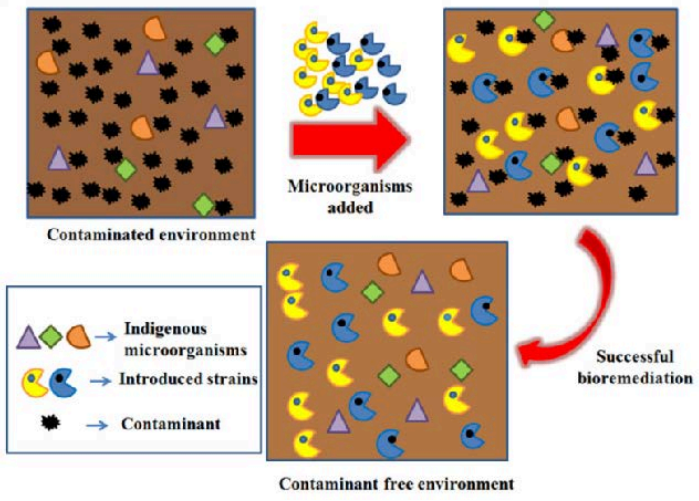


Figure 1 The pictorial diagram of bioaugmentation.

The chemical structures of certain pollutants may be so complex that consortia of different microorganisms may be necessary for their biodegradation, or all of the microorganisms necessary may not be simultaneously present in the environment. In many cases, pollutant compounds may be new, and as a result, microorganisms may not have yet adapted to use them as a substrate. Bioaugmentation can overcome these challenges, as one of its main advantages is that treatment can be tailored to a specific pollutant that is dominant in the environment. Thus, this approach is attractive for addressing both the increasing number of emerging pollutants as well as pollutants that are present at high concentrations.

On the other hand, there have been many instances where bioaugmentation had deficiencies in its process. Although bioaugmentation has been shown to increase the degradation of many compounds in lab-bases studies, it often fails when applied to field sites under environmental conditions.

The implementation of bioaugmentation on the environment can pose problems of predation, nutritional competition between indigenous and inoculated bacteria, insufficient inoculations, and disturbing the ecological balance due to large inoculations. Each problem can be solved using different techniques to limit the possibilities of these problems occurring. Predation can be prevented by high initial doses of the inoculated bacteria or heat treatment prior to inoculation whereas nutritional competition can be settled with biostimulation. Insufficient inoculations can be treated by repeated or continual inoculations and large inoculations are resolved with highly monitored dosages of the bacteria.

Despite a lack of knowledge of this relatively new field, bioaugmentation is a promising alternative approach to environmental purification compared to physicochemical methods. Bioaugmentation is certainly going to play an important role in the future of the global industry.

References:

1. Goswami M., Chakraborty P., Mukherjee K., Mitra G., Bhattacharyya P., Dey S., Tribedi P.: Bioaugmentation and biostimulation: a potential strategy for environmental remediation, J Microbiol Exp., 6(5), 223-231, 2018 .

2. Nzila A., Shaikh A. R., Zhu J.: Bioaugmentation: An Emerging Strategy of Industrial Wastewater Treatment for Reuse and Discharge, Int J Environ Res Public Health., 13(9), 846, 2016.

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

Dmytro Hladchenko
O. V. Balakhontsev, research supervisor
V. V. Hubkina, language adviser
Dnipro University of Technology, Dnipro (Ukraine)

Peaceful atom as a source of electrical energy

The modern world of power energy faces a great challenge of creating and disseminating energy sources that will be as environmentally friendly as possible, could minimize the consumption of fossil resources and, at the same time, make electricity as cheap as possible for the consumer. The main task is to provide the consumer with an energy source that can deliver electricity continuously and at the same time be balanced enough for the electricity grid. Renewables are a good solution for the first two tasks, but they are difficult for the next two tasks.

Fig.1 demonstrates the main data on the costs required for developing new technologies to generate power.

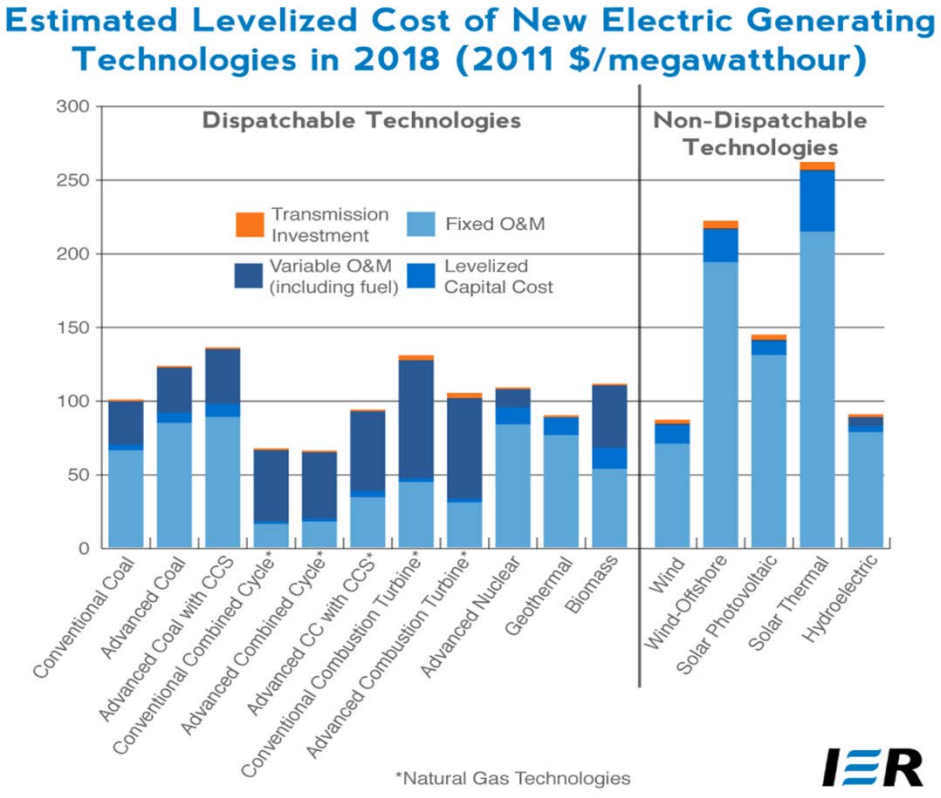


Figure 1. Cost of 1 MWh of electrical energy by the source

What is the solution to these problems?

As we can see from Fig. 1 the price of electricity from renewable sources is very high, and, moreover, the sun and the wind cannot be considered as reliable and stable sources of energy. It means that a specific amount of electricity cannot be

produced continuously, but at the same time it is worth noting that these types of sources have a positive impact on the ability to balance the electricity system. Considering such disadvantages as instability and dependence on physical conditions of such renewable energy sources as solar panels and wind power plants as well as the classic sources of energy resulting in huge emissions into the atmosphere, we can turn to the energy based on nuclear fission chain reaction, in other words, nuclear energy.

Power generation based on nuclear fission chain energy, hereafter nuclear energy, is generated in Nuclear Power Plants, hereafter nuclear power plants. As we can see from Fig. 1, the nuclear energy has a lower cost compared to renewable energy sources, but what other advantages does it have over renewable and classical energy sources? Let's look at this question in Fig.2

Advantages of nuclear energy

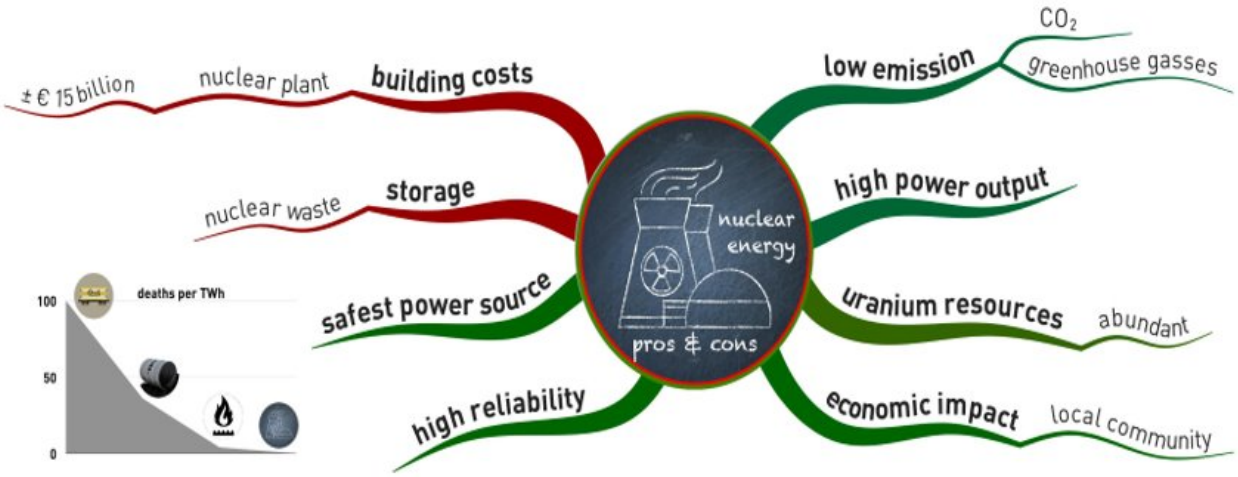


Figure 2. Advantages and disadvantages of nuclear energy

Perspectives

Considering the disadvantages listed above, it is hard to understand the sense and benefits of nuclear energy, but some important reasons can support this idea.

- the number of countries in the world still using large-scale electrification and fully benefiting from standard NPPs compared to developed countries having refused from using nuclear power
- various innovations in this area, e.g., development of small modular reactors (SMRs), that according to various estimates are to reduce the cost of nuclear energy by about 40%, due to lower start-up costs, greater mobility, and less destructive consequences even in the case of an accident if compared with conventional nuclear power plants
- including complete actinide reprocessing and in situ fuel cycle facilities based on advanced aqueous, pyrometallurgical or other dry reprocessing options into generation IV systems thus minimizing nuclear materials transportation and increasing proliferation

- reducing nuclear wastes in the medium term and providing assurance of nuclear fuel availability in the long term due to Actinide management common to all Generation IV alternatives
- creating new power plants powered by cold fusion thermonuclear energy similar to the energy resulted by fusion of light nuclei inside stars but at a much lower temperature.

To sum up, peaceful nuclear energy as a source of electricity has enormous potential and is quite promising to solve many of today's energy problems, so the development of nuclear power is an important challenge for the world and for each country individually.

References:

1. **International Atomic Energy Agency:**

Fusion powers map [Last access: 12.05.2022]
nuclear energy for the future [Last access: 12.05.2022]
what are small modular reactors [Last access: 12.05.2022]
what is nuclear fusion [Last access: 12.05.2022]
infographics nuclear energy compared [Last access: 12.05.2022]

2. **Institute for Energy Research:**

Estimated Levelized Cost of New Electric Generating Technologies
[Last access: 12.05.2022]

Yelyzaveta Ivanchenko
N. O. Rott, research supervisor
V. O. Lapina, language adviser
Dnipro University of Technology, Dnipro (Ukraine)

Development of «green» energy in Ukraine

Now hardly anyone can be surprised by a solar power plant. Travelers are used to seeing large fields of solar panels along roads, and Instagram profiles are full of photos of large wind turbines against the background of sunrise or sunset.

Home solar power plants are also not surprising. Solar panels on the roofs of private houses can be seen in almost every locality in the country. Such photos are no longer published on Instagram; this is quite an everyday reality. Solar power has become as common as a family car or boiler.

If in 2016 there were no more than a thousand owners of solar power plants (SES) in Ukraine, now there are 35,000 of them, and this figure is growing. However, it is growing differently than it was three or five years ago. During this time, the list of equipment for renewable energy sources (RES) has expanded, prices have changed, and key motivations and preferences of consumers are rapidly developing [1].

In 2019, Ukraine entered the TOP-10 countries in the world in terms of green energy development, and in 2020 – in the TOP-5 European countries in terms of solar energy development.

The total capacity of green energy facilities at the beginning of 2022 reached 9656 MW. According to the Ministry of Energy of Ukraine, in 2020 the share of renewable energy sources was over 11%.

The share of "green" energy in the energy balance of Ukraine for 10 months of 2021 increased by 9%. Back in 2019, the share of "green" energy accounted for 3.7% of electricity produced in Ukraine, according to the state enterprise "Guaranteed Buyer". Among the types of renewable energy sources (RES), the largest amount of "green" electricity was generated by solar power plants, followed by wind power. The total production of solar energy (SES) and wind energy (WPS) sources accounts for more than 90% of the total renewable energy production (Figure 1).

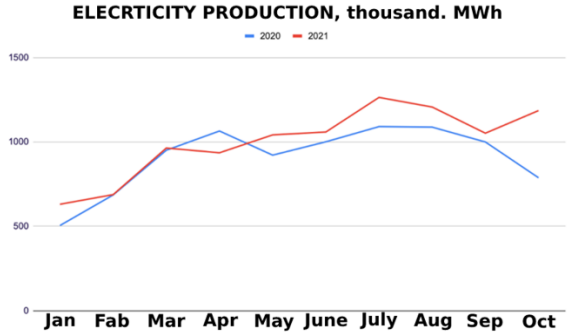


Figure 1. Electricity production in 2020/2021

Against the background of uncertainty about the green tariff and the consequences of the coronavirus crisis, 2021 cannot be called a successful year for

renewable energy sources in Ukraine. New mechanisms to support green energy that should replace the green tariff, such as green auctions and Net Metering, are still under development. However, while the state procrastinates, economic factors make their own adjustments. Therefore, despite the lack of state support, renewable energy sources are competitive and continue to grow. According to the State Agency for Energy Efficiency, the installed capacity of RES facilities in Ukraine in the first half of 2021 increased by 8.3% (Figure 2).

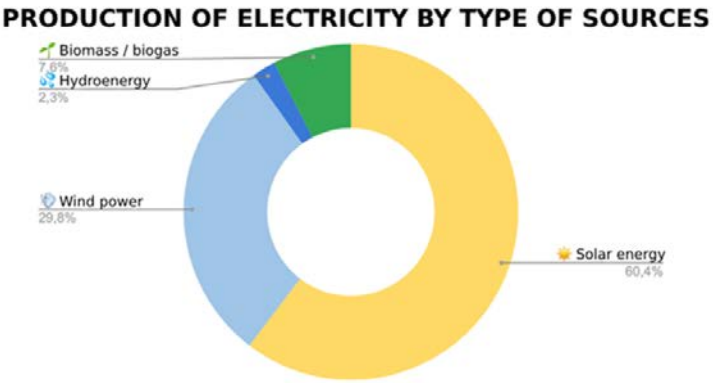


Figure 2. Production of electricity by type of sources

In Ukraine, the market is growing mainly due to domestic and commercial solar power plants (solar energy sources) for their own consumption. Even in the Ukrainian climate, small power plants with a capacity of 3-5 kW provide households with significant savings.

Deloitte predicts that among the main trends for renewable energy sources in 2022 will be:

- development of new generation technologies, using artificial intelligence to optimize energy processes;
- introduction of new business models (including business models for energy storage systems and expansion of RES projects to new markets);
- infrastructure development for RES projects;
- improving supply chains;
- implementation of the circular economy principles (rational use of resources and recycling) [4].

The progressive world is decarbonizing the economy. Ukraine has also pledged to reduce greenhouse gas emissions by 65% compared to 1990 levels by 2030.

The forecast electricity balance of the unified electric power system of Ukraine for 2022 also provides for an increase in the share of renewable energy sources to 9.2% compared to 7.8%, which was discussed in the similar forecast for 2021.

It is also expected to adopt a draft Law on Amendments to certain laws of Ukraine on stimulating the production of electricity from alternative energy sources on a market basis, which will allow producers of environmentally friendly electricity to act as independent market participants and increase revenues.

Another long-awaited change in the legislation is the draft law № 5436-d on the development of energy storage systems, adopted as a basis on November 16,

2021. The project provides for the creation of a new market participant –the operator of the energy storage system, which will balance the operation of the power system and increase the stability of electricity supply to consumers.

In addition, starting from 2019, market players expect to hold the first green auction. This mechanism will boost competition among investors and encourage companies offering the lowest electricity prices.

Green energy is an undisputed global trend in the coming decades. For individual consumers, homeowners, and businesses, it allows them to gain energy independence and significantly reduce the cost of rising electricity prices.

For the state, the RES development is already a guarantee of stable investment and a guarantee that Ukraine will continue to be able to export its products profitably in the future. The EU accounts for between 36% and 42% of Ukrainian exports, so delays in switching to green energy will cost the Ukrainian economy dearly.

To minimize the impact of the military situation on the economy and the formation of Ukraine energy independence, as well as further development of the industry aimed at abandoning Russian gas, the following low-cost steps are effective:

- providing destroyed and damaged green energy facilities with access to a new fund for restoring Ukraine war-destroyed energy infrastructure, established by the European energy community;

- supporting (in the form of tax holidays, no rent and land tax for 5 years, preferential connection to the network) for the construction of new solar and wind power plants.

- providing preferential conditions for green energy companies to access the electricity market "for the day ahead" in order to reduce the burden on the state enterprise "Guaranteed Buyer" for payments under the green tariff;

- increasing the level of flexibility and decarbonization of the Ukrainian energy system, primarily through the construction of new energy storage and transportation capacities, in particular, using biomethane;

- creation of special stimulating conditions for the production of renewable gases by green energy facilities (green hydrogen and synthetic renewable methane) [3].

Each energy sector plays its own role in the system, and everything is interconnected. "Green" capacities, unlike other energy sources, fully correspond to the philosophy of the global energy transition that will inevitably occur in Ukraine, which is part of the democratic world.

References

1. https://svitovyr.ua/thermal_power_plants/
2. https://is.gd/TM6VIy
3. Fücks R. Green growth, smart growth: A new approach to economics, innovation and the environment / Ralf Fücks. – London and New York: Anthem Press, 2013. – 371 p.
4. https://inventure.com.ua/analytics/investments/rynok-vozobnovlyaemyh-istochnikov-energii-vie-ukrainy-v-2021-godu
5. https://www.epravda.com.ua/rus/columns/2022/04/10/685513/

Viktoriia Kovrova
O. K. Ishchenko, research supervisor
I.I.Zuyenok, language adviser
Dnipro University of Technology (Dnipro, Ukraine)
Vilnius Gediminas Technical University (Lithuania)

Polymer concrete: main features and benefits

Concrete is known to be one of the most reliable and durable building materials, but it wears out with the time. For many years civic engineers have been looking for the material and/or technologies which can solve this problem. A series of tries were made to introduce innovative technologies which may solve this problem by improving the characteristics of concrete with the aim to increase its durability and construction properties. One of the alternatives found is polymer concrete, which is a mixture, composition of which consists of various polymeric substances. Possibility of polymer concrete to compete with ordinary concrete is in the focus of this paper [1].

Polymer concrete has proved its high strength and a long service life, it is moisture resistant. It does not deform, perfectly responds to temperature changes and bad weather conditions. It dries quickly and adheres well to any surface(s). This material has high resistance to stretching, it also has good air permeability. From the point of view of ecological safety, it is environmentally friendly, it does not pollute the environment and does not harm human health in any way [2].

Polymer concrete could compete with conventional concrete because it has a lot of construction properties. The most important advantages are as following [1]:

1) rapid solidification which creates appropriate conditions for quick continuing further construction works after a few days (one week is enough for complete hardening instead of a month needed for ordinary cement).
2) the curing of the concrete is independent, it does not need pouring of water, protecting from rain, dust, and heat etc.;
3) good adhesive properties, even to the surface of the reinforced structure;
4) endurance and strength. It is stronger in the conditions of rapid freeze and thaw cycles, if compared with ordinary concrete;
5) high mechanical properties, which are in 3-5 times higher than conventional concrete;
6) resistance to chemicals and corrosion;
7) low shrinkage;
8) resistance to atmospheric influences, temperatures, frosts.

This building material, unfortunately, has some disadvantages. Its negative properties are listed below [1]:

1) the composition includes artificial materials;
2) the expensive cost of some additives;
3) use of the resins and chemicals in composition of polymer concrete has its risks, so the use of personal protective tools (mask, hand gloves etc.) are necessary.

The polymer concrete is successfully used in new construction and for the repairing work. It has a wide range of application spheres due to the big quantity of its positive properties. It is used in landscape design, paths, and terraces, in particular. Walls are trimmed with a similar mixture from the outside. Borders, stairs, fences, pools, plinths are created by using this material. Various shapes, figures, decorative elements can be obtained from it. Moreover, it is easily painted after drying [3].

Use of this building mixture is suitable for floors. Polymer concrete floors can serve as an excellent protection against moisture and keep one's home warm [3].

Polymer concrete is a construction material, the composition of which includes thermosetting resin and thermoplastic polymers. Use of the thermosetting resin is more advisable because of its highly thermal resistance and a variety of chemicals. The polymer concrete consists of aggregates and polymer resin. A successful aggregate must be of a material of high quality, clean gravels, but dust and debris free, and dry. The polymer resin is a binder, and the aggregate is a compressive stress material. These resins include polyvinyl, methyl methacrylate, epoxy resins, polyurethane resins etc.

Epoxy resins are practically odorless. They provide maximum strength to the material. But at the same time, they give concrete fragility [4].

Methyl methacrylate smells sharply, but the smell disappears after polymerization. This kind of concrete sets quickly, but it is vulnerable to chemical influences [4].

Polyurethane resins are considered the most optimal in work. In addition, mineral aggregates from sand or crushed stone as well as special plasticizers and hardeners, are added to the mixture of polyurethane concretes [4].

A significant role in polymer concrete is played by fly ash which betrays the strength of the material, and slag. Another equally important ingredient is liquid glass. It provides protection from dampness and moisture [4].

The preparation of cement-polymer concrete is simple: you need to take a concrete mixer, pour water specially designed for polymers, then pour in a little cement. Then take equal proportions of slag and ash, mix with the contents of the concrete mixer. Polymer additives in concrete are placed and then they are mixed thoroughly. Specifications of polymer concrete is given in the table below.

Material	**Density**	**Compressive Strength**
Urea Formaldehyde Polymer Concrete	2260 kg/m3	37 MPa (5,400 psi)
Polyester concrete	2050 kg/m3	95 MPa (13,800 psi)

The research shows that polymer concrete can substitute ordinary concrete in special cases. Its use is warranted in borders, stairs, fences, pools, plinths, landscape design, paths, terraces etc.

Great number of advantages, especially fast curing, high compressive strength and chemical resistance can provide its wide application in various specialized cases.

References:

1. What is Polymer Concrete? Uses, properties, pros/cons, and ingredients of Polymer Concrete [online] Available at: https://civilengineeringbible.com/article.php?i=323
2. Patel, H. (2019) *Polymer Concrete: Its Pros-Cons, Uses & Properties* [online] Available at: https://gharpedia.com/blog/polymer-concrete-pros-cons-uses-and-properties/
3. Polymer Cement Concrete: Properties and Uses *THE CONSTRUCTOR* [online] Available at: https://gharpedia.com/blog/polymer-concrete-pros-cons-uses-and-properties/https://theconstructor.org/concrete/polymer-cement-concrete/5778/
4. Полімерний бетон http://chastnyi-dom.com/strojmaterial/polimernyj-beton.html

[1]Yevhen Kozii
[2]Artem Yerofieiev
[1]V.V. Ishkov, scientific supervisor
[1]M.L. Isakova, language adviser
[1]Dnipro University of Technology, Dnipro (Ukraine)
[2]V. N. Karazin Kharkiv National University, Kharkiv (Ukraine)

Geological and industrial features of the West Kharkivtsivske oil and gas condensate deposit

Currently, information about the geological and industrial features of the West Kharkivtsivske oil and gas condensate deposit is completely absent. The main results of the research performed by the authors allow to fill this gap.

The deposit is located in the Halytskyi district of Poltava region, 20 km from the Gadyach city. In terms of geology and industry, the deposit belongs to the Hlynsko-Solokhivskyi gas and oil region of the Eastern oil and gas region of Ukraine. Tectonically, it is located in the central part of the axial zone of the Dnipro-Donetsk basin and is part of the Hlynsko- Rozbyshivskyi structural shaft (Fig. 2).

The uplift was discovered in 1954 by seismic surveys and structural mapping drilling in Cenozoic formations. In 1959, structural exploratory drilling was carried out on the area in order to study in detail the geological structure of Mesozoic deposits. Geophysical surveys of 1964-1979 prepared the structure for deep drilling along the seismic horizon $V\text{б}_2$ (Bashkir stage) to assess the industrial oil and gas potential of middle carboniferous deposits. In 1970, when testing well 1, located in the apical part of the uplift, from the productive horizons B-17 and B-18 (int. 4590-4800 m) obtained an oil fountain with a flow rate of 76 t / day. In the same year the deposit was included in the State balance. Subsequent seismic works in 1972 and 1979 established that the West Kharkivtsivske uplift is a separate vault of the Kharkivtsivske anticline structure. In 1983, a parametric well 409 was drilled in the apical part of the folds, which established the industrial oil and gas potential of horizons B-17, B-18, B-19в, B-19н, B-21н, B-22в and B-23 of the upper visean. A total of five wells have been drilled in the area.

The geological structure involves carbonate-terrigenous formations from quaternary to lower carboniferous (upper visean substage).

On the roof of the B-19н horizon, the structure is a brachianticline of the north-western extension (Fig. 1), its dimensions within the closed isogypsum -4840 m 3.6x2.5 km, amplitude 90 m.

Industrial accumulations of hydrocarbons were found in the horizons B-17, B-18, B-19в (oil), B-19н, B-21н, B-22в, B-23 (gas condensate). Sheet deposit dome fold. The main reserves of hydrocarbons are contained in the horizons B-19в and B-19н. Collectors are represented by sandstones.

Oil production from the deposits of horizons B-17, B-18, B-19в began in 1971. The mode of their operation is gas-water pressure. In 1985, the development of gas-condensate deposits of horizons B-19н, B-21н, B-22в, B-23 in the gas mode began. On January 1, 1994, the operating fund of oil wells was two units, gas - one. 4% of oil and 9% of gas from initial production reserves were extracted.

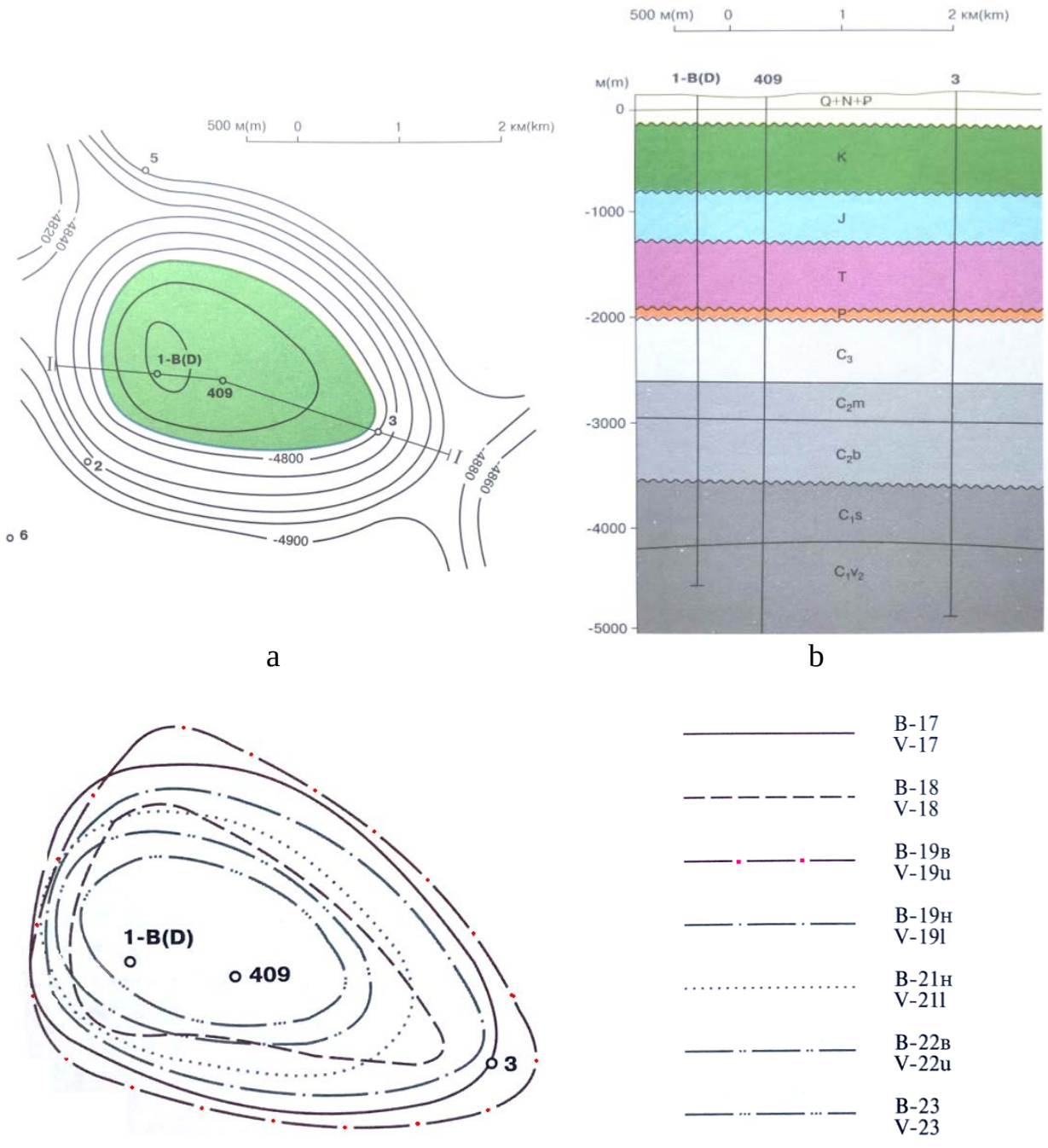


Fig. 1. Features of the geological structure of the West Kharkivtsivske deposit:
a - structural map of the roof of the productive horizon B-19н,
b - geological cross-section along the line I - I,
c - the scheme of comparison of contours of productive deposits,

d - symbols of the contours of productive deposits.

On January 1, 1994, the deposit was in exploration with simultaneous experimental and industrial operation. Now the deposit is in operation.

Earlier, the authors considered the peculiarities of the distribution of some elements in the coal and oil deposits of Ukraine [1-4].

A comprehensive analysis of the geological and industrial features of the West Kharkivtsivske oil and gas condensate deposit allows us to conclude that the use of modern methods and integrated technologies to increase oil production will significantly increase oil production, and the extraction of a number of useful related components - significantly increase environmental and economic efficiency of deposit exploration.

Fig. 2. Location of the West Kharkivtsivske deposit

References

1. Єрофєєв А.М., Ішков В.В., Козій Є.С. (2021). Вплив основних геолого-технічних показників Качалівського, Куличихінського, Матлаховського, Малосорочинського та Софіївського родовищ на вміст ванадію у нафті. Матеріали міжнародної науково-технічної конференції «Український гірничий форум». С.177-185.

2. Kozii Ye.S. (2021). Toxic elements in the c_1 coal seam of the Blahodatna mine of Pavlohrad-Petropavlivka geological and industrial area of Donbas. Збірник наукових праць «Геотехнічна механіка». № 158. С. 103-116. https://doi.org/10.15407/geotm2021.158.103

3. Mykola A. Kozar, Valerii V. Ishkov, Yevhen S. Kozii, Pavlo S. Pashchenko. (2020). New data about the distribution of nickel, lead and chromium in the coal seams of the Donetsk- Makiivka geological and industrial district of the Donbas. Journ. Geol. Geograph. Geoecology, 29(4), 722–730. http://doi: 10.15421/112065

4. Ішков В.В., Козій Є.С. (2017). Про розподіл токсичних і потенційно токсичних елементів у вугіллі пласта $c_7^н$ шахти «Павлоградська» Павлоградсько-Петропавлівського геолого-промислового району. Вісник Київського національного університету. Геологія. № 79. С. 59-66. https://doi.org/10.17721/1728-2713.79.09

Victor Kozyubenko
Serhei Fedoriachenko, research supervisor
Iryna Zuyenok, language adviser
Dnipro University of Technology, Dnipro(Ukraine)

Construction by 3D printers as a new stage in the development of engineering

Construction is one of the features of the superiority of humans over other species. Thanks to our thinking, even in ancient times, we stopped seeking refuge from nature and began to create it ourselves. The building process itself has not changed much over time, but the tools we use to build have changed. Hewing stones, building pyramids from blocks of limestone and granite, making bricks from clay, using mechanisms to build high buildings - all this has one result: a comfortable place for people, where they will not be affected by weather conditions.

Nowadays, the construction of a building requires teams of a large number of people, a large number of vehicles for transportation. Construction of a new building is long lasting, it generates a lot of noise for nearby buildings, relies much on builder skills, and has low productivity. In other words, it may be seen outdated in the new millenium.

3D printers appeared at the beginning of this century have made a breakthrough in various areas. Magic mechanisms that can reproduce any object - one has only to find a drawing on the Internet and fill in the printer with pecial materials. But what if the printer is scaled up to the size of houses, using quick-drying concrete and special house plans? In this case, we will get a new stage in the development of construction. While building with conventional methods takes weeks and sometimes months, building with a 3D printer takes just over two days. Also, instead of several teams, the process requires only two or three people to control the construction. Less staff contributes to cost-saving of construction as it lowers building costs. At the same time, thanks to the automatic process and easy transportation, building with the help of 3D printers can help solve the problem of lack of housing that will be relevant for Ukraine in the coming years.

There is still some skepticism about printed houses. Hoewver, over time, it will disappear as with each newly built house by 3D printer, technology is gaining its popularity. The ease of choosing a new house is also surprising: on the website of leading companies such as ICON, Apis Cor, CuBe Construction, you can already choose a future house from existing drawings or hire an architect and make a house depending on your needs.

As the field of construction using 3D printers is only gaining its popularity, companies are fighting for market leadership. 3D printers are the faces of such companies and are patented, as well as a large number of companies have their own special concrete for the printer, which is also defended by patents and application for invention.

Despite of the benefits, there are some problems in 3D printers. At the moment, printers for high-rise buildings have not been developed yet. So, is not worth talking

about skyscrapers with them. At the moment, with the help of a 3D printer, a maximum of 2 or 3-storey houses plus a basement are being built. The exception is a house in Dubai, which reaches a height of 9.5 meters and an area of 640 square meters.

It is also worth drawing attention to the relationship of printed houses to nature. Due to the speed of construction, there is less impact on the ground. Some companies pay special attention to the composition of concrete, making it as environmentally friendly as much as possible. An example of such companies can be the Ukrainian start-up company PassivDom. Their plans are to create a fully autonomous smart home that can move along the roads like a house on wheels. PassiveDom houses are equipped with accumulators and reservoirs for water storage, smart microclimate control systems (temperature, humidity and oxygen content in the air), as well as all necessary furniture, household appliances, pillows for living

If to think about the plans and the necessity to restore and re-build the destroyed by the wrar cities of Ukraine. Since many Western countries have already expressed their desire to take part in the rebuilding of individual cities, there is a unique opportunity to unite engineers, mechanics and machine builders to create a special 3D printer that will help create at least houses in the suburbs of cities and provide comfortable conditions for workers, which will participate in the rebuilding process.

Creating houses with the help of 3D printers is an innovative technology of our time, surpassing standard construction in almost every way. At the same time, it has a high potential for the future that is proved by the special attention to this technology drawn by space companies. No matter how unreal may it sound, wth the help of 3D printing, it is planned to build the first residential buildings on the Mars and the Moon that could be possible onlywith the remote control of a printing machine. Ultimtely, 3D printers in constructing houses have bright future that is proved by the results of their use demonstrated during last years.

References:

1. 7 Biggest Companies Building 3D Printed Houses by all3DP. [online] Available at: https://all3dp.com/2/best-companies-building-3d-printed-houses/ Accessed on: February 2, 2022
2. Koenig, R. (2021) Companies using 3D printing to build houses at 'half the time for half the price' [online] Available at: https://www.today.com/home/companies-using-3d-printing-build-houses-half-cost-t217164 Accessed on: May 1, 2021
3. World's largest 3D printed building opens in Dubai [online] Available at: https://ecotechnica.com.ua/arkhitektura/4369-krupnejshee-v-mire-3d-pechatnoe-zdanie-otkryli-v-dubae-video.html Accesed on: October 31, 2019
4. PassiveDom: "smart" eco-house, printed on a 3D printer, developed in Ukraine [online] Available at: https://ecotechnica.com.ua/arkhitektura/2160-passivedom-umnyj-ekodom-raspechatyvaemyj-na-3d-printere-razrabotali-v-ukraine.html
Accesed on: March 6, 2017
5. The warmest non-volatile house in the world will be shown in Ukraine [online] Available at: https://ecotechnica.com.ua/arkhitektura/1260-v-ukraine-pokazhut-samyj-teplyj-energonezavisimyj-dom-v-mire.html Accesed on: July 28, 2016

Anatoly Lisogor
V.S. Khilov, scientific supervisor
M.L. Isakova, language adviser
Dnipro University of Technology, Ukraine

Transient Determination in Circuit with Isolated Neutral when Single-Phase Touching

The purpose of the paper is to determine the shocking transient voltage and current in a circuit with an isolated neutral when a single-phase touch. Methods of analysis of the theory of linear electric circuits with lumped parameters in stationary and non-stationary modes of operation are used. The values of the shocking of currents and voltages are estimated. The regularities of changes in shocking of currents and voltages depending on the electrical networks parameters are determined. The practical value of the paper results is the identification of shocking currents and voltages range depending on the electrical networks parameters.

Electrical safety of electrical networks in the general case is assessed by the values of current flowing through a person, contact voltage and exposure time [1]. In electrical networks with isolated neutral, the earth fault does not cause a short circuit and does not lead to disconnection of the damaged phase. In this case, the voltage of the other two phases of the network relative to ground increases to a linear value, which creates an increased risk for staff. Therefore, all devices with insulated neutral should be provided with insulation control for rapid detection of earth faults, and in industries with high safety requirements should have appropriate automation to ensure rapid automatic disconnection of damaged mains [2]. Thus, the task of determining the shocking of transient voltage and current in a circuit with isolated neutral in a single-phase contact of personnel is relevant to protect personnel from electric shock.The purpose of this work is to find the parameters of the electric circuit with minimal shock or contact voltage equal to zero. To achieve this purpose, the following tasks are set: to estimate the magnitude of the shocking currents and voltages, as well as to determine the patterns and range of their changes depending on the network parameters. The study used analysis methods of the theory of linear electric circuits with lumped parameters for steady and transient operation modes [3]. An assumption was made about the symmetry of the power source, the absence of inductive elements in a circuit with lumped parameters.

The transient analysis is performed by the superposition method using the classical approach to solving linear differential equations [1]. With this approach, we separately calculate the parameters of voltage and current at the end of the transient process, the so-called forced components arising under the action of an energy source, and natural components circulating in the circuit under the action of stored electromagnetic energy in reactive elements.

The forced component is found by a phasor method, in which we pass from functions of a real variable to functions of a complex variable, which makes it possible to significantly simplify the analysis of processes in an AC circuit. With this

approach, we pass from integro-differential equations to equations in algebraic form with complex coefficients.

The analysis is performed under the following assumptions: a three-phase source of electromagnetic energy is symmetric one $\underline{E}_A$, $\underline{E}_в=\underline{E}_A e^{-j120ел.гр}$, $\underline{E}_C=\underline{E}_A\ e^{+j120\ ел.гр}$, is an ideal source of EMF with zero internal resistance, the same load phases active and reactive resistance $R_A=R_B=R_C=R_Ф$; $C_A=C_B=C_C=C_Ф$; $X_Ф=1/\omega C_Ф$.

Instantaneous voltage value of the forced component

$$u_{пр} = Jm(\underline{U}_{пр}) = \sqrt{2}E_C \frac{3r_c R_Ф X_Ф \left(R_Ф - r_c\right)}{\left[X_Ф\left(2r_c + R_Ф\right)\right]^2 + \left[3r_c R_Ф\right]^2} \cdot \sin\left(\omega t - 120^0 + arct\frac{X_Ф R_Ф \left(R_Ф - r_c\right)}{X_Ф^2\left(R_Ф + 2r_c\right) + 3\cdot r_c R_Ф^2}\right). \quad (1)$$

where r_C is the active resistance at single-phase touch.

Accumulated in the capacitive element C electromagnetic energy W = qu / 2 = Cu^2 / 2 (where q, u - respectively, the charge and voltage on the capacitor C) obeys the law of energy continuity. It follows that the charge and voltage on the capacitive element immediately before touch and immediately after touch remain unchanged, which allows you to calculate the constant integration A.

Shock voltage when touching phase C

$$u(t) = \sqrt{2}E_C \frac{3r_c R_Ф X_Ф \left(R_Ф - r_c\right)}{\left[X_Ф\left(2r_c + R_Ф\right)\right]^2 + \left[3r_c R_Ф\right]^2} \cdot \sin\left(\omega t - 120^0 + arct\frac{X_Ф R_Ф \left(R_Ф - r_c\right)}{X_Ф^2\left(R_Ф + 2r_c\right) + 3\cdot r_c R_Ф^2}\right) + Ae^{\lambda t}.$$

Conclusions. The free component of the striking voltage in the circuit is not generated if the angle of contact is equal to

$$\psi_E = 120^0 - arct\frac{X_Ф R_Ф \left(R_Ф - r_C\right)}{X_Ф^2\left(R_Ф + 2r_C\right) + 3\cdot r_C R_Ф^2}.$$

Under this condition, the shocking voltage will be equal only to the forced component, and this is the voltage in phase C.

If the contact angle ψ_E = 0, then the striking voltage at the time of contact will be zero, then the striking voltage increases and is the sum of the attenuating exponent and the voltage in phase C. The results obtained in the work make it possible to develop effective devices for protecting personnel from electric shock in case of single-phase unauthorized contact with conductive devices.

References

1. Theoretical Fundamentals of Electrical Engineering: textbook / V.S. Khilov; Ministry of Science and Education of Ukraine, National Mining University, 2018. – 467 p.

2.Хілов В.С., Фофанов К. П. (опубліковано 10.06.2016). Спосіб безперервного контролю опору ізоляції кабельної мережі з ізольованою нейтраллю (Патент України 111784). Бюл.№11..

3.Хілов В.С., Фофанов К.П. Основні вимоги до безперервного контролю опору ізоляції в мережі ізольованою нейтраллю напругою до 1000В та тенденції розвитку данних систем / Форум гірників – 2014: матеріали між. нар. конф. 1-4 жовт. 2014 р., м. Дніпропетровськ. – Д.: ТОВ «Лізунов Прес», 2014. – Т.3. 232 с.

Yaroslav Makarenko
O.V. Balakhontsev, research supervisor
V.V. Hubkina, language adviser
Dnipro University of Technology, Dnipro (Ukraine)

Artificial Intelligence in a renewable energy

Over the last few decades, the global energy demands are growing tremendously and keep expanding every year. Based on this information it can be concluded that in nearest future fossil fuels will not be enough to meet our needs in energy. The main opportunity for humanity to overcome this energy crisis is using such renewable resources as sunlight, wind, geothermal heat, etc. to produce “clean” energy that does not result in climate changes and any emission of pollutants is minimal.

And nowadays we make small but confident steps into the “green” conversion of our power industry. But the main disadvantage of using such type of energy is its unreliability. Sometimes the weather condition can be unpredictable. Subsequently, the whole energy-producing totally depends on this factor. The solution to this problem is implementing Artificial Intelligence into a renewable energy sector.

Cheap and clean energy is extremely essential for the development of different spheres of human life. And AI technology is closely tied to the ability to produce such type of energy. Artificial Intelligence has the huge potential to decrease the waste of energy, and accelerate and facilitate the use of renewable energy in the power grids all over the world.

AI is known to be based on the principle of simulating human intelligence in electronic machines and algorithms where the latter ones could mimic the way of human thinking. By performing such an operation program can automatically learn and process information without human assistance. This technology helps us to solve complex logical tasks and operate with a big amount of data.

One of the techniques that could be used in the renewable power sector is called fuzzy logic. It is a logical system for the standardization and formalization of approximate reasoning. Fuzzy logic is the type of reasoning where the truth of a statement is not binary truth or false. It is similar to classical logic but reminds a degree of truth that ranges from zero (which is absolutely false) to one (which is absolutely true). Fuzzy logic allows to create a fuzzy inference system where human-interpretable rules for functioning are applied (Fig.1).

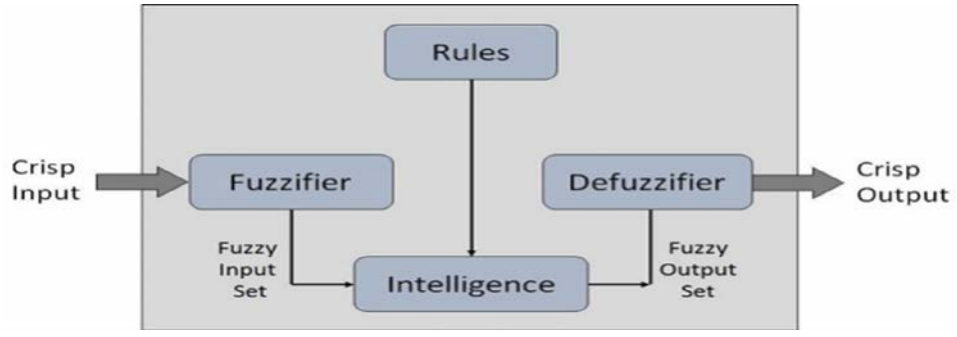


Figure 1. Scheme of the Fuzzy inference system

Fuzzy inference systems are considered to be a form of artificial intelligence. It is like a chameleon that mimics and repeats the human approach to solving problems.

Fig.2 demonstrates the oversimplified process of how this technique works. This example shows the decision process the banker might do to assess the risk of a loan. Bankers look at the credit rating which is the input into the decision process and then determine the overall risk of giving the loan which is the output.

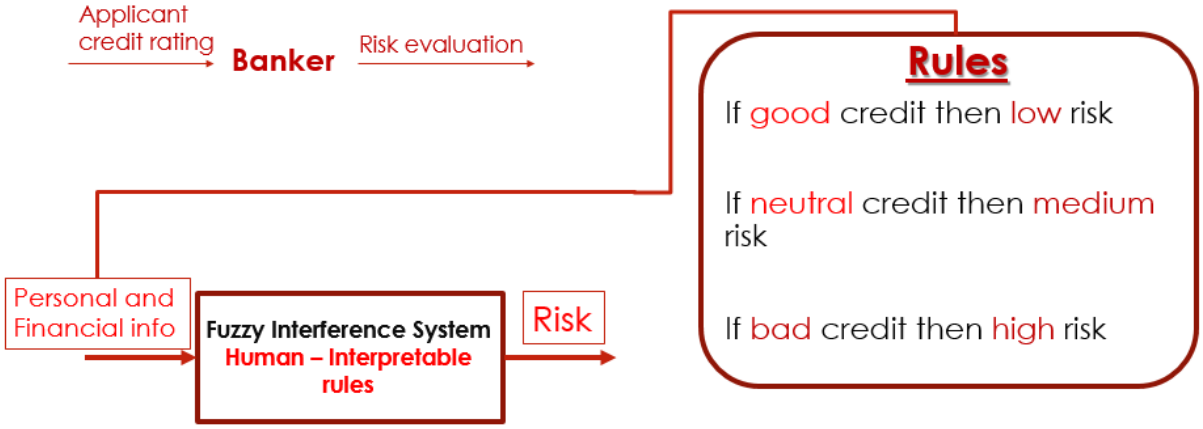


Figure 2. Example of how the Fuzzy Inference System works

But it is a very simplified system and to solve such problems the banker must take advantage of existing knowledge and experience in the form of simple rules. And in this way, the rules themselves have been developed over the time. Based on the experience and data the encoding of the knowledge takes place. And this knowledge can be used to predict future scenario of what might happen in different situations.

On the whole, fuzzy logic is a way to encode this experienced-based knowledge (human knowledge and skills) in the form of logical rules.

After all, we can highlight the main pros and cons of implementing such technology in the power sector:

Pros

1. **AI forecasting.** With the help of this fuzzy logic algorithm, we could bring forecasting to the next level in the energy industry
2. **Improved safety and reliability.** AI could help us better understand energy consumption patterns.

Cons

1. **Financial pressure.** Implementing such technology needs a big amount of finance and funding.
2. **Lack of specialists.** We still have not enough professionals who have mastered this technology properly

It should be concluded that AI has a great potential to revolutionize the renewable energy sector. Implementation of different AI technologies is the main key to build a low-carbon future without any environment pollution. Moreover, providing different AI techniques and algorithms can help us to produce sustainable energy that could raise our awareness of the future.

References:

1. Artificial Intelligence in Power Systems. [Online] Available: https://www.iosrjournals.org/iosr-jce/papers/necon/volume-1/B.pdf Accessed: 01.05.22.
2. The role of AI technology in improving the renewable energy Sector. [Online] Available: https://imaginovation.net/blog/artificial-intelligence-in-renewable-energy/. Accessed: 03.05.22.
3. Renewable energy sources. [Online] Available: https://www.slideshare.net/trilby/renewable-energy-sources-presentation . Accessed: 01.05.22.
4. Decentralized energy system. [Online] Available: https://www.unescap.org/sites/default/files/14.%20FS-Decentralized-energy-system.pdf. . Accessed: 02.05.22.
5. Opportunities and challenges of AI in the energy sector. [Online] Available: https://intellias.com/opportunities-and-challenges-of-artificial-intelligence-in-the-energy-sector/ . Accessed: 01.05.22.

Bohdan Manin
Dnipro University of Technology, Dnipro (Ukraine)
V.B. Backuridze-Manina, research supervisor
M.V. Manin, research supervisor
Y.V. Kaniuka, research supervisor
Dnipro State Medical University, Dnipro (Ukraine)
L.V. Pavlenko, language advisor
Dnipro University of Technology, Dnipro (Ukraine)

Combined exercise bike as a device for physical rehabilitation of the military personnel

As of May 7, 2022, there has been a war between the Ukrainian people against the Russian occupiers. The Armed Forces of Ukraine give a decent rebuff to the enemy, but during the fighting, many Ukrainian defenders are wounded to varying degrees. The most common injuries during hostilities are injuries to the lower extremities.

Patients with soft tissue injuries of the lower extremities have a higher rate of recovery, and patients with fractures of varying severity have a lower rate of recovery [1]. Training on a stationary exercise bike or bicycle is used to restore the function of the musculoskeletal system of patients, starting from the end of the second or from the beginning of the third stage of rehabilitation.

But these methods of rehabilitation are not perfect. After all, while training on a bicycle, the patient can not accurately control the load. The use of a stationary exercise bike requires its installation in the gym, but because of the number of patients, rehabilitation centers do not always have enough space to install a large number of these exercise machines.

Also, it is not possible to get the same quality cardio load when training on a stationary exercise bike as when training outdoors, because gyms often have lower oxygen concentrations due to lack of ventilation.

That is why in our previous research work the concept of a combined exercise bike as a device for physical rehabilitation and sports was developed [2]. The bicycle is taken as a basis of the combined exercise bike. An electric motor built into the rear wheel of the bicycle and a load control system consisting of pedal pressure sensors, a pedal rod speed sensor, a controller that controls the entire exercise bike system and a battery are used to perform the functions of the exercise bike and control the load [2].

The combined exercise bike is used for training on the street. It looks like a bicycle and can ride on all surfaces, but has the ability to precisely control the load on the patient. The exercise bike can be used both on specially equipped grounds, sports stadiums and in the city, moving on bicycle paths, streets, etc.

In this scientific work, we propose to improve the previously proposed exercise bike [2] for use by the military, who received injuries to the lower extremities of varying severity.

In order to speed up the process of rehabilitation of patients, we proposed to use a tricycle instead of a two-wheeler, on the basis of which we developed the concept of a combined exercise bike in previous research. This decision is due to the fact that not all patients after injuries are able to maintain proper balance. This is also due to the fact that when using a more stable three-wheeled combined exercise bike, we do not include the upper extremities and the upper body of the patient and give the load only on the lower extremities. Thus, patients who have injuries not only to the lower extremities but also to soft tissue injuries of the upper body, or patients who have undergone surgery after bullet wounds can restore the function of the lower extremities without risk of injury to other upper extremities and upper body injuries.

As noted in previous research [2], a physical therapist should develop a training program for the rehabilitation of patients, in our case – the military.

Considering that a large number of patients will use the combined exercise bike during the same period of time, we proposed to create a special mobile application in which the training program will change depending on the pace of training and the well-being of patients, taking into account the need of each patient in a separate training program.

The physical therapist will be able to develop a training program for the entire course of rehabilitation, changing the load, execution time and other training parameters. The patient will need to indicate his state of health on many criteria at the end of each session.

The patient's application contains a complete history of training. All training data is stored in a database accessible to the physical therapist. Thanks to this, the doctor is able to adjust the patient's training program depending on the dynamics of his training and well-being.

Because the doctors are able to track each patient's progress remotely, it increases their efficiency and allows them to work with more patients.

Using a combined exercise bike together with a special mobile application containing a training program allows the patient to receive more effective rehabilitation in a shorter time than using a stationary exercise bike [2].

The introduction of a combined exercise bike as a device for the rehabilitation of the military after injuries of the lower extremities can significantly affect the pace of rehabilitation and improve its effectiveness, which will help speed up their recovery and return to the Armed Forces of Ukraine, that, in turn, will make it possible to quickly expel all occupation groups from the Sovereign State of Ukraine.

References:

1. Khasan Dandash, D. O. Pidkopay, V. O. Lytovchenko, Y. V. Haryachyy, Sharbel′ Yusef (2018) Use of the physical rehabilitation program of victims with the consequences of mining and explosion injuries of the lower limbs at the outpatient stage.

2. Manin Bohdan (2021) Combined exercise bike as a device for physical rehabilitation and sport.

Yehor Nechai
O. V. Balakhontsev, research supervisor
V.V. Hubkina, language adviser
Dnipro University of Technology, Dnipro (Ukraine)

The role of hyperloop in transportation innovation

Few innovations have the potential to revolutionize the process of society operation and to create entirely new industries and economies. The innovation in transportation is pivotal for our society because improving the way people travel is empirical for modernization in other fields. A common example of this is transportation issues, which sparked a massive growth in other sectors such as catering and oil industries. This concept generates the idea that a truly game changing the inventions makes “a whole other set of new ideas imaginable for the first time,” is why nearly a half of the top 20 inventions of all the time are related to transportation. According to such experts at Big Think, a wheel, a compass, a steam engine, a combustion engine, a car, an airplane, and a rocket included into a top of 20, highlighted an enormous potential impact of the transportation innovations on the world.

Hyperloop is a developing form of ground transportation that carries passengers or cargo through low pressure tubes in levitating pods. In this system, pods have the potential to reach the speeds of over 750 mph, which is more than double the top speed of the fastest trains in the world. The idea for this technology was firstly proposed by Elon Musk in his open-source paper “Hyperloop Alpha” in 2013. Since then, many private companies have emerged to make this dream a reality. The concept may initially sound like a magic, but the core technology is much simpler than the one we would think.

Magnets are a sole source of power for a hyperloop. Using magnets for levitation and power is not uncommon, and a great number of modern train systems, including the fastest train in the world, rely on the magnets to float slightly above the train tracks. This concept, known as a magnetic levitation, or Maglev, can be demonstrated by applying a small number of magnets. The magnets on the ground are oriented to repel the magnets of the object, and when these opposing forces match, the object hovers slightly above the ground. Although this becomes slightly more complex when working with larger systems, most companies implementing a hyperloop technology are planning to use a form of this physical phenomenon to lift their pods above the track. Using magnetic levitation greatly reduces the friction involved throughout the entire transportation process, making travel faster and more energy efficient compared to other forms of ground transportation.

Magnets are also used to power and propel Maglev trains and hyperloop pods. Changing magnetic poles along the track makes this propulsion system works and operates in such a way that the train or pod is constantly being attracted to the magnets in front of it and repelled by the magnets behind it. This method of power production requires fewer moving parts than other forms of ground transportation

because magnetic forces can be created using only electrical currents, whereas most systems require complicated combustion engines and brakes. As it has already been proven, this technology leads to some benefits, namely, a smoother deceleration. Trains no longer need to generate friction to slow themselves down, so instead of screeching to a stop because of inconsistently applied friction, trains decelerate by flipping the direction of the track's magnetic forces, allowing for a smooth and silent transition.

This great invention may be considered like a fancy Maglev train, but the core difference is a hyperloop system of tubes. In comparison with traditional trains the friction can be reduced by transporting hyperloop pods through the tubes where air is fully pumped out. The process of pumping out the air is quite simple as it utilizes the same technology used for pumping water from low to high ground. Air pumps will be performed periodically to keep the pressure in the tubes at a specified level: not quite a perfect vacuum, but close to one.

The hyperloop is developed to use these low-pressure tubes for the same reason as commercial airplanes that can fly at such high altitudes where the air is much thinner and less dense. This process reduces the "drag force of the air by 1,000 times relative to sea level conditions," giving the hyperloop a major advantage over ground transportation alternatives, as drag forces are the largest opposing forces at high speeds. In combination with magnetic levitation and propulsion, a tube system creates the perfect environment for nearly frictionless travel.

Let us consider a possible impact on such important issue as environmental protection. Compared to all current transportation systems, the hyperloop is projected to last longer creating fewer carbon emissions and reducing noise pollution. Due to the virtually frictionless environment, the hyperloop hardware undergoes less stress over the time, resulting in improved longevity of the system and lower maintenance costs. Additionally, the whole system runs on electricity thus carbon emissions is reduced to zero indexes if combined with solar power. Even if sustainable energy sources are not immediately feasible for usage, the system uses so little energy that it will be still more efficient than any other form of transportation. Finally, as hyperloop pods are contained within a tube system, there will not be noise pollution to the surrounding community, thus improving the lives of humans and animals along the route.

In addition to social and environmental benefits, the personal benefits of hyperloop are expected to be profound. The hyperloop is poised to revolutionize the convenience of transportation, boasting numerous advantages to individuals. The first of these individual benefits is pure speed. Now a drive from LA to SF takes almost 7 hours, while travelling by the hyperloop is going to be around 43 minutes. This what Virgin Hyperloop One promises and is just one of thousands of potential routes. Dreaming about a night out in Vegas? It will take you about 30 minutes via hyperloop, less than the average commute to work in some US cities. It is a common fact that commute time has a massive impact on personal stress levels, and a decrease in commute time could decrease a lot of problems with people's health.

Additionally, hyperloop could prove to be much safer than cars or trains due to the removal of human operators. The system will be fully automated, removing the possibility for a human error, which is the cause of almost all transportation accidents today. Furthermore, the magnets in the system will be so strong that derailing a pod should be nearly impossible, and weather is likely to have no effect on the system. The tubes are expected to be built to withstand earthquakes, tube depressurization, and power outages, which would result in an incredibly safe travel experience. Finally, the price to ride hyperloop is estimated to be only $20 for a one-way trip from LA to SF. The reason hyperloop might be so cheap is that the energy costs to operate the system are so low.

It should be concluded that a transportation problem will be the first one to be solved with introducing the hyperloop, but within the next decade, many proponents believe that hyperloop will be used in a combination with concurrent innovations to redefine modern transportation.

References

1. M. Gambino. (2014, September 14). *The World Is What It Is Today Because of These Six Innovations* [Online]. Available: https://www.smithsonianmag.com/

2. P. Ratner. (2017, September). *Top 20 greatest inventions of all time* [Online]. Available: https://bigthink.com/

3. B. Hesse. (2015, August 13). *Everything you need to know about Japan's L0 Series maglev: the fastest train in the world* [Online]. Available: https://www.digitaltrends.com/

4. DDelectroTech.com. (2017, July 23). *How to Make Floating Pencil at Home using Magnets & Cardboard* [Online]. Available: https://www.youtube.com/

5. C. Jeon. (2011, February). *Physics of Maglev Train* [Online]. Available: http://ffden-2.phys.uaf.edu/212_spring2011.web.dir/Chan_Jeon/physicsof-maglve-train.html

6. S. Ranger. (2018, March 15). *What is Hyperloop? Everything you need to know about the race for super-fast travel* [Online]. Available: https://www.zdnet.com

7. Multiple Authors. (2018, August 7). *Virgin Hyperloop One: Our Story* [Online]. Available: https://hyperloop-one.com/our-story

8. R. Half. (2017, October 23). *Ahead Of Halloween, Robert Half Reveals U.S. Cities With Spookiest And Most Stressful Commutes* [Online]. Available: https://www.prnewswire.com/

9. E. Musk, *Hyperloop Alpha*. Hawthorne, CA: SpaceX, 2013.

10. R. Vartabedian. (2018, July 29). *Calculations show bullet train can complete route within 2 hours and 40 minutes. Reality may prove slower* [Online]. Available: http://www.latimes.com/

11. A. Berger, J. Kotkin. (2017, May 18). *Preparing For The Infinite Suburb* [Online]. Available: https://hyperloop-one.com/

12. Statista. (2018, June). *Number of flights performed by the global airline industry from 2004 to 2018 (in millions)* [Online]. Available: https://www.statista.com/

Oleksandr Zotsenko & Oleksandr Popudin
O.V. Balakhontsev, research supervisor
V.V. Hubkina, language adviser
Dnipro University of Technology, Dnipro (Ukraine)

Renewable energy

Across the globe, manufacturers are increasingly developing new ways of using renewable energy to strengthen clean energy competitiveness in various industries. Process heating systems are critical to the global manufacturing industry's ability to turn raw materials (such as oil, iron ore, trees, crops, etc.) into products (including plastics, metals, paper, and food). These systems use energy to generate, supply, transfer, contain, or recover heat energy. The manufacturing industry must increase the efficiency and reduce the energy utilization of these systems in order to be competitive, while reducing fossil fuel use and greenhouse gas emissions.

Solar thermal systems have a significant potential for industrial process heating worldwide. While these systems are primarily used for low-temperature applications, new designs have been deployed to serve applications requiring up to 400°C. Small scale plants and industries that are less energy-intensive (like the textile and food sectors) have a significant technical and economic potential for renewable energy through solar thermal systems. However, the limitations of high initial capital costs and low deployment rates have resulted in a vicious cycle that needs to be broken.

Wind energy offers many advantages, which explains why it is one of the fastest-growing energy sources in the world. Research efforts are aimed at addressing the challenges to greater use of wind energy.

Wind power is cost-effective. Land-based utility-scale wind is one of the lowest-priced energy sources available today, costing 1–2 cents per kilowatt-hour after the production tax credit. Because the electricity from wind farms is sold at a fixed price over a long period of time (e.g. 20+ years) and its fuel is free, wind energy mitigates the price uncertainty that fuel costs add to traditional sources of energy.

Hydroelectric energy, also called hydroelectric power or hydroelectricity, is a form of energy that harnesses the power of water in motion such as water flowing over a waterfall to generate electricity. People have used this force for millennia. Over two thousand years ago, people in Greece used flowing water to turn the wheel of their mill to ground wheat into flour.

Most hydroelectric power plants have a reservoir of water, a gate or valve to control how much water flows out of the reservoir, and an outlet or place where the water ends up after flowing downward. Water gains potential energy just before it spills over the top of a dam or flows down a hill. The potential energy is converted into kinetic energy as water flows downhill. The water can be used to turn the blades of a turbine to generate electricity, which is distributed to the power plant’s customers.

Hydroelectric energy is the most commonly used renewable source of electricity. China is the largest producer of hydroelectricity. Other top producers of hydropower around the world include the United States, Brazil, Canada, India, and Russia. Approximately 71 percent of all of the renewable electricity generated on Earth is from hydropower.

Geothermal energy is heat within the earth. The word geothermal comes from the Greek words geo (earth) and therme (heat). Geothermal energy is a renewable energy source because heat is continuously produced inside the earth. People use geothermal heat for bathing, to heat buildings, and to generate electricity.

The slow decay of radioactive particles in the earth's core, a process that happens in all rocks, produces geothermal energy.

The earth has four major parts or layers:

- An inner core of solid iron that is about 1,500 miles in diameter.
- An outer core of hot molten rock called magma that is about 1,500 miles thick.
- A mantle of magma and rock surrounding the outer core that is about 1,800 miles thick.
- A crust of solid rock that forms the continents and ocean floors that is 15 to 35 miles thick under the continents and 3 to 5 miles thick under the oceans.

Scientists have discovered that the temperature of the earth's inner core is about 10,800 degrees Fahrenheit (°F), which is as hot as the surface of the sun. Temperatures in the mantle range from about 392°F at the upper boundary with the earth's crust to approximately 7,230°F at the mantle-core boundary.

The earth's crust is broken into pieces called tectonic plates. Magma comes close to the earth's surface near the edges of these plates, which is where many volcanoes occur. The lava that erupts from volcanoes is partly magma. Rocks and water absorb heat from magma deep underground. The rocks and water found deeper underground have the highest temperatures.

Renewable energy sources are about sustainability. They are clean, inexhaustible, and locally available. They are also allowing local energy independence. And they are environmentally friendly.

References:

1. https://www.nrdc.org/stories/renewable-energy-clean-facts
2. https://www.energy.gov/eere/wind/how-do-wind-turbines-work
3. https://www.energysage.com/energy-storage/storage-101/how-do-batteries-work/

Anastasiia Prudko
O. V. Balakhontsev, research supervisor
V.V. Hubkina, language adviser
Dnipro University of Technology, Dnipro (Ukraine)

Innovation in wind energy technology

People have known for centuries how to harness the power of the wind, but only with recent experience and technical capabilities it became possible to exploit reliably the enormous potential. Wind power is one of the fastest growing renewable energy technologies. Usage is rising worldwide, partly because costs are falling. The price of wind power can already compete with the price of nuclear power. The new climate policy is beginning to reduce the use of fossil fuels and is stimulating the development of technologies that reduce turbine prices. Total wind capacity has increased by almost 10% per year over the past decade. In 2020, the new installed capacity increased by 24%, to a record 78 GW. Wind farms in China and the United States account for about 60% of this volume (Fig. 1).

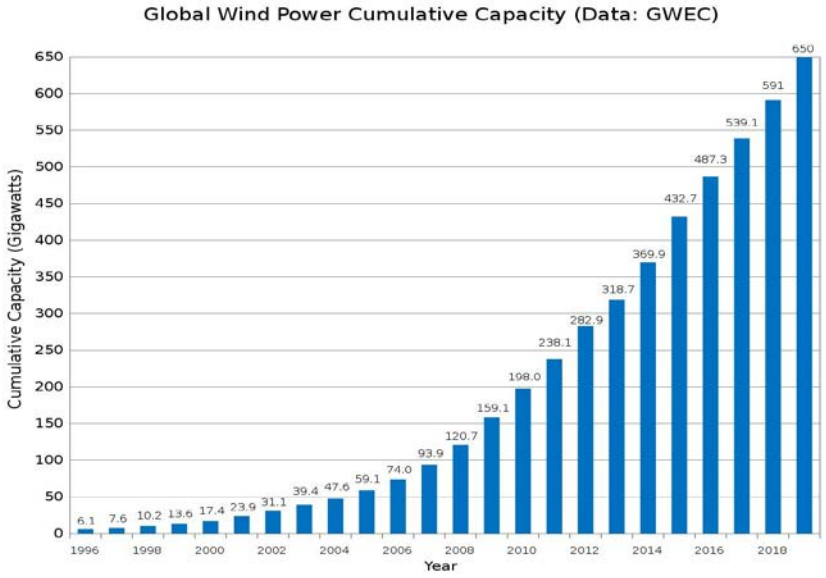


Figure1. Growth of wind power capacity in the world

New ways of operating wind turbines more efficiently also provide such results. Some new innovations in the field of developing wind energy technologies are the following:

Innovation №1. Airborne wind turbine is a rotary wind turbine concept supported in the air without a tower, thus benefiting from higher speed and higher altitude wind retention, avoiding the cost of building a tower, or the need for sliding rings or turning mechanism around the vertical axis. Makani's airborne wind power system is the leader among all airborne wind turbines technologies. The Makani turbine can also be deployed in a deep water, which can provide access to renewable energy sources. Compared to traditional wind turbines, Makani's airborne wind power system produces 50 per cent more energy and uses 90 per cent less material.

Innovation №2. The second innovative project is the floating wind turbine Nezzy² by the Aerodyn Engineering technology development company and ENBW energy group. A 1:10 scale twin-turbine model with a hub height of 18 meters has been floating in a quarry pond north of the mouth of the Weser River since spring. This is the precursor of a double turbine that is said to generate about 15 megawatts (MW). A 10 by 10-meter floating vessel, the submerged Y-shaped structure consists of prefabricated reinforced concrete elements, with vertically protruding columns at the outer ends and in the center of each. The turbines are divided along the central column. The wire ropes bind them together at the height of the engine rooms and separately to the columns of the floating hull.

Innovation №3. The third project is a developed method for producing turbine blades using polyurethane resin. The first rotor blade for a modern wind turbine, fully cured by polyurethane resin, has a length of 64.2 meters and is likely to start testing the turbine of Chinese manufacturer Goldwind. Using synthetic polyurethane resin, the hardening binders commonly used in rotor blades, such as the most commonly used epoxy or polyester resins, are replaced. The normal manufacturing process consists of stacking fiberglass layers into giant templates for sheet fabrication and then impregnating the fibers with resin.

The creation process, including solidification, takes 24 hours. Polyurethane resin significantly reduces this duration. And it has physical properties that lead to better sheet elasticity and higher sheet wall resistance. Fiberglass, tempered with polyurethane resin, is also better against shear forces. This happens on the rotor blades, which are slightly rotated under load. Of course, since the previous epoxy blades were designed to withstand strain, pressure, or shear, the designers compensated for their fatigue with greater wall thickness. The developers claim that this new material saves production time, weight and therefore costs.

Innovation №4. Switching from onshore wind turbines to offshore wind turbines is also a powerful source of progress in wind energy. In a series of publications IRENA about innovations in the field of renewable energy sources it is approved that the offshore wind power opens up areas with high wind resources. Sites can be built quickly on a gigawatt (GW) scale, near key markets, making marine wind energy an important complement to the technology portfolio for cost-effective decarbonization of the energy sector. Offshore wind power is expected to reach 100 GW by 2030 as innovation continues and the industry develops. In order to cope with the increasing distance of installation of wind farms and to be able to develop offshore wind power in areas where marine soil is too deep, research has focused on floating wind energy. The first projects are now only prototypes.

It should be concluded that wind power is a great way to generate clean renewable energy and the innovations in wind technology can turn the movement of the air in the perfect fuel for our energy needs. Modern turbine design is a testament to the unlimited creativity and novelty of our specialists in electrical engineering industry
whose aim is to override the crisis in power energy consumption taking place nowadays.

References:

1. Makani - X, the moonshot factory https://x.company/projects/makani/
2. Andrew R. Henderson, David Witcher: Floating Offshore Wind Energy — A Review of the Current Status and an Assessment of the Prospects.
3. Floating wind turbine: Nezzy² https://www.enbw.com/renewable-energy/wind-energy/our-offshore-wind-farms/nezzy2-floating-wind-turbine/
4. "Global Electricity Review 2022". Ember. 29 March 2022. Retrieved 2 April 2022.
5. Offshore Wind Power 2010 Archived 30 June 2011 at the Wayback Machine BTM Consult, 22 November 2010. Retrieved: 22 November 2010.
6. "Global Wind Report 2021". Global Wind Energy Council. 24 March 2021. Retrieved 31 March 2021
7. Wind energy https://www.irena.org/wind#:~:text=Wind%20is%20used%20to%20produce,the%20turbine%20connected%20to%20them

Dmytro Siryk, Vladyslav Zelezniak, Vladyslav Chernets
O.V. Balakhontsev, research supervisor
V.V. Hubkina, language adviser
Dnipro University of Technology, Dnipro (Ukraine)

Energy storage system

An Energy Storage System (ESS) is an electric facility connected to the Integrated Power System (IPS) of Ukraine and consisting of at least one electric energy storage facility with engineering structures, power conversion equipment and related auxiliary equipment. ESS receives electricity from the IPS of Ukraine or from its own electric generation facilities, stores this energy in any form, and releases the electricity to the IPS of Ukraine.

A lithium-ion battery or Li-ion battery is a type of rechargeable battery composed of cells in which lithium ions move from the negative electrode through an electrolyte to the positive electrode during discharge and back when charging. A prototype Li-ion battery was developed by Akira Yoshino in 1985, based on earlier research by John Goodenough, M. Stanley Whittingham, Rachid Yazami and Koichi Mizushima during the 1970s–1980s, and then a commercial Li-ion battery was developed by a Sony and Asahi Kasei team led by Yoshio Nishi in 1991. Lithium-ion batteries are commonly used for portable electronics and electric vehicles and are growing in popularity for military and aerospace applications.

The lead–acid battery is a type of rechargeable battery first invented in 1859 by a French physicist Gaston Plante. It is the first type of rechargeable battery ever created. Compared to modern rechargeable batteries, lead–acid batteries have relatively low energy density. Despite this, their ability to supply high surge currents means that the cells have a relatively large power-to-weight ratio. These features, along with their low cost, make them attractive for a use in motor vehicles to provide the high current required by starter motors.

The main technical characteristics that determine the quality and cost of batteries or ESS are the following:

- ESS capacity is a total capacity (kWh) or (MWh) of batteries making up the ESS, and which can be supplied by ESS to the grid at the connection point taking into account the consumption of electricity for the ESS's own needs;
- voltage;
- Depth of Discharge (DoD) is the maximum allowable level of discharge of a battery (expressed as a percentage) of the nominal energy capacity of the battery to ensure that the rate of battery degradation (loss of capacity) does not exceed the battery manufacturer's rated power;
- battery lifetime is the maximum rate of change in charging and discharging capacity.
- operating temperature range;
    - self-discharge;

- dimensions and weight;
- charging current;
- number of recharging cycles, etc.

The life of the battery depends on the materials used in the development of the battery, also the life of the battery depends on the operation and its capacity. Self-discharging battery is a process in which the battery is discharged with the terminals and devices removed and disconnected.

Alternating current (AC) is an electric current which periodically reverses direction and changes its magnitude continuously with time in contrast to direct current (DC) which flows only in one direction. A common source of DC power is a battery cell in a flashlight. The abbreviations AC and DC are often used to mean simply alternating and direct, as when they modify current or voltage.

It should be concluded that energy storage system is unlikely to rely on a single type of a battery and the combination of quick response, high-debit tech and slower, high-capacity systems is going to be required. As a flexible power source, energy storage has many potential applications in renewable energy generation, grid integration, power transmission and distribution, distributed generation, micro grid, and ancillary services such as frequency regulation, etc.

References:

1. What is alternating current. Available at:https://www.allaboutcircuits.com/textbook/alternating-current/chpt-1/what-is-alternating-current-ac/
2. Battery lifetime prognostics. Available at: https://www.sciencedirect.com/science/article/pii/S2542435119305859
3. Challenges and opportunities for the global battery storage market. Available at https://npp-power.eu/challenges-and-opportunities-for-the-global-battery-storage-market/
4. Energy Storage in 2021: Challenges and Opportunities (2021). Available at: https://www.idtechex.com/en/research-article/energy-storage-in-2021-challenges-and-opportunities/25303

Ilya Yaremchuk
O.V. Balakhontsev, research supervisor
V.V. Hubkina, language adviser
Dnipro University of Technology, Dnipro (Ukraine)

What is the Tesla coil?

Life in the 21st century is becoming to be wireless, so we can say without doubts that the world of wireless technology is here. Innumerable wireless applications like wireless powered lighting, wireless smart-homes, wireless chargers for any devices and so on have been developed due to a wireless technology.

In 1891, the most famous discovery of Nikola Tesla “Tesla” coil was invented. Nikola Tesla was the great inventor, so he was obsessed with providing wireless energy, which led to the invention of the Tesla coil. This coil does not require a difficult complex circuit and so it is a part of our daily lives like remote control to any devices, smartphones, computers, X-rays, neon, and fluorescent lights, etc.

A Tesla coil is a radio frequency oscillator (lat. oscillo - rocking) that drives the air-core double-tuned resonant transformer to produce high voltages with a low current. To understand better, let us define what is a radio frequency oscillator. Primarily, we are aware that an electronic oscillator is a device that produces electrical signals of either a sine wave or a square wave. This electronic oscillator produces signals in the great radio frequency range of 20 kHz - 100 GHz, known to be as a radio frequency oscillator.

A “Tesla coil” working principle can be identified as the ability to produce output voltages up to several million volts based upon the size of the coil. The Tesla coil works on a principle to achieve a condition called resonance. Here, the primary coil emits huge amounts of current into the secondary coil to drive the secondary circuit with maximum energy. The fine-tuned circuit helps shoot the current from a primary circuit to a secondary one at a tuned resonant frequency.

A spark gap connects the coils and capacitors. The functionality of the spark gap is in generating the spark to excite the system. This coil has two main parts – a primary coil and a secondary coil, where each coil has its own capacitor. For better understanding a principle of a circuit diagram is given:

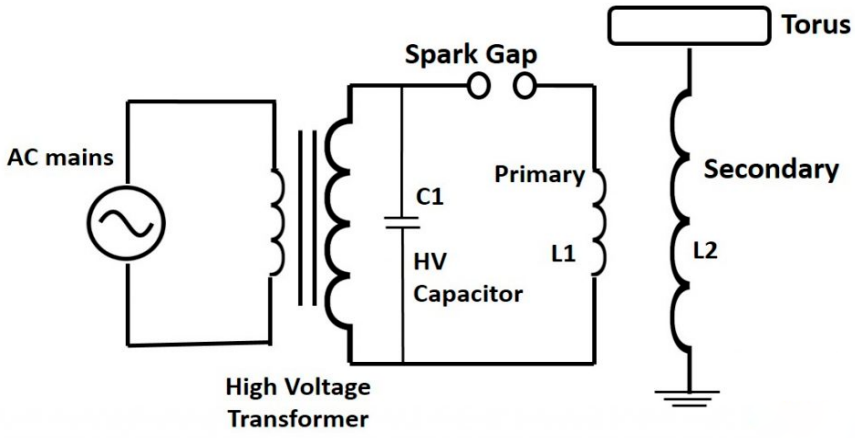


Fig.1 “Tesla coil” circuit diagram

The combination of a capacitor and primary winding 'L_1' of the circuit forms a tuned circuit. This tuned circuit ensures that both primary and secondary circuits are finely tuned to resonate at the same frequency. The resonant frequencies of the primary 'f_1' and secondary circuits 'f_2' and are calculated by the equation

$$\boldsymbol{f_1 = \frac{1}{2\pi\sqrt{(L_1C_1)}}} \textbf{ and } \boldsymbol{f_2 = \frac{1}{2\pi\sqrt{(L_2C_2)}}}$$

As the secondary circuit cannot be adjusted, the moveable tap on 'L_1' is used to tune the primary circuit till both the circuits resonate at the same frequency. Therefore, the frequency of the primary is the same as the secondary.

$$\boldsymbol{f_1 = \frac{1}{2\pi\sqrt{(L_1C_1)}} = \frac{1}{2\pi\sqrt{(L_2C_2)}}}$$

The condition for primary and secondary to resonate at the same frequency is,

$$\boldsymbol{L_1C_1 = L_2C_2}$$

The output voltage in the resonant transformer does not depend on the number-of-turns ratio as in ordinary transformer. As soon as the cycle begins and as the spar sets up, the primary circuit's energy is stored in the primary capacitor 'C_1' and the voltage at which the spark breaks down is 'V_1'.

$$\boldsymbol{W_1 = \frac{1}{2}\, C_1V_1^2}$$

Similarly, the energy at the secondary coil is given by,

$$\boldsymbol{W_2 = \frac{1}{2}\, C_2V_2^2}$$

The advantages of using "Tesla coil" are the following:

- allows uniform distribution of voltage throughout the winding coils;
- builds up the voltage at a slow pace and hence no damage;
- great performance for viewers;
- the use of 3-phase rectifiers for higher powers can offer tremendous load sharing.

The disadvantages of using "Tesla coil" can be identified as:

- several health hazards due to high voltage radio frequency emission that includes skin burn, damage to the nervous system and heart;
- high costs of a DC smoothing capacitor;
- time-consuming construction of circuit as it needs to be perfect to resonate.

The Tesla coil is so popular and widespread that it has found countless ways how to use it in such areas as: a) aluminum welding where cars use these coils for the spark plug ignition; b) artificial lighting and music sounds in entertainment and education industry are used as attractions at electronics fairs and science museums;
c) high vacuum systems and arc lighters; d) vacuum system leak detectors. And this is just a small part of where it can be used.

Scientists from South Korea have developed a new power transmitter - a resonant system of dipole coils (Dipole Coil Resonant System, DCRS), operating at a distance of up to 5 meters between the receiver and transmitter. At first glance, the

system is devoid of many of the shortcomings of CMRS, rather compact coils of 10x20x300 cm are used here, which can be quite discreetly mounted in the walls of an apartment.

General DCRS Configuration

As the experiment showed, at a frequency of 20 kHz, the maximum output power was 1403 W at a distance of 3 meters, 471 W at 4 m and 209 W at 5 m. When working with power at 100 W, the efficiency is 36.9% at 3 m, 18, 7% at 4 m and 9.2% at 5 m. Thus, the technology completely allows you to power even modern large LCD TVs (40 W) at a distance of 5 meters using wireless transmission. Another thing is that 400 watts will be “pumped out” from the mains, but no wires.

Even with a low efficiency, the technology is still useful in some exceptional situations. For example, this year a group of Korean physicists has managed to transmit 10 watts to control the equipment similar to that installed at the nuclear power plant in Fukushima, at a distance of 7 meters.

To sum up, the Tesla coil can be used to generate a high voltage, a low current and high frequency electricity. In fact, the invention of wireless power transmission has changed the way the world communicates due to the capacity of transmitting electricity wirelessly over a distance of several kilometers.

References:

1. https://www.elprocus.com
2. Dr. Ramana Pilla, Dr. M Surya Kalavathi & Dr. G T Chandra Sekhar (2019). Basic Electrical Engineering.
3. https://en.wikipedia.org/wiki/Nikola_Tesla
4. https://electronics.stackexchange.com/questions/504227/find-v1-and-v2-for-the-circuit
5. https://habr.com/ru/post/219857/
6. Tesla N. Apparatus for transmitting electrical energy, application filed jan, 18, 1902, renewed May 4, 1907, 1,119,732. patented Dec. 1, 1914.
7. United States US 20070222542A1 Patent Application Publication Pub. No.: US 2007/0222542 A1 Joanno Poulos et al. Pub. Date: Sep. 27, 2007

[1] Artem Yerofieiev
[2] Yevhen Kozii
[1]V.V. Ishkov, scientific supervisor
[1]M.L. Isakova, language adviser
[1] V. N. Karazin Kharkiv National University, Kharkiv (Ukraine)
[2] Dnipro University of Technology, Dnipro (Ukraine)

About geological and industrial features of Karaikozivske oil and gas condensate deposit

At the moment, information about the geological and industrial features of the Karaikozivske oil and gas condensate deposit is completely absent. The main results of the authors' research presented in this paper allow us to fill this gap.

Earlier, the authors considered the peculiarities of the distribution of some elements in the coal and oil deposits of Ukraine [1-8].

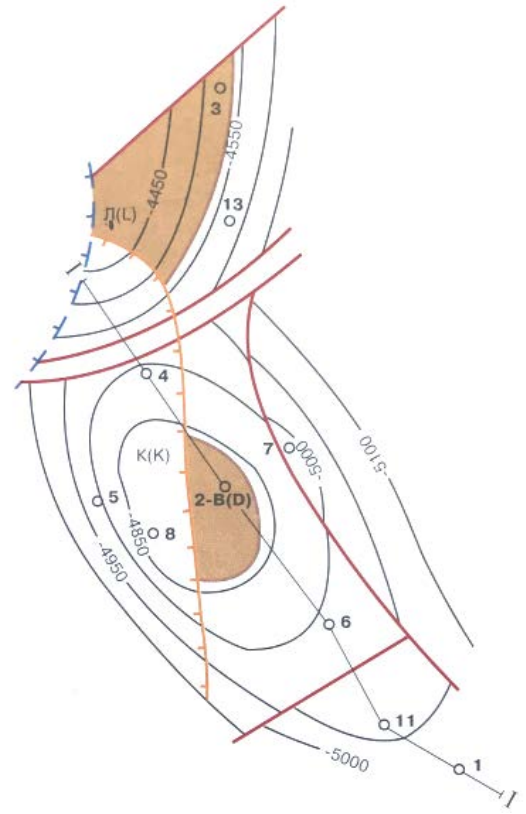
The deposit is located in Krasnokutsk district of Kharkiv region at a distance of 10 km from Krasnokutsk city. Tectonically, it is located in the central part of the northern flank zone of the Dnipro -Donetsk basin (Fig. 2).

The uplift was discovered by structural mapping drilling in 1957-1958. The study of its geological structure continued with geophysical work in 1963 on the reflective horizons of the mesozoic, permian, upper carboniferous, and in 1971 - the middle and lower carboniferous. Detailed seismic surveys in 1972-1973 prepared the uplift for exploratory drilling, which began in 1976. In 1981 when testing well 2 from the deposits of the Serpukhovskyi stage (productive horizons C-5, C-5a, int. 4981-5196 m), an inflow of oil with a flow rate of 75 m^3 / day was obtained through a fitting with a diameter of 10 mm. The deposit was included in the State Balance in 1982. A total of 12 prospecting and exploration wells were drilled in the area, of which only two were productive. The carbonate-terrigenous stratum was discovered. rocks from quaternary to lower carboniferous (Visean stage).

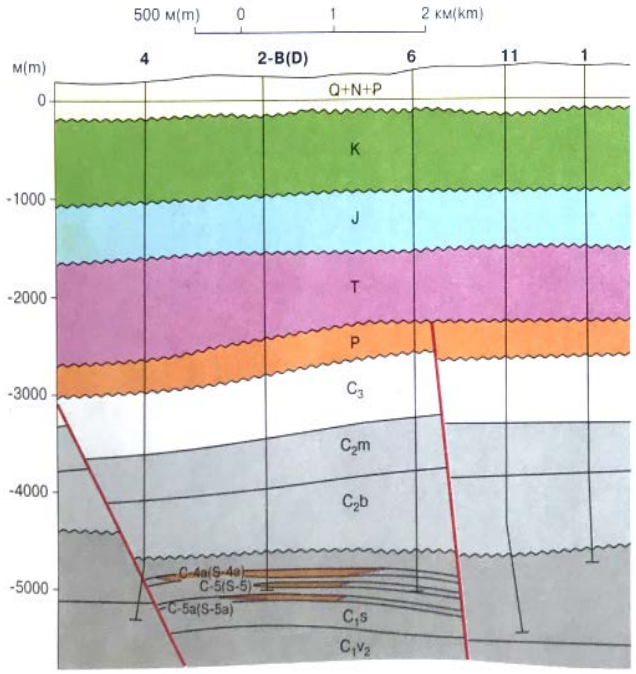
In the Serpukhovskyi stage formation the tributary Liubivskyi block and the Karaikozivske uplift itself, which has the form of a brachianticline of the north-western extension, have been established. It is complicated by transverse and longitudinal downthrow. On the roof of the horizon C-5 the dimensions of the structure within the isogypsum -4900 m 3.1x1.75 km, amplitude 75 m (Fig. 1).

Exploration works have established oil deposits in the Serpukhovskyi horizons C-4a, C-5 i C-5a, and gas deposits in the visean horizons B-14 and B-15. Within the Liubivskyi block, they are layered tectonically shielded and lithologically limited, in the area of the Karaikozivske uplift - dome fold formation, on the horizon C-5 - the deposit is lithologically limited. Collectors are sandstones with low reservoir properties. Condensate and dissolved gas reserves were not calculated and are not reflected in the State Balance Sheet.

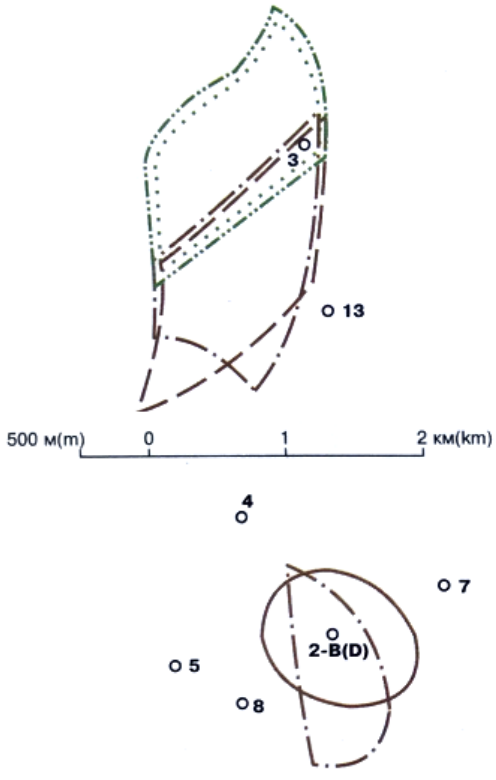
On January 1, 1994, the deposit was in exploration. It is currently in industrial operation.



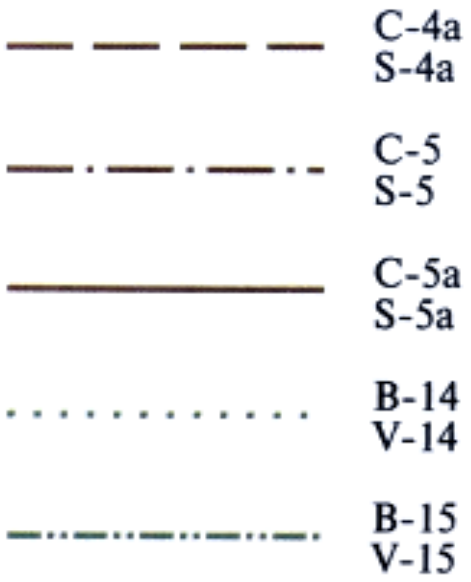
a



b



c



d

Fig. 1. Features of the geological structure of the Karaikozivske deposit:
a - structural map of the roof of the productive horizon C-5,
b - geological cross-section along the line I - I,
c - the scheme of comparison of contours of productive deposits,
d - symbols of the contours of productive deposits.

Analysis of geological and industrial features of Karaikozivske oil and gas condensate deposit allows us to conclude that the use of modern methods and integrated technologies to increase oil production will significantly increase oil production, and the extraction of a number of useful related components - significantly increase environmental and economic efficiency of deposit exploration.

Fig. 2. Location of the Karaikozivske oil and gas condensate **deposit**

References

5. Ishkov V.V., Koziy E.S., Lozovoi A.L. (2013). Definite peculiarities of toxic and potentially toxic elements distribution in coal seams of Pavlograd-Petropavlovka region. Збірник наукових праць НГУ. № 42. С.18-23.

6. Єрофєєв А.М., Ішков В.В., Козій Є.С. (2021). Особливості впливу геолого-технологічних показників деяких родовищ на вміст ванадію у нафті. Матеріали VIII Всеукраїнської науково-практичної конференції студентів, аспірантів та молодих вчених «Перспективи розвитку гірничої справи та раціонального використання природних ресурсів». С. 43-46.

7. Kozii Ye.S. (2021). Toxic elements in the c_1 coal seam of the Blahodatna mine of Pavlohrad-Petropavlivka geological and industrial area of Donbas. Збірник наукових праць «Геотехнічна механіка». № 158. С. 103-116. https://doi.org/10.15407/geotm2021.158.103

8. Ишков В.В. Козий Е.С. (2013). Новые данные о распределении токсичных и потенциально токсичных элементов в угле пласта с6н шахты «Терновская» Павлоград-Петропавловского геолого-промышленного района. Збірник наукових праць НГУ. № 41. С. 201-208.

9. Ишков В.В. Козий Е.С. (2014). О классификации угольных пластов по содержанию токсичных элементов с помощью кластерного анализа. Збірник наукових праць Національного гірничого університету. № 45. С. 209-221.

Valeria Zarovska
O. V. Balakhontsev, research supervisor
V.V. Hubkina, language adviser
Dnipro University of Technology, Dnipro (Ukraine)

Wind turbine technology

In the world of renewable energy such issue as developing solar and wind energy is undoubtedly stand out. The commonly used tools for generating solar energy are solar panels that can capture sunlight and convert it into electrical energy. The second type of renewable energy uses a so-called wind turbine for converting wind energy into electricity.

As it is known wind is formed due to the difference in pressure between two different regions of the air. This occurs when the sun heats the atmosphere thus making changes on the Earth's surface, and rotation of the planet. Wind can become stronger or weaker "when exposed to water, forests, meadows and changing terrain." Nature and wind speed varied greatly depending on location and season, but some of these features are fairly predictable

Wind energy for a long time considered as a clean inexhaustible energy source. Before the wind energy can bring significant benefits, a lot of problems should be solved where the high cost of wind turbines and their ability to operate reliably in the automatic mode for many years and provide uninterrupted power supply takes the first place. Therefore, today the most important task facing the wind energy is to reduce the unit cost of electric turbines. One way to reduce costs is the use of more efficient electrical wind turbine structures.

Wind power is growing annually by 10% and is a major part of the majority of the fight against climate change plans and sustainable growth in various countries, including China, India, Germany and the United States.

The basic components of any wind power system are quite similar. The blades of a certain size and shape are connected to the drive shaft and then to the pump or generator, which either uses or collect wind energy. If the wind energy is used directly as a mechanical force, such as grinding grain or pumping water, it is called a windmill. If the wind energy is converted into electricity, this wind turbine system requires additional components such as a battery to store electricity, or in the case of connecting to the power distribution system the power line is needed.

Wind turbines are considered to be very complex devices and to be profitable and efficient technology a deep preliminary study is required. Nowadays, there are several types of wind turbines and wind power plants that can be emphasized.

Most wind turbine comprises three blades mounted on a tower made of steel pipes. There are fewer common varieties with two blades, or with concrete or steel lattice tower. A turbine tower being 100 feet or more above the ground allows using higher wind speed found at higher altitudes. When wind flows through the blade, the air pressure on one side of the blade is reduced. The difference in air pressure of both sides of the blade creates a lift force and resistance. The strength of the lift has more

resistance, and this causes the rotor to rotate. The rotor is connected to a generator, either directly (if a direct drive turbines) or through the shaft and several gear transmissions that form the speed of rotation and allow creating a physically smaller generator. This process of the wind power combined with rotation generates electricity.

To connect to the national grid, the electrical energy is then transmitted through the transformer at a portion which increases the voltage on the national electricity system used. At this stage the electricity is usually moved to the transmission network of the National Grid, and then it is ready to be transmitted and can be further used at households and by businesses. Alternatively, a wind farm or a single wind turbine can generate electricity, which is used in private form of ownership with the help of an individual or a small set of households or businesses.

Two main types of high-power wind turbines can be identified. The first one to be mentioned works on a vertical axis of rotation revolving on a "Savonius Rotor". The main advantage of the system of vertical axis turbines is the ability to build systems of any size and structure on the basis of their energy. This result is achieved by combining individual turbines and their modules of different structure in the system at any geographic location as plain, mountainous or sea areas. Darrieus rotor is based on the vertical axis of orthogonal rotation. This is also known as a turbine whipping eggs and resembles a huge eggbeater. This is an effective design, but more downtime is required and therefore it is less reliable. To improve the strength (the area above the rotor blade area) three or more blades are commonly used.

Speaking about the advantages of applying wind energy such important issues as its environment friendliness and its relevance to green energy should be stressed out. In the process of electricity production greenhouse gas is not released into the atmosphere. In addition, it helps to save fossil fuels and reduce pollution due to less consumption of fossil fuels.

Moreover, production of electricity using a wind turbine is a stable process. After installing the turbine fuel cost is zero. Wind is the fuel for wind energy, and substantially no unlimited supply of fuel for power generation. While on the ground the sun will shine, the wind will continue to blow due to the difference in the temperature of the atmosphere, caused by sunlight. After installing the necessary equipment, the operation and maintenance of wind turbines get cheaper, as one of the main factors of its lower operating costs is a freely available energy in the form of the blowing wind.

As for negative effects of wind energy the following points should be taken into consideration: the conviction of the earth; the effect on fauna; noise effects, visual impact; electrical, radio, and television disturbance.

A wind turbine must not be located too close to each other because their capacity will be reduced due to the wind flow interference. Therefore, their construction associated with a significant seizure of land. Wind power plants require about 0.1 square kilometers of free space for 1 megawatt capacity. Accordingly, a power output of 200 megawatts would require about 20 square kilometers surface [9]. The effect on the animal world is expressed as a danger for birds, insects, and aquatic

organisms. The impact on the fish fauna is the most dangerous during the construction period because the violation of fish habitat due to the fish migration takes place.

References:

1. Sovacool B. K. Contextualizing avian mortality: A preliminary appraisal of bird and bat fatalities from wind, fossil-fuel, and nuclear electricity // Energy Policy. 2009. Vol. 37, Is 6. P. 2241-2248.

2. Arnett E.B., Erickson W.P., Kerns J., Horn J. the spinning Conservation International. other Relationships between Bats and Wind Turbines in Pennsylvania and West Virginia: An Assessment of Fatality Search Protocols, Pattems of Fatality, and Behavioral Interactions with Wind Turbines. 2005.

3. How Do Wind Turbines Work?
https://www.energy.gov/eere/wind/how-do-wind-turbines-work

4. Patent number US1697574 "A Rotor adapted to be driven by wind or flowing water".Fling date Aug 13, 1925 Inventors Savonius Sigurd Johannes.

5. Kiseleva S.V., Nefedova L.V. Development of the wind-driven resources of the European shelf zones // Vestnik of Mosecow University. Ser Geography. 2006. Vol. 6. P. 52-58

6. Thonnerieux Y. Eoliennes et oiseaux: Quelles consequences? // Courr. Nature. 2005. Vol. 218. P. 27-33 (in French).

7. Arnett E.B., Erickson W.P., Kerns J., Horn J. Relationships between Bats and Wind Turbines in Pennsylvania and West Virginia: An Assessment of Fatality Search Protocols, Patterns of Fatality, and Behavioral Interactions with Wind Turbines. 2005. Bat Conservation International.

8. What Is Wind Energy?
https://www.treehugger.com/what-is-wind-energy-5097217

Section 04 Computer Science and Solutions in IT

Yelyzaveta Antonenko
T. Zheldak, research supervisor
L. Pavlenko, language supervisor
Dnipro University of Technology, Dnipro (Ukraine)
University of Koblenz and Landau (Germany)

Is the replacement of copper cables for Internet access with GPON technology financially beneficial?

Nowadays, it is rather impossible to imagine modern life without having a connection to the Internet. This net surrounds people everywhere: from their houses to grocery stores or gas stations. The phrase "to google something" has become a normal almost daily used phrase in a usual vocabulary of an average person. Having a connection to the Internet fortunately or unfortunately has become a basic necessity, so now there are lots of ways to have an access to the World Wide Web: wired internet, Wi-Fi, etc. As society's demands were rising, technology was developed to meet all the requirements and even to guess the next people's requests or surpass their expectations. With the growth of Internet power, it began to spread all over the world, and technology that was used exclusively for commercial enterprises was brought to the masses. The cheapest and the best was to provide Internet using copper by making copper wiring systems and providing through them Internet to almost every household. For that period of technology, this was probably the best choice regarding the price-quality ratio. The production of these types of cables was relatively cheap because of their material and the speed of the Internet was more than enough to meet the customers' needs.

With the advent and development of computer networks and the Internet, it has become possible to transmit voice using IP telephony technology. To date, multiservice networks are widely used for both data transmission and telephony. This phenomenon of unification of fundamentally different systems was called the convergence of communication services.

The main disadvantage of dial-up access is limited bandwidth. In addition, with this version of the Internet connection is fully engaged in the telephone line. Broadband Internet channel increases the speed of data exchange several times and does not require a monopoly on the telephone line.

Comparing the amount of transferring data through the Internet, it was clear that the existing network can no longer qualitatively support the increasing demands of customers. That is why the search for an alternative began.

Broadband Internet access provides high-speed data transmission that exceeds the maximum allowable dial-up connection using a modem or regular telephone line. Connection, in this case, is carried out on fibre-optic, wired, or wireless Internet backbones of various types.

Broadband Internet is a so-called two-way connection, which can simultaneously transmit and receive data at high speed. The organization of broadband access allows you to use digital television services, remote storage of bulk data and sending voice messages (IP-telephony) – free or at very low rates.

As an example, in this paper, the situation in which one of the Internet Service Provider (ISP) companies found itself will be considered.

After analyzing the company's processes, it was found that its main problem is the outflow of subscribers, and as a result, reduced profits and the company went into recession.

Due to the high demand of subscribers for high-speed Internet, the existing copper network cannot provide the services that customers need, so a large number migrate to other providers. The main disadvantage of a copper network is that the signal travels long distances, creating obstacles, and copper is the best conductor.

With a normal Internet connection via a copper network, the Internet speed does not exceed 20 Mbps. This speed is quite slow for the modern user because it will be enough only for seamless viewing of news in the text and with a minimum number of images when there will be obstacles when watching videos. Another problem with keeping customers' copper connections in good condition has been the destruction and disappearance of particularly large cables over the past five years. The highest costs were observed on the main wires, where the diameter of the cable tie can be from 10 to 20 centimetres in diameter. And given the fact that most telephone subscribers and all Internet connections are on the copper network, constant disconnections and/or loss of connections have forced customers to look for alternatives and seek services from other providers, which has led to a loss of a significant share of the customer base. All these parameters led to the company's transition into recession.

Nowadays, GPON (Gigabit Passive Optical Network) technology is actively gaining popularity. Its essence is that the provider winds a fibre-optic cable directly to your apartment and puts a special junction box. With this schedule, you technically have the ability to connect to the global network at a speed of 1 Gbps, in other cases, the speed will not exceed 100 Mbps.

The high speed of the Internet channel in Ethernet technology allows you to quickly download large amounts of information, comfortably work in a multimedia network and conduct various video meetings online.

The company has found a solution – to migrate – to dismantle the existing network, and with the money received to build a fibre-optic network. Fibre optic network – GPON – a representative of the family of passive technologies of optical access networks PON. The advantages of GPON include the highest speed, synchronous frame format, integration with ATM and TDM technologies, and defined development plans.

The material for the production of fibre optic cable is glass or plastic and information on it is transmitted not by electrical but by light. The advantage of the latter is that it allows you to transmit a signal over long distances with negligible attenuation.

There are five main points that justify the advantage of fibre optic cable over copper: cost, bandwidth, speed and distance, reliability, and safety. The following is a more detailed description of each of these items:

a) cost:

A few years ago, the price of fibre optic cable was almost twice as high as that of copper, but now the cost of fibre optic components and equipment has dropped dramatically. It is important to start with the premise that the transmission of electricity through copper has so far been cheaper than the transmission of laser energy through fibre optics. To use electricity using a copper network use the cost of a switch cabinet. It should be noted that the standard telecommunication cabinet includes the cost of UPS (Uninterruptible Power Supply), data transmission equipment, HAVC (Hybrid Automatic Voltage Control), and floor area.

These aggregate costs typically exceed the additional costs of fibre optic equipment in a centralized fibre optic architecture and also take up significantly more workspace, which is often limited. Thus, all-fibre LAN is more economical and compact than a twisted-pair network environment for new construction and overhaul.

b) bandwidth:

Although copper is ideal for voice signals, it has very limited bandwidth, while fibre provides standardized performance of up to 10 Gbps and above.

Fibre-optic communication lines provide more than 1000 times more bandwidth than copper and can be more than 100 times longer. The typical product of bandwidth and distance for a multimode fibre is 500 MHz / km, so a cable 500 meters long can transmit 1 GHz. While the twisted pair, optimized for high data rates (Cat 6 cable), can transmit 500 MHz for only 100 meters. In addition, the signal loss at a distance of more than 500 meters in the fibre is insignificant, and copper has a very high loss at high frequencies.

c) speed and distance of transmission:

Optical fibre, in comparison with the transmission of data over copper wire, can be considered as the dependence of the speed of photons on the speed of electrons. Photons move at the speed of light, while the electrons used in a copper move at less than one per cent of the speed of light. Although fibre optic cables do not reach the speed of light, they are only 31% slower. So you can see that there is a huge difference in speed between fibre and copper. In addition, the fibre does not have a distance limit of 100 meters, which is inherent in unshielded copper twisted pair without an amplifier. Thus, the distance can be from 550 meters for a multimode cable with a speed of 10 Gbps and up to 40 km for a single-mode cable.

d) reliability:

Fibre optic cable is much less susceptible to various environmental factors than copper cable. For example, the quality of copper will significantly deteriorate at a distance of two kilometres, but the use of fibre optic cable at the same distance can provide extremely reliable data transmission. Moreover, fibre is also immune to environmental factors such as temperature and electromagnetic fluctuations. The same cannot be said about copper: it is impossible to deploy fibre optic cable next to industrial equipment without any problems. As well as the transatlantic cable

connecting the United States with Europe and beyond as the fibre can be immersed in water.

e) security:

Because the optical fibre does not transmit electricity, it does not emit signals and cannot be connected and copper uses electricity and can be broken, which can lead to the failure of the entire system. Broken or damaged optical fibre can be detected very quickly using a number of control methods, including control of actual power transmission or pilot transmission. On the other hand, the copper cable through which the current passes can completely short-circuit or even cause a fire if it is damaged or worn.

Thus, the advent of optical cable with its constant decreasing cost, increased bandwidth, extremely high speed and long transmission distance, excellent reliability, and impeccable security has replaced copper in all aspects of transmission and reception of the network. Fibre optic cable has become one of the most popular tools for both innovative cable routing and modernization, including the trunk, horizontal, and even desktop applications. And with the steady reduction in cost and internal improvements that seem to be made daily in the fibre optic connection, the design of the fibre will be more convenient and cost-effective. It is only a matter of time before fibre optics completely replace the copper cable in both telecommunications and short-distance networks.

The main financial problem in this situation is, as is mentioned before, the cost of the replacement of the old equipment and the growing churn of clients from the company to its opponents. The choice was either not to implement any upgrade to the company's technology, which according to the analysis would have led to becoming bankruptcy, or to take a calculated risk and switch from copper cables to fibre-optic ones. As it could be said now, the second path was chosen, and despite the financial loss at the beginning of the implementation process, the forecast for the following years shows growing profit and increasing customer database, which could be interpreted as a successful transition to more modern and up-to-date technology.

References:

1. Copper and Optical Fibre Structured Cabling Networks | Tecnicontrol. www.tecnicontrol.pt/en/copper-and-optical-fibre-structured-cabling-networks
2. “GPON.” Wikipedia, 4 Mar. 2020, https://uk.wikipedia.org/wiki/GPON

Yuliia Boiko
O.P. Kupenko, research supervisor
L.V.Pavlenko, language adviser
Dnipro University of Technology, Dnipro (Ukraine)

Application of machine learning methods for analysis and detection of credit card fraud

Nowadays, with the development of information technologies and the computerization of many processes, more and more often we perform general everyday processes with the help of Internet resources and computer devices. An example is online shopping on the Internet using bank cards. Along with the development is the growth of credit card fraud, the so-called fraud.

One of the important conditions for increasing the level of combating cybercrime is the widespread use of modern advances in scientific and technological progress, which in recent years have made a breakthrough in the field of information technology.

The urgency and necessity of the task are that in our country, law enforcement agencies do not use Antifraud detection systems to monitor and prevent fraud.

Antifraud detection is a system for monitoring and preventing fraudulent transactions, which checks each payment in real-time, driving them through dozens and sometimes hundreds of filters. Anti-fraud mechanisms work in such a way as to monitor whether there is something "unusual" in the payment. The task of the system is to check each transaction, find "suspicious" moments in it and make a decision - to reject the payment or skip it, or assign it to a certain class, so you can then investigate and collect all necessary information about the cardholder, IP address and others that would help find the culprit. The anti-fraud system consists of several components: automatic transaction monitoring, which contains many filter parameters, cardholder authentication and card validation mechanisms, as well as transaction monitoring in "manual" mode for extreme cases.

Thus, Machine Learning tools form a pattern of user behaviour, using clustering algorithms to determine the most typical for this client the amount of cash withdrawals or purchases. Unlike the above-mentioned filters and limitations, self-learning ML-models are able to extend previously set rules, adapting to the client. However, such flexibility does not conflict with accuracy. If a single transaction does not fit into previously formed templates, taking into account possible assumptions, it is considered an anomaly.

As a result, machine learning algorithms allow the Antifraud detection system to continuously monitor and detect suspicious cases, providing flexible adjustment of filtering parameters through the interactive formation of behavioural patterns. In addition, Machine Learning tools automate decision-making by rejecting anomalous operations and blocking compromised maps.

Such systems are often available in large banks but are very expensive, so most sites use third-party payment methods that are not protected by such protection

and recognition systems. It is on such sites that fraudulent activities take place. Therefore, the use of such systems in cyberpolice is very important and will prevent crime.

The development of the Antifraud detection system will allow detecting fraudulent actions during transactions and assisting in the work of cyber police officers.

The work is devoted to the research and development of software for the detection of credit card fraud. Practical application of such a system is possible in the conditions of the law enforcement agency for the management of cybercrime in the Dnipropetrovsk region, which in turn is part of the staff of the central police administration.

The object of research is the law enforcement activities of the Department for Combating Cybercrime in the Dnipropetrovsk region, namely monitoring and detection of illegal actions in the banking sector (skimming, fraud, carding, financial pyramids, etc.).

The subject of research is the algorithms and methods of machine learning used in the creation of the classifier Antifraud detection system to ensure the detection of fraudulent activities in law enforcement agencies.

The aim of the study is to increase the efficiency of cyber police officers in detecting fraudulent actions and further searching for criminals, possible prediction of illegal actions on credit cards.

To achieve this aim, the following research tasks are identified and solved:

- exploring the methods by which you can build a classifier of banking transactions;
- developing and constructing a classifier on unbalanced data and analyzing the obtained results.

The following research methods are used to solve the tasks:

- Undersampling and Oversampling methods for balancing an unbalanced sample;
- XGBoost, AdaBoost and gradient boosting methods and ensembles of appropriate models to build a classifier of banking transactions to detect fraud.

During the study, the algorithms of XGBoost, AdaBoost, gradient boosting and ensembles of appropriate models for building a classifier of banking transactions were implemented step by step. An open-source sample was taken as input, as access to personal data, downloading and further use and study for persons without special permission is prohibited by current legislation. The dataset contains credit card transactions made in September 2013 by European cardholders. This dataset represents transactions that took place over two days. It contains only numerical input variables that are the result of principal components.

An analysis of the inputs revealed that there was a large imbalance between the data, as the number of fraudulent transactions was less than 1% of the total sample. Four experimental exercises were conducted under different conditions to identify the most optimal values.

Analyzing the results of machine learning, it should be noted that the method of gradient boosting was not optimal, because it gave low accuracy results and training time was very long compared to the other two methods, so it was excluded from further calculations. Also, during the implementation of the two methods, sampling methods were used, which helped to improve the results of machine learning. Based on the results of the experiments, experiments can be considered effective, but the choice of a particular method of boosting and sampling may vary.

The XGBoost algorithm has a higher-class accuracy (more accurately separates "good" transactions) and also has a faster execution time of the learning algorithm, and the AdaBoost algorithm has a better classifier depth (more accurately separates "bad" transactions), due to the fact that the algorithm AdaBoost learns from the "bad" results of previous training. That is, with each step the number of bad learning outcomes decreases. However, as a result, a large number of potentially good transactions fall into the "suspicious".

In this case, you can start from the wishes of the customer of such classifiers, or it is appropriate to use these two algorithms together. They will, so to speak, balance each other's learning outcomes.

In our case, the customer is a state law enforcement agency, which aims to identify as many suspicious transactions as possible, as they may pose a greater threat in the future. Therefore, we can assume that in this case, the depth estimate is more basic than the accuracy of the model.

The economic effect of the results is expected to be positive due to the fact that the annual loss from financial fraud in the field of online payments is reduced.

The social effect of the results of the work is expected to be positive due to the reduction of the number of crimes in the financial sphere and protection of the population from illegal transactions i.e. leads to increased public confidence in the National Police of Ukraine. The difficulty of implementing such a system is that it is necessary to involve analysts in the implementation and further analysis of the results of the classifier because such a system requires knowledge and skills in the analytics section. On the other hand, this confirms the importance of the role of system analysts not only in industry and production but also in government agencies.

References:

1. Antifraud systems [Electronic resource] - Access mode: https://encyclopedia.kaspersky.com/glossary/antifraud/#:~:text=Antifraud%20systems%20are%20software%20suites,and%20a%20fraud%2Danalysis%20system.
2. Construction of classifiers on unbalanced samples on the example of credit scoring. [Electronic resource] - Access mode: https: //u.to/ow1bGw
3. Sampling algorithms. [Electronic resource] - Access mode: https://u.to/tA1bGw
4. Ensemble methods: begging, boosting and stacking. [Electronic resource] - Access mode: https://u.to/vA1bGw

Oleksandr Bukrieiev
A.A. Martynenko, research supervisor
I.A.Ivanchenko, language advisor
Dnipro University of Technology, Dnipro (Ukraine)

Cloud technology

The beginning of cloud market history started in 2006 year, when 'Amazon' company launched cloud" Amazon web-service", but before this in1950s scientists talked about

a concept of time distribution. As then computers cost too much, it was unreal to buy them for all specialists. This gave push to create technology that may allow some people work on one shared processor. Realization of this technology started in 1959 year. Next step was made in 1960 years when the idea of "Intergalactic computer net", proposed by Josef Licklider, appeared. The essence of this conception was in that all users from anywhere in the world had to be bounded and get access to program and data upon any sites. Cloud is an outsource of IT infrastructure. Cloud computing is a virtualization of physical servers. Server is a computing node of any modern IT infrastructure where data processing takes place.

Data preservation takes place on a specific equipment. The technology that determined Cloud development was a virtualization of server's resources. Virtualization allows to divide a physical device into parts and use first part in one task, second one in another task, etc. In this way virtualization allows significantly increase the efficiency of a server use. Therefore, it is possible to give one part of such infrastructure to one customer's demand, another one for next one customer, etc. Most of the clients don't want to spend much money on really reliable data-centres (centres of data processing) and maintain servers. More effective way is to take part of infrastructure from cloud providing service.

In today's world there are such type of clouds as IaaS, PaaS, SaaS, IaaS – a step aside from local infrastructure. This service is with payment when third side provides infrastructure services like preservation and virtualization, if you need them, via cloud/Internet. As a user, are you in charge of the operation system and any data, programs, middleware and using time, but provider gives you access to network, servers, virtualization, storage device and control over them.

IaaS gives you opportunity to purchase only necessary resources and components for low price. Moreover, free of charge maintaining makes IaaS a very affordable option.

PaaS is a kind of a cloud when client receives some environment for programs' work (for example, data base) in addition to resource.

First of all, such cloud is useful for developers and programmers. PaaS allows users to develop, run and manage their programs without having to create and maintain an infrastructure or platform that is typically associated with this process. SaaS – this time the provider also provides a program, such as e-mail

service. Today, there is a wide range of providers, such as: OVHcloud, 1&1 Lonos Cloud, AWS, Azure, Fuga Cloud, Cloud Sigma.

The cloud can exist in two versions: public and private. The public version is intended for use by a wide range of users. Things that make this cloud public are resource allocation, usage agreement, management (at a minimum, the vendor manages virtualization, maintains equipment and network).

The private type is intended for use by a single organization that includes multiple users, such as departments. A private cloud can be owned by one company or a third party, such as a collocation. Such cloud can be physically located both in and outside the jurisdiction of an owner.

Even such a convenient thing as a cloud has its problems, including security issues. Unlike the organization's local infrastructure, its cloud deployment is located outside the perimeter of the network and is accessible directly from the public internet. This facilitates the attacker's unauthorized access to the organization cloud resources. Improperly configured security or compromised credentials can allow an attacker to gain direct access, potentially without the organization's awareness. To prevent this, there is a suggestion of creating two types of standards: the first one should regulate possible ways of interaction between different clouds, and the second one is the interaction of the owner organization and its customers. As for the leasing process itself, here, it makes sense to have a private meeting of representatives of the parties of the tenant and provider companies, on which they will be able to agree and discuss all clauses of the contract. Cybersecurity experts will also play an important role. As the IT sector currently "is suffering from hunger", and, at the same time, is becoming popular among schoolchildren: young professionals will appear. This can be used by potential attackers who can pretend to be them and strike from the inside. Therefore, there is a proposal not to admit to the important safety infrastructure employees who have worked for less than one / and a half year in the company. It is also important to understand how the cloud affects one's business – in this case, cost is paramount. According to the SoftwareONE Managing and Understating On-Premises and Cloud Spending report, about 30% faced difficulties due to lack of transparency and visibility. There is a belief that this problem can be solved by creating an information panel that would allow the company to organize and track activities in the cloud.

Another big problem of cloud computing is the inadequacy of resources and expertise- one of the cloud migrations challenges this year. According to the report by Right Scale, almost 75% of the respondents marked it as a challenge, while 23% said that it was a serious challenge. Such problem may have been appeared due to the fact that most technical universities do not train specialists in cloud computing but they should, at least, introduce such an optional course into their educational programs. Moreover, local business companies in the region may also contribute in solving this problem either donating to universities or creating their own courses to grow up young professionals. Some clouds have specific problems with their services that they provide to the others – lack of trust. They provide cutting-edge service like advanced big data analytics, virtual reality, augmented reality, machine learning, and

artificial intelligence, but their customers prefer to believe that the vendor cannot fulfil their expectations of dependability, usability, and functionality. Such interesting opportunity suffers from lack of trust and the only one exists to fix it – improve the quality of service and show it to the customers. Perhaps, company providers may do this by using marketing or via one big advertising video with their products.

To sum up, one can see that cloud computing was one of the main binding technologies, which caused transformations and stimulated the growth of innovation in the IT industry. Cloud computing is one of the best examples of a full-fledged technology solution that has forever impacted the IT industry.

Resources:

1. https://www.redhat.com/en/topics/cloud-computing/iaas-vs-paas-vs-saas?sc_cid=7013a000002pgRcAAI&gclid=EAIaIQobChMI-ti_19-Q9AIVg_uyCh0FLQHFEAAYAiAAEgIAcvD_BwE&gclsrc=aw.ds
2. https://www.toolbox.com/tech/cloud/blogs/10-key-challenges-in-cloud-computing-and-how-to-overcome-110518/
3. http://integritysys.com.ua/solutions/pricatecloud-solution/
4. https://www.otava.com/reference/the-benefits-of-disaster-recovery-in-cloud-computing/
5. https://wamsinc.com/2013/12/05/the-5-biggest-challenges-cloud-computing-can-solve/
6. https://www.mindinventory.com/blog/cloud-computing-challenges/

Kateryna Chuian
I. O. Zabolotska, directrice de recherche
I. O. Zabolotska, conseilleuse linguistique
Université Nationale Polytechnique de Dnipro, Dnipro (Ukraine)

Les téléphones portables dans notre vie

Un téléphone mobile est un appareil de communication électronique connecté à un réseau de communication sans fil via des ondes radio ou des diffusions par satellite. Les téléphones portables sont utilisés dans le monde entier à diverses fins.

Les téléphones portables présentent de nombreux avantages.

1. Tout d'abord c'est un appel vers divers services en cas d'urgence, une communication avec des personnes qui n'ont pas accès à une ligne fixe, peu importe où elles se trouvent.
2. Deuxièmement, vous pouvez utiliser le téléphone à l'école. De nos jours, nous recourons de plus en plus souvent à l'enseignement à distance, qui a ses propres particularités. M. Sharples [1] évoque les caractéristiques du "mobile learning" : collaboration en ligne sur un projet, "moblogging" (mobile blogging), apprentissage personnalisé, travail en groupe, recherche en ligne, égalité d'accès à l'apprentissage.
3. En outre, le téléphone est principalement utilisé à des fins de divertissement. Vous pouvez écouter de la musique, lire, jouer des jeux, regarder des vidéos, des films et des réseaux sociaux lorsque vous vous ennuyez.

Mais dès que vous commencerez à utiliser les téléphones portables, vous ne pourrez plus vous en détacher, et commencerez à les utiliser dans tous les domaines de la vie. Vous ne pouvez jamais laisser votre téléphone portable à la maison, vous êtes devenu accro à cet appareil portable et vous ne pouvez pas quitter la maison sans lui, ce que les experts appellent l'addiction. Non seulement vous pouvez l'utiliser pour contacter différentes personnes, mais vous pouvez également l'utiliser pour envoyer et recevoir des e-mails et rechercher sur Internet. En conséquence nous en sommes devenus dépendants, et nous ne pouvons plus imaginer la vie sans ces appareils.

"Il a déjà été démontré que la dépendance au téléphone portable affecte négativement l'interaction sociale, la santé mentale et le bien-être", a déclaré Frank de Vocht, de l'Université de Bristol [2]. Par exemple, une étude de 2015 a révélé que les adolescents qui utilisent beaucoup leur smartphone dorment mal et se sentent trop fatigués. Ces données, selon les scientifiques, sont plus significatives en termes de santé publique.

Si vous pensiez que la dépendance était le seul inconvénient d'un téléphone portable, vous vous trompiez, car il existe de nombreux autres inconvénients similaires.

1. Le premier inconvénient est la détérioration de la mémoire. Le rayonnement électromagnétique des smartphones affecte négativement la capacité des adolescents à se souvenir des informations, en particulier des images abstraites. Dans ce cas, l'exposition directe se produit presque exclusivement lors de

conversations téléphoniques. "80 % du rayonnement est absorbé lorsque l'appareil mobile est proche de la tête", explique Rösli [2].

2. En outre, les radiations des téléphones portables ont des effets néfastes sur la santé et peuvent provoquer le développement de cellules cancéreuses. Par exemple ; l'étude de Yawei Zhang, MD, professeur de sciences environnementales à la Yale School of Public Health [3] fournit des preuves que la susceptibilité génétique influence l'association entre l'utilisation du téléphone portable et le cancer de la thyroïde. , a déclaré

Chaque fois que nous achetons un téléphone portable, nous ne pensons qu'à tous ses avantages. Nous en avons besoin car ils sont le moyen le plus simple et le plus sûr de communiquer avec toutes les personnes que nous connaissons ou voulons connaître, parce que en utilisant les dernières technologies, nous pouvons faire beaucoup. Les gens ont différentes raisons pour lesquelles ils achètent des téléphones portables, et ce qui peut sembler un avantage pour certains d'entre nous peut être considéré comme un inconvénient pour d'autres. En tout cas, avant d'acheter un portable nous devons bien réfléchir à la manière de minimiser l'impact des défauts du téléphone sur nous.

Bibliographie :

1. Sharples M. A Theory of Learning for the Mobile Age / Sharples, M., Taylor, J.,Vavoula, G. // The Sage Handbook of E-learning Research / R. Andrews & C. Haythornthwaite (eds.). – London : Sage, 2007. – P. 21-47.
2. Ника Воюцкая. Какой вред мозгу наносит смартфон? URL: https://www.dw.com/ru/%D0%BA%D0%B0%D0%BA%D0%BE%D0%B9-%D0%B2%D1%80%D0%B5%D0%B4-%D0%BC%D0%BE%D0%B7%D0%B3%D1%83-%D0%BD%D0%B0%D0%BD%D0%BE%D1%81%D0%B8%D1%82-%D1%81%D0%BC%D0%B0%D1%80%D1%82%D1%84%D0%BE%D0%BD/a-45061612
3. Yale University. Thyroid cancer, genetic variations and cell phones linked in study. URL: https://medicalxpress.com/news/2020-01-thyroid-cancer-genetic-variations-cell.html

Sofiia Denysiuk
I.G. Hulina, research supervisor
O.V. Khazova, language adviser
Dnipro University of Technology (Ukraine)

Smart application SaveME to stay close forever

In the time when human race is trying to control everything nearly the only thing that hasn`t succumbed jet is time. The most painful aspect for us, average people, is limited time with another person you love. So, what do we do when we miss someone? Yes, crying, rewatching videos and photos we already saw for a hundred times. But that cannot supersede the real time with that person.

Nowadays people created services to animate photos, such as:

- Deep Nostalgia;
- Avatarify;
- Reface;
- Movepic;
- Puppets World;
- Vimage.

These apps are intended for nostalgic use, that is, to bring beloved ancestors back to life.[1] They are truly animating photos, but videos that are created consist of a fixed sequence of movements and gestures, but will relatives of this person recognize him? They will certainly understand that it is not his moves, mimics and so the only thing here is dear to them is his face. So, we make the conclusion that these animations do not replace a real conversation.

This problem can be solved by the smart application SaveME (ME is abbreviated from memories). For instance: have you broken up or are you in different time zones? Such circumstances can make you feel lonely and for these cases, our mobile application was invented.

SaveME will create an illusion of a full-fledged conversation with a dear one who is currently absent or unable to contact for one reason or another. In this situation, a user can just open the app and choose the contact (a “Model”) of the person he/she wants to talk to and have “a video call” while he/she is going to be able to ask questions and get complete and believable answers. While this call the “Model” will fully copy the manner of speech, facial expressions and gestures of the prototype, this is what is making SaveME so valuable. The relatives and other people, who know this person themselves will not see any difference between the prototype and the “Model”.

To ensure the proper operation of the SaveME application, the “Model`s” prototype (the future virtual interlocutor of the owner of the application) must be interviewed in the format of a “video call” with a portrait shooting. The questionnaire will contain the optimal set of questions, the answers to which will serve as a template to maintain a dialogue of the "Models" with a “caller”. Questions on

personal, every day - apolitical topics (What is your mood? What is your happiest memory? What advice will you give if someone is sad?) will be asked. Then an AI will create a multifunctional database to properly choose answers, reactions and mimics depending on the “caller`s” tone. The “Model” will be able to contextually select the topics or words, as the AI has structured the database.

Additional features of SaveMe include:

- An unlimited number of contacts ("Models") can be saved. It depends only on the willingness of a user;
- Cloud technologies can be connected to save space on the user's smartphone;
- Additional surveys can be passed, that will enrich the “Model`s” vocabulary and will increase its resemblance to reality;
- The base dialogues will be possible to make offline.

As a huge amount of information is being stored, the theme of its security is vital. First of all, the prototype himself has to give consent to create a “Model”. Secondly, with the help of a detailed recorded survey with face recognition, security against the creation of fakes with the use of celebrities will be ensured. "Model`s" answers are completely generated by artificial intelligence, so it is impossible to force the model to say a certain phrase. All data processing and storage takes place on a device that protects user data from leakage and prevents situations like leaving the database exposed [5].

The important theme that can bother a lot of people thinking about such an idea is the moral part of the question. AI can only become what humans want it to become. Humans are tasked with coding into their AI creations [6]. Immortality or self-protection, what is standing behind the goal of creating this application? The recommendation is to perceive this idea, not as people cloning or as an additional way for getting humanity from real communication. People with loss will find a rescue in this app and what difference does it make between rewatching old videos and using SaveMe? Take into account that AI was created to help humanity. That is why let's take all the advantages.

References:

1. Deep Nostalgia™: Animate your family photos: https://www.myheritage.com/deep-nostalgia
2. Be anyone and reface anything: https://hey.reface.ai/
3. Bring your Puppet to Life: https://puppets.world/
4. Breathe new life into your photos: https://vimageapp.com/
5. Chinese facial recognition company left database of people’s locations exposed https://www.cnet.com/news/privacy/chinese-facial-recognition-company-left-database-of-peoples-location-exposed/
6. Artificial Intelligence and the Fear of the Unknown: https://interestingengineering.com/artificial-intelligence-and-the-fear-of-the-unknown

Vladyslav Drobnyi
T.A. Zheldak, scientific supervisor
I.I. Zuyenok, language adviser
Dnipro University of Technology, Dnipro (Ukraine)

Dijkstra's Algorithm

There is a variety of ways how to find the shortest path for any purposes. From my perspective and experience, the easiest way is to use Dijkstra's algorithm. The described algorithm for finding the shortest path may be of interest for people who are engaged in analysis and/or who have a desire to develop their skills in analysis. Though this algorithm was proposed by Edsger Wiebe Dijkstra in 1952, it still finds its implications in different areas.

The creator of this algorithm is Edsger Wiebe Dijkstra, a Dutch scientist whose works influenced the development of computer science and information technology. In his research, Dijkstra draws great importance to the simplicity and elegance of mathematical reasoning. By writing his articles, he created a new style of scientific and technical communication, which can be described as something in between journal publications and friendly correspondence. He believed that programming is not shamanism, not dancing with a tambourine, but a mathematical discipline. And any discipline, if it claims to be something more than an external effect, must be built on a solid foundation. Mathematical logic is considered to be such a foundation.

Dijkstra came up with the idea of the algorithm for finding the shortest path in 1952. This algorithm appeared when Dijkstra was engaged in the tasks of evaluating the performance of the ARCMAC computer. Thanks to this algorithm, the scientist was able to find the best solution to determine the optimal way to transfer electricity to the critical elements of the circuit, thereby minimizing the consumption of copper. He called this method as "the shortest tree algorithm". Using this algorithm successfully, Dijkstra decided to formalize it and bring it to the worldwide publicity in 1959.

Since then, this algorithm has expanded its areas of application. It is widely used not only in the field of computer science and programming, but it is also used to determine the shortest distance in the road network, for planning road and air routes etc. Given the necessary data, using this algorithm, you can find out which sequence of roads to use to get from one city to another. Of course, these are not all applications, but these examples already show how useful this algorithm is.

To describe how this algorithm can be applied, there is a need to explain what stands for "finding the shortest path" and what the key terms are (see Fig. 1). To understand this algorithm, we will find the shortest path on the graph. The definition of a graph can be given as a collection of two sets points and lines. These points are called vertices and lines are called edges. Directed edges are called arcs. Let us have a look on a simple graph given in Figure 1. It has three vertices and two arcs. These arcs also have weights. The weight of an arc can represent distance, time, or something like that.

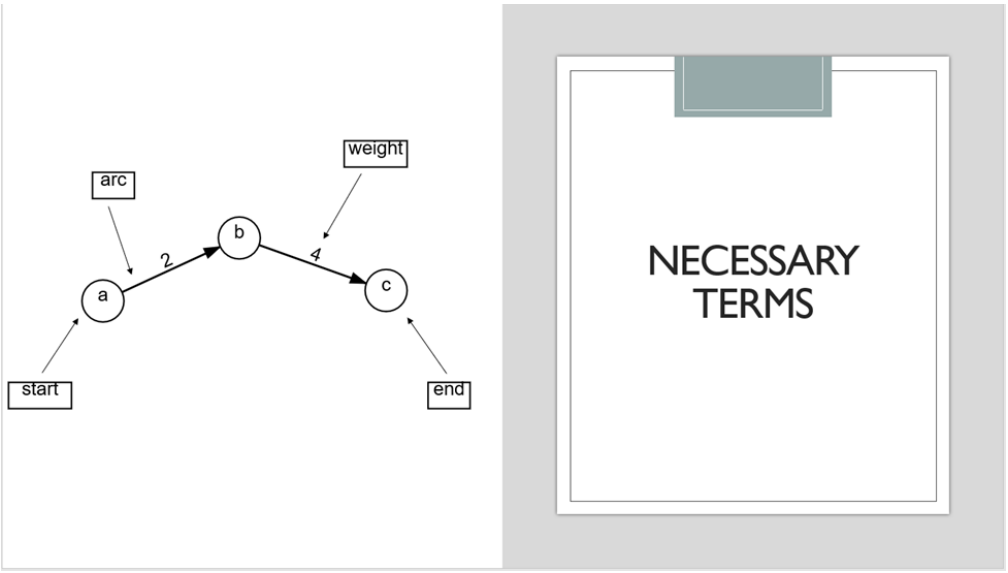


Figure 1. Key terms

Let us consider how the algorithm works. Figure 2 demonstrates the graph and the task: to find the shortest path from point “a” to point “g”. So, how should we start?

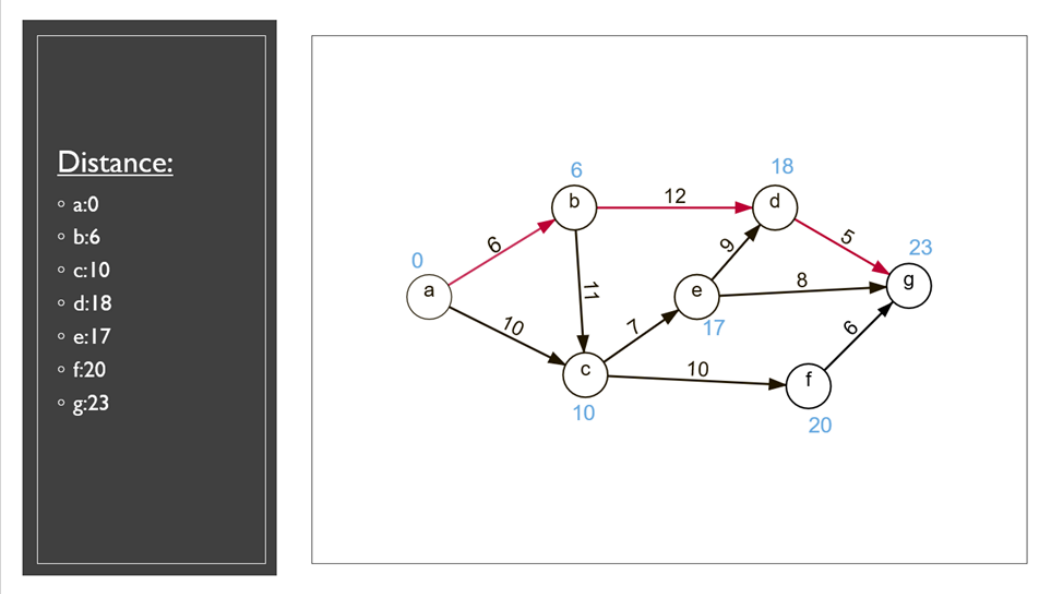


Figure 2. Finding the shortest path, using Dijkstra’s Algorithm

On the left side you can see distances to every point. The distance from the source point to itself is 0. The distance from the source point to the others has not been determined yet, so we use the infinity symbol to represent this initially.

Next, we should check neighboring points starting from point “a.” Neighboring points for point “a” are “b” and “c.” Then, we should find the minimum value between the distance to this point and the sum of the distance of the previous point and the weight of the arc. After that we are moving to the point with minimum distance, which is point “b” (see Fig. 2) and repeat these steps. For “b” neighboring points are “d” and “c”. Here minimum is point “c”. Here again: moving to it and repeat. We need to do this over and over until we reach the end.

Then, we are checking neighboring points for point “c”: “e” and “f”. For “e” point the distance is 17 and for “f” it is 20. Seventeen less than twenty, so we are moving to the point “e”. For “e” - neighboring points are “d” and “g.” Distance for “d” still 18 and for “g” it is 25. So, we are moving to the point “d.” And for “d” it is only one neighboring point, it is point “g.” And new distance for “g” is 25.

The blue numbers next to the points are minimum distances to these points. So, our task was to find the shortest path from “a” to “g,” and now we can easily find it. The minimum distance to “g” is 23 and you can see that the sum of arcs’ weights between “a”,” b”, “d” and “g” is 23. So, this is the shortest path from “a” to “g.” To check if it is the shortest path, we can look on the other paths. For example, path a-c-f-g. Sum of arcs’ weight is 26 and it is more than 23, so it is not the shortest path. By the way, graph can have several short paths, but in this example, it is only one. So, this is the shortest path from “a” to “g.” To check if it is the shortest path, we can look on the other paths. For example, path a-c-f-g. Sum of arcs’ weight is 26 and it is more than 23, so it is not the shortest path. By the way, graph can have several short paths, but in this example, it is only one.

The detailed describing how the Dijkstra's algorithm works illustrates its every step and demonstrates its simplicity that makes it applicable for different areas not limited to Computer Sciences and IT only.

References:

Edsger Dijkstra: In Search of the “Shortest Way” to Conscious Programming (2016) [online] Available at: https://sudonull.com/post/80638-Edsger-Dijkstra-In-Search-of-the-Shortest-Way-to-Conscious-Programming

Estefania Cassingena Navone (2020) *Dijkstra's Shortest Path Algorithm - A Detailed and Visual Introduction* at freeCodeCamp [online] Available at: https://www.freecodecamp.org/news/dijkstras-shortest-path-algorithm-visual-introduction/

Andrii Fokin
I. M. Udovyk, research supervisor
V. V. Zabolotnikova, language adviser
National TU «Dnipro Polytechnic», Dnipro, Ukraine

Mobile Application Development Based on Flutter Platform

Mobile app development is growing rapidly. Currently, mobile applications that reveal their value are the most popular way to connect people with businesses. One of the main problems for developer is cross-platform development. At the same time, developers must choose an operating system Android or iOS or both. To overcome the cross-platform issue, Google developed a platform known as Flutter, which is an open-source interactive environment for mobile users announced in 2017. It can develop native applications with a single code. This means that you can use one programming language to create two different apps [1]. Two million users and almost half a million developers use the framework every month [2]. There are already 50,000 Flutter apps available on the Google Play Store, and the number is growing fast. Today, Flutter has equal popularity with React Native on both GitHub and Stack Overflow. eBay, Alibaba Group, Groupon, and other popular e-commerce providers also use Flutter to give their web and mobile apps a consistent look and feel. Google Trends confirms the growing interest in the Flutter framework, as can be seen from the comparison chart in Figure 1.

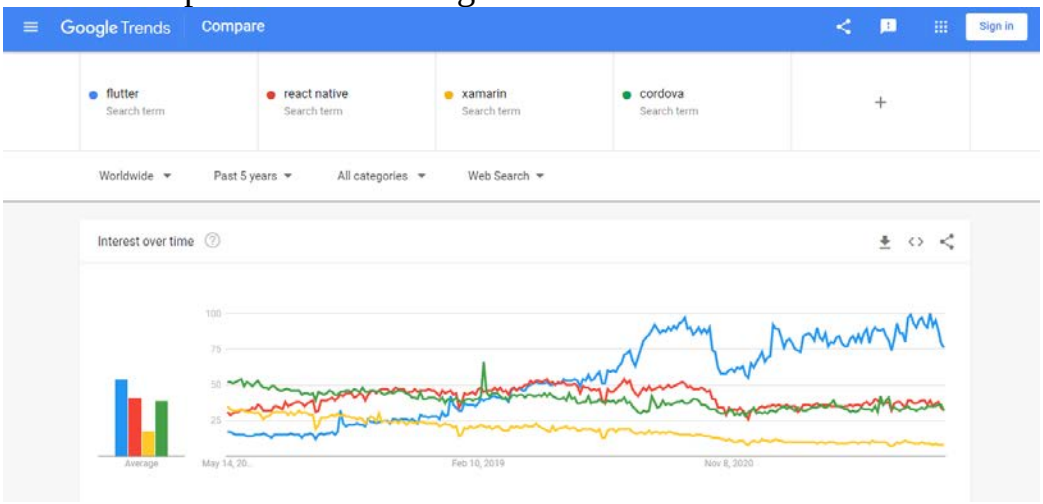


Figure 1 — Comparing the popularity of cross-platform frameworks

Flutter is Google's portable UI software development kit for building your own mobile, web, and desktop apps. It offers a complete environment with a framework, widgets, and tools. Flutter is a cross-app development framework that faultlessly interacts with cameras, geolocation, networks, and storage. The architecture and engineering design of Flutter allows you to create responsive and user-friendly applications. Flutter as a framework is very promising and now has a large developer community. This technology is a good choice for small to medium-sized applications or when content and core features require constant iteration. The Dart language is also the fastest growing programming language at present. The list of features added in the last two years is also great [3].

The creators of Flutter wanted to invent a technology that allows you to create a high-performance cross-platform mobile application as quickly as possible. The following features allow this:

1) Flutter's hot reload feature allows you to speed up performance.
2) Using Flutter, you can write code, manage it, and run it on multiple platforms such as Android, IOS. For developers this saves time and money.
3) This makes the application development process easier and faster. It also allows us to modify or update the code after changes have been made.
4) The Flutter application is written directly in native code, which eliminates any performance issues associated with the interpretation process.
5) Every Flutter app is built using the Dart programming language, which uses JIT and AOT compilation for faster startup, higher performance, and smoother operation. With the JIT feature you can increase your development speed and update your user interface.

Flutter is not a programming language. It is a pre-coded SDK consisting of ready-to-use and customizable widgets. The programming language used is Dart, also developed by Google. By avoiding the use of a bridge to communicate with a native layer such as Android or iOS, Flutter minimizes performance issues and increases application startup time. To develop an application using Flutter, you need developers to program in Dart.

Dart is a new programming language that supports a wide range of programming utilities such as interface, collections, classes, dynamic and optional typing. It is designed for both server and browser. This is a list of important Dart features:

1) Open source. Dart is an open-source programming language, which means that it is freely available.
2) Independent platform. Dart supports all major operating systems. These are Windows, Linux, Macintosh.
3) Object-oriented. Dart is an object-oriented programming language that supports all the oops concepts like classes, inheritance, interfaces, and extra input features.
4) It is easy to learn the language. Dart is an easy language to learn, and the Google developers have put a lot of effort into the documentation. Developers with OOP experience can jump into programming quickly if they know the basics because it has a Java-like syntax.
5) High performance factor. Applications run in Dart run faster than other programming languages. And features like JIT compilation and AOT compilation improve the performance of Dart. JIT or Just in Time compilation helps enable hot reloading, while AOT or Ahead of Time compilation helps to speed up startup and improve application execution.

Testing is an activity that is used to test and validate a software or application that is bug-free and meets user requirements. This confirms that the actual result is as expected. The Flutter framework offers great support for automated application testing. Full application testing is divided into three types. They are the following:

1) Unit testing. This is the easiest way to test an application or software. It tests a single function, method, or class. The purpose of unit testing is to test the correctness of the code under various conditions.
2) Widget testing. Widget testing is used to test a single widget. The purpose of this testing is to ensure that the widget's user interface looks and interacts with other widgets as expected. This testing involves multiple classes and requires a test environment to find more bugs.
3) Integration testing. Integration testing includes both unit testing and testing of widgets as well as external application components. The purpose of integration testing is to make sure that all widgets and services work together as expected.

Flutter is one of the innovative mobile technologies on the market right now. It is not a universal for everything, but it is a 100% promising framework given its breadth of coverage and speed of implementation. Flutter is the fastest framework for developing cross-platform mobile applications. With Flutter, you can quickly bring your app to market using a single codebase. Flutter offers a huge opportunity for developers. For companies that want to create apps for both iOS and Android, Flutter is the best choice. This is a good option for creating applications with amazing user interface and high performance.

References:

1. Kumar, D., 2019. “Flutter” To Build iOS & Android Apps. [Blog] Medium. Available at: https://levelup.gitconnected.com/flutter-to-build-iosandroid-apps-f8786d6fe987

2. Technologies, T., 2019. Why Should Android App Developers Consider Flutter? [Blog] Think Future Technologies. Available at: https://www.tftus.com/blog/why-mostly-android-developer-consider-flutter-app-development

3. Szczepanik M, Kedziora M. State Management and Software Architecture Approaches in Cross – Platform Flutter Application.

Oleksandr Holinko
M.A. Alekseiev, scientific supervisor
M.L. Isakova, language advisor
Dnipro University of Technology, Ukraine

The use of fractals in the analysis of acoustic signals of the jet mill

The grinding of materials plays an important role in many industries. For this, various crushers and mills are used. At the same time, the jet mill has a number of advantages over other types of mills, such as: high purity of the ground material, low grinding temperature, and others [1].

The jet mill is a kind of mill used to obtain ultrafine products by dry process. Grinding occurs when particles collide with particles in a fluidized bed, air flows or high pressure steam.

Currently, acoustic signals are increasingly used to control the grinding process [2]. At the same time, spectral methods and wavelet analysis methods are used to form informational features of mill acoustic signals [3]. The complexity of the classification lies in the fact that this acoustic signal is non-stationary. Existing methods for classifying an acoustic signal do not provide confidence in which the performance of the mill is maximum.

The aim of the work is to study the possibility of using fractals in the analysis of the acoustic noise of the jet mill, which accompanies the operation of the mill to provide more effective control of the state of the mill. To do this, it is proposed to use such a property of fractals as self-similarity to determine the state of the jet mill by acoustic noise that appears during the operation of the jet mill.

What are fractals? A fractal is a complex geometric figure that has the property of self-similarity, that is, it is composed of several parts, each of which is similar to the whole figure as a whole. At the same time, fractals are everywhere around us, both in the outlines of mountains and in the winding line of the sea coast. Some of the fractals are constantly changing, like moving clouds or flickering flames, while others, like trees or our vascular systems, retain an evolutionary structure.

There are many examples of fractals, because they surround us everywhere. Fractals, for example, are present in complex dynamics. There they naturally appear in the study of nonlinear dynamical systems. Some of the most famous fractals of this kind are the Julia set, the Mandelbrot set, and Newton basins [4].

Another example of fractals are fractal curves. One such curve is the so-called Koch Snowflake. Also, fractal curves are the Levy curve, the Minkowski curve, the Piano curve and the Pythagorean tree [5].

The third example or kind of fractals are stochastic fractals. Such fractals include the trajectory of Brownian motion on a plane and in space, Schramm-Löwner evolutions, various types of randomized fractals, that is, fractals obtained using a recursive procedure, in which a random parameter is introduced at each step.

The word «fractal» was introduced by Benoit Mandelbrot in 1975 to refer to the irregular but self-similar structures that he studied. Looking through the results of

noise measurements, Mandelbrot drew attention to one strange pattern - the noise graphs at different scales looked the same. An identical pattern was observed regardless of whether it was a noise plot for one day, a week, or an hour. It was worth changing the scale of the graph, and the picture was repeated every time[6].

At the same time, when analyzing the acoustic noise of the jet mill, we can also see a pattern that the noise graphs on different scales look very similar (Fig. 1). Based on this, it can be argued that the results of noise measurements have fractal properties.

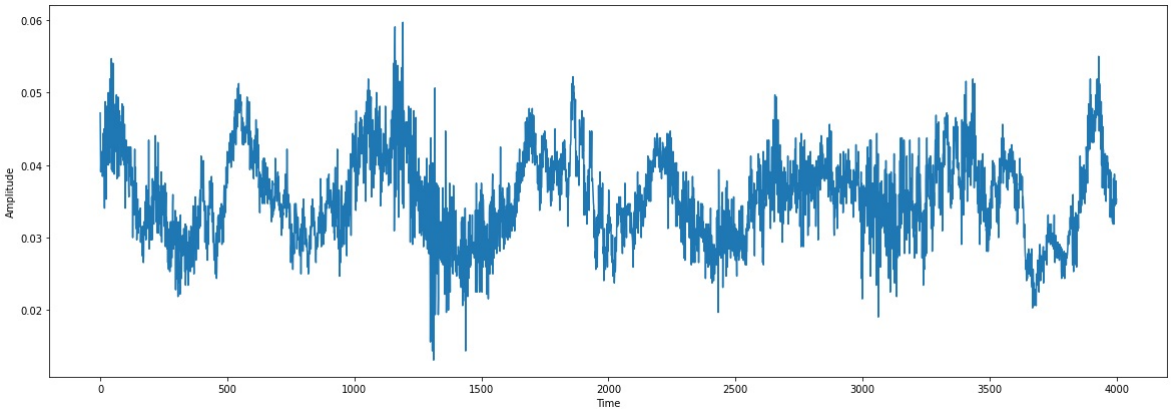


Figure 1. Graph of jet mill acoustic noise

In order to evaluate the fractality of figures, we need some indicator. One such analysis metric is the self-similarity coefficient. An example of which is R/S analysis and the Hurst coefficient. As a starting point, Hurst took a formula from Einstein's work on the Brownian motion of particles. From which Hurst derived his formula. Using this coefficient, one can determine how self-similar the process is in different modes of operation in different time intervals. The Hurst exponent, H, for the time interval of the time series can be determined from the expression:

$$\mathrm{E}\left[\frac{R(n)}{S(n)}\right] = Cn^H, n \to \infty,$$

where R(n) is the range of accumulated deviations of the first n values from the mean value of the series,

S(n) - standard deviation;

E[x] - mathematical expectation;

n - the value of the time interval (the number of points in the segment of the time series);

C is a constant.

The Hurst coefficient can vary from zero to one, while the larger the coefficient, the more self-similar the process is, and the more the next value depends on the previous ones. Moreover, if the coefficient is greater than 0.5, then the process has persistence in which the system is correlative; if it has been moving up during a series of observations, then it is likely to continue to go up during a series of subsequent observations, and vice versa. And if the Hurst coefficient is less than 0.5, then it has antipersistence, in which if the system moved up during a series of observations, then

it will most likely go down during a series of subsequent observations, and vice versa.

Conclusions

The obtained results of such a method of fractal analysis of time series as the Hurst exponent for a jet mill in operating mode averaged about 0.9, and during loading or unloading - 0.8. Then, based on the differences in these coefficients, it can be argued that fractal analysis can be used in the analysis of the acoustic noise of a jet mill.

References

1. Koeninger, B.; Hensler, T.; Romeis, S.; Peukert, W.; Wirth, K.-E. Dynamics of fine grinding in a fluidized bed opposed jet mill. Powder Technol. 2018, 327, 346–357.

2. Krzywanski J., Urbaniak D., Otwinowski H., Wylecial T., Sosnowski M. - Fluidized bed jet milling process optimized for mass and particle size with a fuzzy logic approach / Materials 2020, 13, 3303; doi:10.3390/ma13153303

3. Pilgrim I., Taylor R. - Fractal Analysis of Time-Series Data Sets: Methods and Challenges. Intech Open 2018.

4. Makabe Y.; Muto K. - Application of fractal dimension to the evaluation of environmental / Inter-noise 2014

5. Kenneth Falconer. Fractal Geometry: Mathematical Foundations and Applications. Wiley, 1990.

6. Feder J. Fractals. New York: Plenum; 1988.

Ihor Kachan
D.V.Ivanov, research supervisor
O.V. Khazova, language adviser
Dnipro University of Technology, Dnipro (Ukraine)

Development of IT-market in Ukraine: complexities, challenges and opportunities

When we talk about the prospects of the Ukrainian IT-market, the question immediately arises: how different is it from the world and is it different at all? Globally we are not different - the further we go, the more we are integrated into the global IT system. But if you look closer at the industry's kitchen, there are differences.

The main difference is that we put different accents on market segments. For example, now in the Ukrainian IT the focus on digitalization in the banking system is relatively higher because of the high competition in this segment. This is our local "know-how" and certainly it can be considered a strength of technological achievements of the market. But it is as if we focus on one segment and ignore a number of others - as a result we seem to be jumping over several steps. Though it is typical for Ukrainian IT to pass through stages of evolution in a revolutionary way - we are jumping over them.

Another point of difference is that in the Ukrainian IT-segment now there are difficulties in terms of resources. There are many outsourcing companies working for foreign countries. These companies have big internal resources to pay labor - this is the difficulty of development for Ukrainian companies. Many developers want to work for foreign, not Ukrainian projects. For some of them it is an opportunity to master English and have an exceptional line on their CV to increase their price tag as a specialist. For others it is an opportunity to go abroad for permanent residence.

Another important point is that in Ukraine and abroad the culture of doing business is different. We have a very developed culture of empathy, business is becoming more and more socially responsible - these are important components of business culture in Ukraine, which should be noted.

What changed are waiting for the IT-market in the near future? There are several areas in the IT-segment, the popularity of which increased because of the pandemic. One of the main ones is IT-security. This area has always been relevant, but the coronavirus has only further demonstrated its importance. Now the number of transactions on the Internet has increased, which has led to an increase in online fraud. Today's scammers create a new combination every time to get money fraudulently. This is definitely not the sphere where you can set up protection mechanisms once and they will work forever. That is why IT security is a platform for development, and it is permanent.

The second area that is already successfully winning the competition with hardware is cloud systems. A few years ago, IT companies that were developing in the hardware direction felt much better and more confident. But today users want to

store information in the clouds without being tied to hardware. From here on, this process will only continue to evolve.

And finally, the third direction, which will grow in IT in the near future is the intellectual work in the development with the right of ownership. We can already assume that in the foreseeable future this area will have the largest profits in the IT industry.

However, it is not a secret that the main difficulty of Ukrainian IT-market today is the loss of staff. Ukrainian IT-companies find it difficult to compete with the level of tasks and salaries of the international companies. A surge in demand for IT specialists has led to a clear imbalance - Ukrainian IT companies want to hire their own developers, but many of them work for foreign outsourcing companies (where their salaries are constantly rising). This is another window for development and a reminder to many companies to review their approaches.

The lack of support from the state is one more fact that cannot be ignored. The presence of a simplified taxation at the legislative level would significantly help the development of IT-industry in the country.

And the main difficulty in the context of the pandemic is the lack of a clear prediction of the industry development. The goal to remain successful, to survive, to preserve and not to lose all the accumulated work is not the real goal. It is very important to have an accurate forecast for the future: plans, ways of development, achievable goals even under the conditions of turbulence and uncertainty.

To sum up, the market is already overheated, and at some point, foreign customers may turn away from us and look at the markets in other countries. The development is of lower quality there, but customers may first put stricter conditions on quality control to ensure a high result and address this problem. We should also consider the scenario in which the structure of taking developers for outsourcing may change. As an example, some American IT companies keep their high-level intellects exactly in their own country, outsourcing more narrow tasks. Now we are already competing with the rest of the world, where the IT industry is developed. But at the same time in Ukraine the specialized IT-education is severely depressed - there are simply not enough educational institutions, because the issue of IT-industry development is not considered a priority at the state level. Therefore, it is very important to revise the training system - in Ukraine there are already a lot of seniors who can teach others. If we raise the idea of the priority of IT training to the national level - we will raise the GDP not at the expense of resources and minerals, but as a result of the development of the IT-industry.

References:

1. IT — топова галузь України. Чи має вона зелене світло для розвитку? [Електронний ресурс]. Режим доступ: https://biz.nv.ua/ukr/experts/ukrajinskiy-rinok-it-dani-ta-perspektivi-rozvitku-doslidzhennya-novini-ukrajini-50180299.html

2. Бум IT-сектору в Україні допоміг пережити пандемію, але проблеми в галузі ще залишаються [Електронний ресурс]. Режим доступ: https://www.radiosvoboda.org/a/bum-it-sektoru-v-ukrayini/31195801.html

Daniil Kachur
I.G. Hulina, research supervisor
O.V. Khazova, language adviser
Dnipro University of Technology, Dnipro (Ukraine)

How the Internet of Things can improve our lives

In our time, the development of technology is one of the most rapid directions in the development of mankind. It was almost impossible to imagine a gadget that has all the functionality that today's smartphone has, a century ago. However, more and more things and devices become "smart" with the ability to connect to the Internet and perform all possible functions. Such devices can be connected to one network and then it will be the Internet of Things, and despite the skepticism of some people regarding IoT, this network can considerably improve our lives.

The Internet of Things (IoT) contains several phenomena at once. Firstly, these are the smart devices themselves, which have various sensors and can connect to the network and interact with each other. At the moment, there are about 18 billion of such devices, and it is quite possible that by 2025 this number will increase to 25 billion. Secondly, it is a method of connection - M2M - that is, machine-to-machine, without human intervention.

Several smart devices that are connected to the same network create an IoT system in which they “communicate” through one common data source called a cloud. A connected gadget can have any number of sensors, for example an air pollution sensor typically has a few sensors, while an oil derrick can have hundreds or thousands of sensors.

The IoT system can be independent in making decisions and changes. The whole system will work according to this algorithm: the data is sent from the devices to the cloud, where certain software processes it, and, depending on the result of the processing, gives the signals back to perform any actions. For example, the light bulb is turned off if the motion sensor “informs” the cloud that there is no movement in the tracking area. However, there is also the possibility to self-manage IoT devices through applications on a smartphone. In this case, the data will go from the application to the data cloud and back to smart devices to make user-defined changes to their work [1].

The concept of IoT states that the smart things that surround us are connected to the same network to ensure maximum user comfort and energy savings. This means that the whole IoT system is not just sensors and devices that can be connected to the Internet to perform various functions, it is the concept of a system that actually creates an environment for "communication" between the user and smart devices.

In recent years, the Internet of Things has been actively developing and spreading around the world. As a result, this technology has become one of the most breakthrough technologies of the 21st century [2]. In fact, any electrical device can become a part of the Internet of Things, the only thing is that the device must be able to connect to the Internet in order to communicate with the cloud. The simplest

example of such a device is a light bulb or an air conditioner, the cooling temperature of which can be set from a smartphone [3].

One of the most developed areas where IoT has found its application is the concept of a smart city. Most of all, such technologies can be found in European cities, where the special attention to IoT as an integral part of the life of a modern person is paid. Some of the simplest examples of IoT technologies in European cities that develop the concept of a smart city are urban transport with motion sensors, garbage cans with filling sensors, transport route planning based on data on the movement of people around the city, video surveillance. All these smart devices and sensors are designed to improve and simplify people's lives. So, with the help of urban transport with movement sensors, a person can always, for example, track the bus he/she needs in order to know when to be at the bus stop. Garbage cans with filling sensors can inform utilities which of them are full and need to be picked up, and which are fairly empty. Thus, utility services will be able to make the most optimal routes for garbage trucks, and the city will become cleaner from garbage.

Special attention should be paid to video surveillance technology. Today it is difficult to imagine a city without a video surveillance system. Thousands of IoT cameras in the city leave practically no chance for thieves and intruders to go unnoticed. A facial recognition system, along with the footage from these cameras, can easily identify the perpetrator and make it easier for law enforcement to find him. A video surveillance system on the city's roads can determine the speed of a moving vehicle in order to record speeding, and a license plate recognition system can identify a specific car to issue a fine for the owner of it. It can also be noted that in Ukraine this system is very developed and if a driver violates the speed limit on the highway equipped with speed control video surveillance, then he will receive a fine in "Diya" application in a couple of minutes. As a result, the safety of the city is improved, as people know that they will be held accountable for any violation, whether it is a traffic violation or a robbery.

Some projects of smart houses look no less interesting. Appliance manufacturers are actively experimenting with IoT technology, introducing it to various household appliances. For example, smart window blinds that know exactly when to rise or lower depending on whether you are asleep or awake or what day of the week it is; a smart coffee maker that reads your facial expression and knows how you feel and what kind of coffee you need; a smart oven that has the intelligence to bake a chicken the way the user wants it, or even a smart refrigerator that sends you an SMS that you have run out of milk and you need to go to the shop in the evening [4].

In a smart home, the IoT meters record themselves how much energy was spent this month - no need to run around and take readings. Home smart speakers with a voice assistant, such as Amazon Echo or Google Home, allow the user to turn on music, make a call or search for information on the Internet using voice commands. Smart home security systems can send notifications to the user's smartphone if, for example, a fire sensor in the kitchen is triggered. Some solutions for such a home even show how much a particular light bulb or a household device

connected to the network consumes. In fact, a smart home is an intermediary between the user and IoT devices - it combines all their readings and displays them to the user in a form convenient for him - on a TV or smartphone screen, or orally.

Despite all the advantages of IoT, such as comfort and energy savings, this technology also has significant drawbacks. The first and one of the most important is insufficient security measures. The fear of data leakage is always present, as smart devices collect and transmit sensitive information, the disclosure of which can lead to serious consequences. Also, one of the disadvantages is the associated costs, since the implementation of IoT solutions implies the construction of an extensive network consisting of several smart devices and the corresponding technical infrastructure, including the power grid and the communication network. The third disadvantage is the dependence on the power supply and the network itself. Although the Internet of Things implies the autonomous operation of several devices, such a network is still highly dependent on external factors such as a stable power supply and Internet connection.

In conclusion, one thing can be noticed. Based on the examples above, most IoT technologies are not essential for each of us. Moreover, many people think that items like IoT window blinds are overkill. Nevertheless, IoT devices using city air pollution sensors, video surveillance systems, glucose monitoring, which is vital for diabetic patients, and many others contribute to improving the quality of people's life, their safety, health and comfort. It is safe to say that the Internet of Things is the technology of the future, the technology that not only helps and saves people's lives right now, but has tremendous potential in future developments.

References:

1. IoT Explained - How Does an IoT System Actually Work? [Online]. Available at: https://www.leverege.com/blogpost/iot-explained-how-does-an-iot-system-actually-work#:~:text=An%20IoT%20system%20consists%20of,the%20need%20for%20the%20user
2. What is IoT? [Online]. Available at: https://www.oracle.com/cis/internet-of-things/what-is-iot/
3. What is the IoT? Everything you need to know about the Internet of Things right now. [Online]. Available at: https://www.zdnet.com/article/what-is-the-internet-of-things-everything-you-need-to-know-about-the-iot-right-now/
4. How internet of things simplifies everyday life. [Online]. Available at: https://economictimes.indiatimes.com/jobs/how-internet-of-things-simplifies-everyday-life/articleshow/47107729.cms?from=mdr

Illia Karapysh
K.S. Rodna, research supervisor
S.I. Kostrytska, language adviser
Dnipro University of Technology, Dnipro (Ukraine)

Neural networks as a tool for solving data mining problems

Internet is becoming more complex every day. New technologies are appearing constantly: virtual reality, voice search, voice assistants, Wi-Fi 6, 5G, 3D-printing and tons of others. It indicates that there is a need to store big data, sort them out and find potentially useful information. A lot of companies use data mining technology to process data arrays.

In general, data mining is an automated data search based on the analysis of huge amounts of information. To segment the data and assess the likelihood of subsequent events data mining uses complex mathematical algorithms, statistical models or some machine learning methods [1, 6].

There are 4 stages of data mining. The first step is problem definition. After identifying the problem, the aim and the requirements are set.

Data gathering & preparation stage determines if the collected information is relevant. Unnecessary information is removed, patterns identified, and a table for the future analysis model structured.

Model building & evaluation stage includes the correction of parameters and technologies for building a model to create an optimized problem analysis system and correlating the resulting model and the problem to be solved.

Knowledge deployment stage covers organizing, presenting and application of the results [8].

Neural networks can be used for data mining. A neural network, in simple terms, is a computer program, which works on the principles of human brain, although it is not the same. NNs are rather biologically inspired by our nervous system than an exact replica of how the brain functions [1, 2]. Neural networks are able to use the experience and errors of past program launches. It means that any NN is a self-learning artificial intelligence system.

Artificial neural networks detect, recognize and extract patterns from databases, and filter out noise in the data. The ability of pattern recognition and function estimation makes ANNs quite common and useful in data mining [1]. Databases are growing to enormous sizes and the need for automated processing is becoming apparent.

In data mining, there are 3 types of artificial neural network model:

In the feed-forward networks as the simplest type of ANN the information is processed in only one direction. It means that a cycle is not formed by connections between all the nodes [4]. It is usually used for prediction or recognizing of some data patterns [1].

With feedback networks, the signals are processed in both directions [2]. It is really well suited to solve some problems of optimization [4]. Mostly, feedback networks are used for optimization of calculations and associative memory [1].

Self-organization networks, a type of artificial neural networks, are based on competitive learning rather than learning on errors of past program launches. Most of the time, they are used for cluster analysis [2].

Artificial neural network applications are used in personalizing the purchaser's experience. Such companies as AliExpress, Netflix, Spotify and others use AI to recommend the customers some of their products [3]. Those recommendations are based on the personal preferences of their customers. Depending on what series they watch, what music they listen to and what is inside their shopping cart, the system analyzes their preferences and shows something similar.

Moreover, ANNs might help us in healthcare. They are able to diagnose diseases with incredible accuracy. There were experiments, in which artificial neural network's recommendations matched the doctor's ones with 99% accuracy, and sometimes they even improved the human decisions [7].

Furthermore, NN could be used both for the recognition, identification of cultural value objects and for the construction of the intelligent decision support system (IDSS), as it can be considered as a class of modeling methods. Therefore, there are some areas of its application:

- pattern recognition (in the operation of the cultural value object recognition subsystem);
- classification (in the subsystem of data warehouse formation);
- decision-making and management (in the subsystem of user's requests and answers modeling);
- prediction (in IDSS in general);
- approximation (in approximating any continuous function with predetermined accuracy).

Overall, modern IDSS can definitely use neural network in the designing and the development of some of its components [5].

Taking into account all of the above, there are some pros and cons of artificial neural networks in data mining. Pros include low error rate, continuous improvement and optimization of various learning algorithms, network simplification algorithm, ability to make sense of nonlinear processes, good robustness, parallel processing, high degree of fault tolerance, and many others. The cons are complex structure, poor interpretability and long learning time [1].

The main conclusion to be drawn is that neural networks are an indispensable tool for data mining. Every day NNs are becoming more and more trusted and useful. Such problems as clustering, classification and recognition of patterns become easy to solve [7]. That is the reason why humanity should pay attention to the development of neural networks. They can definitely help us to solve some new problems when implementing new technologies.

References:

1. Gaur, P. *Neural Networks in Data Mining.* International Journal of Electronics and Computer Science Engineering. Retrieved 2 May 2022 from https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.640.136&rep=rep1&type=pdf#:~:text=The%20neural%20network%20model%20can,Feedback%20network%3A%20It%20regards%20Hopfield
2. GeeksforGeeks. (2022). *How Neural Networks Can Be Used for Data Mining?* Retrieved 28 February 2022 from https://www.geeksforgeeks.org/how-neural-networks-can-be-used-for-data-mining/
3. GetSmarter. (2022). *How Artificial Neural Networks Can Be Used for Data Mining.* Retrieved 24 April 2022 from https://www.getsmarter.com/blog/career-advice/how-artificial-neural-networks-can-be-used-for-data-mining/#:~:text=Neural%20networks%20are%20often%20used,increase%20sales%2C%20and%20lower%20costs.
4. Kumar Dash, A. (2019). *Feed Forward Neural Networks.* OpenGenus Foundation. Retrieved 3 May 2022 from https://iq.opengenus.org/feed-forward-neural-networks/#:~:text=In%20feed%20Forward%20Neural%20Networks,Values%20in%200%20or%201.
5. Martynenko A., Moroz B., Hulina I. (2020). *Building tools of an intelligent decision support system to identify cultural values*. Computer-integrated technologies: Education, Science, Production. Retrieved 24 April 2022 from https://doi.org/10.36910/6775-2524-0560-2020-41-12
6. Stedman C., Hughes A. (2022). *Data Mining.* Techtarget. Retrieved 13 April 2022 from https://www.techtarget.com/searchbusinessanalytics/definition/data-mining
7. UpGrad. (2019). *Artificial Neural Networks in Data Mining: Applications, Examples & Advantages.* Retrieved 3 May 2022 from https://www.upgrad.com/blog/artificial-neural-networks-data-mining/#Use_of_Artificial_Neural_Networks_in_Business
8. Walker M., (2016). *The Data Mining Process.* Data Science Association. Retrieved 16 March 2022 from https://www.datascienceassn.org/content/data-mining-process

Marharyta Kovalenko
Duale Hochschule Stuttgart, Baden-Württemberg, Deutschland
I.A. Yaremenko, Sprachbetreuerin

Digitalisierung der Lehre: Verbesserung der Kommunikation in Sekretariat an Hochschulen durch Konzepte Chatbots und Social Intranet

Seit jeher basiert jegliche Zusammenarbeit und damit verbundene Entwicklung der Menschen auf erfolgreicher Kommunikation. Wissen, Erfahrungen, Erkenntnisse oder Empathie zu vermitteln und zu erlangen sind die Grundlagen einer sozialen und vernetzten Gesellschaft. Besonders seit dem Einzug der Digitalisierung sind diese Aspekte noch weiter in den Vordergrund getreten und die Menge der Informationen wächst exponentiell. Des Weiteren verbreitet sich die computervermittelte Kommunikation in rasantem Tempo und bietet stetig neue und innovative Möglichkeiten des Informationsaustauschs an.

Jedoch wird in den Medien auch häufig davon berichtet, dass an vielen Stellen, wozu auch die Hochschulen gehören, nicht genug Möglichkeiten der Digitalisierung genutzt werden und entsprechende technische Aufrüstung dringend notwendig sei. Nichtsdestotrotz ist das Digitalisierungsprozess an Hochschulen heutzutage, insbesondere wegen der Corona-Pandemie, von großer Bedeutung. Anhand einer Schwerpunktstudie zur Digitalisierung der Hochschulen wird deutlich, dass die befragten Hochschulleiter der Digitalisierung von Lehren und Lernen und der Digitalisierung der Verwaltung die höchste Priorität zuordnen und dass die Befragten der Digitalisierung der Verwaltung den niedrigsten Entwicklungsstand beimessen [1].

Derartige Studien bestätigten den Verdacht, dass es sinnvoll ist, sich mit Sekretariat an Hochschulen und der dortigen Situation im Hinblick auf Digitalisierung, damit verbundenen Arbeitsabläufen und der Kommunikation auseinanderzusetzen. Das Ziel war herauszufinden, welche Konzepte als Verbesserungspotentiale dort zu finden sind und als die möglichen und zu erarbeitenden Lösungen gelten können.

Hauptpriorität soll es sein, Sekretariat an Hochschulen, das für die Verwaltung und Koordination aller organisatorischen und unterstützenden Prozessen an Hochschulen zuständig ist, zu entlasten. Dies soll durch eine Verbesserung der Kommunikation zwischen Sekretariat und Studenten geschehen. Hierfür soll primär die eigenständige Informationsbeschaffung für Studenten im Internet durch den Einsatz eines Chatbots sowie einer Social Intranet Plattform erleichtert werden, um Rückfragen in Sekretariat zu vermeiden.

Als ein denkbares Konzept, ist ein Chatbot eine textbasierte Computeranwendung, die für den Zweck der vereinfachten Informationsbeschaffung entwickelt wurde. Die Informationsbeschaffung des Nutzers erfolgt dabei über eine direkte Kommunikation mit dem Programm über eine Texteingabe mit einem

digitalen Dialogfenster. Der Chatbot reagiert dabei auf die Eingaben im Dialogfenster, sodass die Illusion eines Gesprächs auf Englisch „Chat“ für den Nutzer entsteht [2]. Der Chatbot soll auf der offiziellen Internetseite der Hochschule unter dem bereits existierenden Teilbereich für Fragen und Antworten hinzugefügt werden. Durch die Einspeisung von allgemeinen Informationen durch Sekretariat in den Chatbot, soll eine Verschiebung der allgemeinen Anfragen in Sekretariat zum Chatbot bewirkt werden [3].

Unter dem Begriff des Intranets, was als ein weiteres Konzept gelten könnte, versteht man ein selbstständiges Netzwerk, dass zum Austausch und den Erhalt von Informationen innerhalb einer Organisation oder eines Instituts dient. Ein Zugriff auf das Intranet ist nur über ein authentifiziertes Endgerät möglich, da es unabhängig von einem öffentlichen Netzwerk nur für berechtigte Personen zugänglich sein soll [4]. Die Verwendung von Verteilersystemen zur Versendung von kurzfristigen Informationen per E-Mail soll durch den Einsatz eines Social Intranets verringert werden.

Das Social Intranet soll als Ergänzung der Hauptinternetseite der Hochschule eingesetzt werden und Informationen zu aktuellen Themen des Studienzweiges enthalten. Die Informationen werden hierbei von den Dozenten selbstständig erstellt, sodass eine Weitergabe der Informationen durch das Sekretariat entfällt. Informationen auf der Social Intranet Plattform der Hochschule können beispielsweise zu Themen wie Änderungen am aktuellen Stundenplan oder allgemeine Informationen der Dozenten an die Studierenden sein [5].

Auf den ersten Blick erfüllen Social Intranet und Chatbots ähnliche Aufgaben. Ein entscheidender Unterschied ist jedoch die verwendete Kommunikationsstrategie. Hierbei kommen zwei Hauptstrategien in Frage: Push und Pull. Bei einer Pull-Strategie erfolgt die Informationsbeschaffung durch den Nutzer, in dem er beispielsweise eine Website aufruft oder nach den gewünschten Informationen sucht. Bei der Push-Strategie werden die Informationen aktiv an den Nutzer ausgespielt. Dies ist zum Beispiel bei Newslettern oder Push-Nachrichten der Fall [6].

Beim Social Intranet handelt es sich daher, um ein Pull-Medium. Studierenden und Mitarbeiter von Hochschulen müssen sich in ein System einloggen und aktiv nach den benötigten Informationen suchen.

Ein Chatbot hingegen kombiniert Push- und Pull-Strategien. So bietet er zum einen die Möglichkeit, aktiv nach Informationen zu suchen. Auf der anderen Seite kann er Studierenden und Mitarbeiter via Push-Notifications über Neuigkeiten oder Ankündigungen auf dem Laufenden halten.

Bei der Beurteilung, welche Technologie am besten geeignet ist, steht die Feststellung, für welche Aufgaben diese eingesetzt werden soll und wie die Kommunikationsgewohnheiten der Kommunikationspartner (in dem Fall: Studierende und Mitarbeiter) aussehen, im Mittelpunkt. Es handelt sich hierbei nicht zwangsläufig um eine Entweder-Oder-Entscheidung. Bedenkenswert ist aber, dass eine Kombination von Social Intranet und Chatbot ebenfalls eine denkbare Lösung für Kommunikation zwischen Sekretariat und Studierende an Hochschulen wäre.

Literaturverzeichnis

1. Cantner, U. (2019): Digitalisierung der Hochschulen voranbringen - drei Empfehlungen für Politik und Hochschulen. Expertenkommission für Forschung und Innovation (EFI).
https://hochschulforumdigitalisierung.de/de/blog/digitalisierung-hochschulen-voranbringen-empfehlungen-politik-und-hochschulen
2. Fonial GmbH (2021): Intranet.
https://www.fonial.de/wissen/begriff/intranet/
3. Gilch, H. et al. (2019): Zum Stand der Digitalisierung der Hochschulen in Deutschland in Forschung, Lehre und Verwaltung. https://www.researchgate.net/publication/333924976
4. IBM Cloud Education (2019): KI virtuelle Assistenten vs. Chatbots
https://www.ibm.com/de-de/cloud/learn/chatbots-explained
5. Kauz GmbH (2021): Alles, was Sie über Chatbots wissen müssen.
https://kauz.net/technologie/chatbot-leitfaden/#was-ist-ein-chatbot
6. Prisha, A.(2018): Communication Methods: Interactive vs Push vs Pull. Communication Management.
https://www.projectcubicle.com/interactive-push-pull-communication-methods/

Olena Kudria
A. A. Martynenko, research supervisor
O.V. Khazova, language adviser
Dnipro University of Technology (Ukraine)

Perspectives of Game Development in Ukraine

Games are an important part of modern entertainment. It is no wonder that some people decide to dedicate their lives to game *development*. Game development is the process of creating a game and this process has a certain life cycle. First, the product ideas are set out in the game concept document, Game Design, where the UI, characters, music, environments, graphics with lights and shadows, game progression are specified. Other stages include technical requirement analysis, development, testing and deployment.

As this industry comprises games for cell phones, consoles, computers or other gadgets, it offers a wide range of possible jobs. For example, gameplay developers are directly responsible for the mechanics. They work closely with game designers who come up with the concept of a game, its basic mechanisms and rules. Animation developers create animation systems and work with Skeletal animation. UI developers deal with a graphical interface, for example, making a variety of menus and transitions between them. There may also be more complex tasks, such as customising the appearance of a three-dimensional character. Back-end developers work with the server, parsers, data retrieval without touching the game itself.

The game starts with an engine. A lot of big companies create their own engines, but still the most famous engines are Unity and Unreal Engine. Both are used in Ukraine, although according to DOU Unity is more demanded.

Fig. 1 – The amount of vacancies according to DOU [3].

Another important game design area is a 3D modelling environment. Those vacancies can have different names, for example a Technical Artist or a 3D Artist. According to DOU, the first place belongs to Maya, the second to Blender and the last one is 3ds Max.

Even 2D models created for frame-by-frame animation need to be 'brought to life', especially if the game relates to multiple storylines. For this reason, designers often transfer models to the specialised software using skeleton technology. Invisible 'bones' can be added to characters and other objects, which can then be manipulated to quickly create various animations. In Ukraine popular software is Spine, 23 vacancies on DOU.

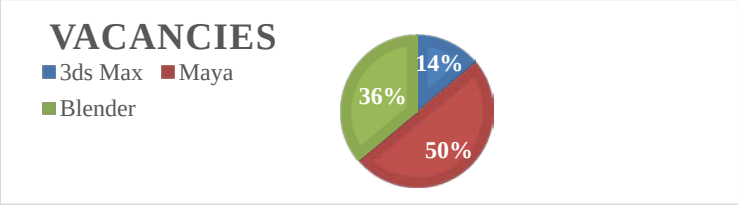


Fig. 2 – The amount of vacancies according to DOU [3].

Despite the fact that there are no big publishers in Ukraine and the domestic market is not big enough to make the project profitable, Many people also think that the creation of Ukrainian GameDev is owed to O like S.T.A.L.K.E.R., Cossacks, METRO.

But Ukraine is strong in game development specialists. Today our graduates are recognised as highly competent, creative and persistent. Global IT giants regularly come to hire engineers for their headquarters. But the biggest problem for most people in this industry is that we do not have many games of our own. Most domestic companies are outsourced and work on various content for foreign games. This can include 3D models or the complete adaptation of already published projects to other platforms. Some are proud that they help work on world-famous titles. Others are very disappointed that talented specialists are not making something of their own.

However, although there are still many studios making their own projects, many developers are not satisfied with the genres they choose. The reason is simple: they make casual games. This direction is very common in Ukraine, as such games do not cost much and can be developed easily and quickly. That is why many developers do not take it seriously.

In the case of indie games, the number of developers is large and growing every year. Every year, Game Gathering offers indie game developers an opportunity to showcase and promote their projects. However, the problem is that some investors are afraid to invest in new projects due to Ukrainian bureaucracy and legislation.

GameDev is alive in Ukraine and will not disappear from the world market: developers are too good for that. There are not many well-known AAA titles in Ukraine (however, recently Ukrainian developers participated in Far Cry 6 and released Sherlock Holmes: Chapter One), but *the industry is growing and has great prospects*.

References:

1. Четыре шага. Что нужно, чтобы Украина стала мировым центром разработки цифровых игр? [Електронний ресурс]. Режим доступу: https://biz.nv.ua/amp/ukraina-kak-centr-cifrovyh-igr-vozmozhno-kakie-usloviya-nuzhny-novosti-ukrainy-50123252.html
2. Геймдев: какие есть специализации программистов и с чего начинать. [Електронний ресурс]. Режим доступу: https://dou.ua/lenta/articles/gamedev-for-beginners/
3. DOU [Електронний ресурс]. Режим доступу: https://jobs.dou.ua/

Tamara Kurshubadze
A.A. Martynenko, research supervisor
V.V. Hubkina, language adviser
Dnipro University of Technology, Dnipro (Ukraine)

Artificial intelligence in music

Nowadays, information technology occupies an important place in all areas of human activity and its importance is difficult to overestimate. However, such technology as artificial intelligence has recently attracted a lot of attention. Artificial Intelligence (AI) is a branch of modern science that studies ways to teach a computer or system to think like a human being. The founder of Microsoft, Bill Gates, believes that AI is one of the technologies that can change a person's life - to make it more productive and efficient [1].

It should be emphasized that this technology is no longer something fantastic and unrealistic for anyone, because using AI, autopilot cars, navigation programs, Siri and Alex assistants, smart home devices, robots and others have been created. But will AI be able to write music or compose lyrics for songs? And will the computer be able to completely replace a person in the field of music - whether a producer or a singer?

Writing music on a computer has always been considered a rather complex technological task, but not an unrealistic one. If you dive into the history, the first attempt to create a piece of music was done in 1957. The ILLIAC computer (with the help of composer L. Hiller and programmer L. Isaacson) wrote the ILLIAC Suite, which was later performed by an orchestra of professional musicians.[2]

However, after the experiment it became clear that the algorithmization of the process of writing music is quite difficult. Computers with such musical patterns as initial data developed the composition randomly, adhering only to such restrictions as the tone of the work, the presence of dissonances, and so on. Therefore, the person (most likely, the composer) had to listen to all created compositions and choose the best fragments. Because of this inconvenience, the idea of writing music on a computer had been postponed for several years.

A little later, another musician tried to repeat a similar experiment. Faced with a creative crisis in 1982, Daniel Cope decided to use his knowledge of computer science and programming languages to develop programs using AI to write classical works. Moreover, his Experiments in Musical Intelligence (EMI) are still helpful to create a large number of compositions of various styles and genres.[3]

Many composers and producers turn to the possibilities of artificial intelligence with different intentions and tasks. For example, renowned Grammy Award-winning producer Alex Da Kidd used IBM Watson (an artificial intelligence computer system using natural language and machine learning for the analysis of vast amounts of unstructured information to answer questions) to analyze music hits and lyrics of several years, data from movies and social networks in order to determine the theme of the new song. In addition, this song, entitled "Not Easy", took the 4th place in the iTunes Hot Tracks chart after the release [4].

Another example is the artificial intelligence system called Jukedeck, which was developed in 2012 and could write a soundtrack of any style in seconds. Several songs created by Jukedeck have been used by such well-known companies as Coca-Cola and Google to compose catchy background music. Jukedeck writes music using neural networks, which are based on the desire to mimic the human nervous system. In other words, the more information you enter into the network, the better the AI will understand the logic of writing music, for example, when the chord G should be followed by D and so on.

However, the difficulty of using artificial intelligence in creating music is that it does not have "good" or "bad" music. If we take, for instance, image recognition using neural networks, then the algorithm analyzes which image is correct and which is not. Unfortunately, we cannot divide music into "right" or "wrong". Jukedeck employees foresaw it and set a goal to produce a musical taste in the algorithm. This is possible only by adjusting the neural network based on the analysis of the amount of music downloaded by users on the sites or based on their own musical taste. That is why the process of creating music with artificial intelligence is quite difficult and complex, but, the possibility of its improvement and adjustment to real situation is becoming a real thing.

In fact, AI is used in music not only to create songs, but also for other purposes. It provides referral systems in streaming services; finds talented musicians around the world; helps create new sounds, improve audio files, mix songs, and more. At the moment there are many extraordinary music programs, but here are the most popular ones [5]:

- **Aiva Technologies** is an AI-based soundtrack platform that allows users to upload their work to create even more new variations on songs. The purpose of this platform is not to completely replace musicians, but to promote the joint work of artificial and natural creativity.
- **Amper Music** is a platform that uses AI to compose and produce music tracks for specific content. The user has the ability to choose the style, mood, and length of the track, so some additional musical knowledge is not required.
- **Spotify** is a service that contains millions of songs, albums, and podcasts. Artificial intelligence is used in a playlist called Discover Weekly, which automatically selects tracks for users based on their musical tastes.
- **Shazam** is a program that can identify songs in seconds using AI. When you click on the search button, at first a digital audio print is created, then it is compared to millions of tracks in the Shazam database in seconds, and finally, the user gets the title and lyrics, artist's name and biography, concert dates and recommended tracks.

However, despite the number of newly created music programs and experiments that have been conducted for over 50 years, the technology of writing music using artificial intelligence is at an early stage of the development. So far, it cannot create "hit music" on its own, but this technology has a great potential in the future. Therefore, producers, musicians and music workers do not need to worry about their

jobs and the possibility of being replaced by computers. Moreover, they need to seize the opportunity and use AI as a "muse", a source of creativity in order to create new music that everyone will enjoy.

References:

1. Why Bill Gates thinks gene editing and artificial intelligence could save the world (2020) [Online] https://www.geekwire.com/2020/bill-gates-thinks-gene-editing-artificial-intelligence-save-world/#:~:text=Microsoft%20co%2Dfounder%20Bill%20Gates%20has%20been%20working%20to%20improve,exponentially%20in%20the%20years%20ahead
2. Композитор на базі штучного інтелекту: на що здатний Google Music Transformer? (2018) [Online] https://www.imena.ua/blog/composer-with-artificial-intelligence/
3. EMI: When AIs Become Creative And Compose Music (2021)[Online] https://bernardmarr.com/emi-when-ais-become-creative-and-compose-music/
4. How Artificial Intelligence (AI) Is Helping Musicians Unlock Their Creativity (2021) [Online]https://www.forbes.com/sites/bernardmarr/2021/05/14/how-artificial-intelligence-ai-is-helping-musicians-unlock-their-creativity/?sh=68783a970045
5. AI Music: Companies and Applications to Know (2022)[Online] https://builtin.com/artificial-intelligence/ai-music-examples

Juliia Martynenko
K. S. Rodna, research supervisor
S.I. Kostrytska, language adviser
Dnipro University of Technology, Dnipro (Ukraine)

Google Artificial Intelligence can replace people in creating chips

There is a problem in the world of the development of chips. This process is laborious and takes a lot of time to be done by human. Fortunately, the newest technologies are in progress now. So, modern methods of solving such problems are being created. Google is known to have created artificial intelligence (AI) to design chips. Algorithms cope with this task much faster than a human, and the quality of the final product often exceeds the results of specialists in the field [1].

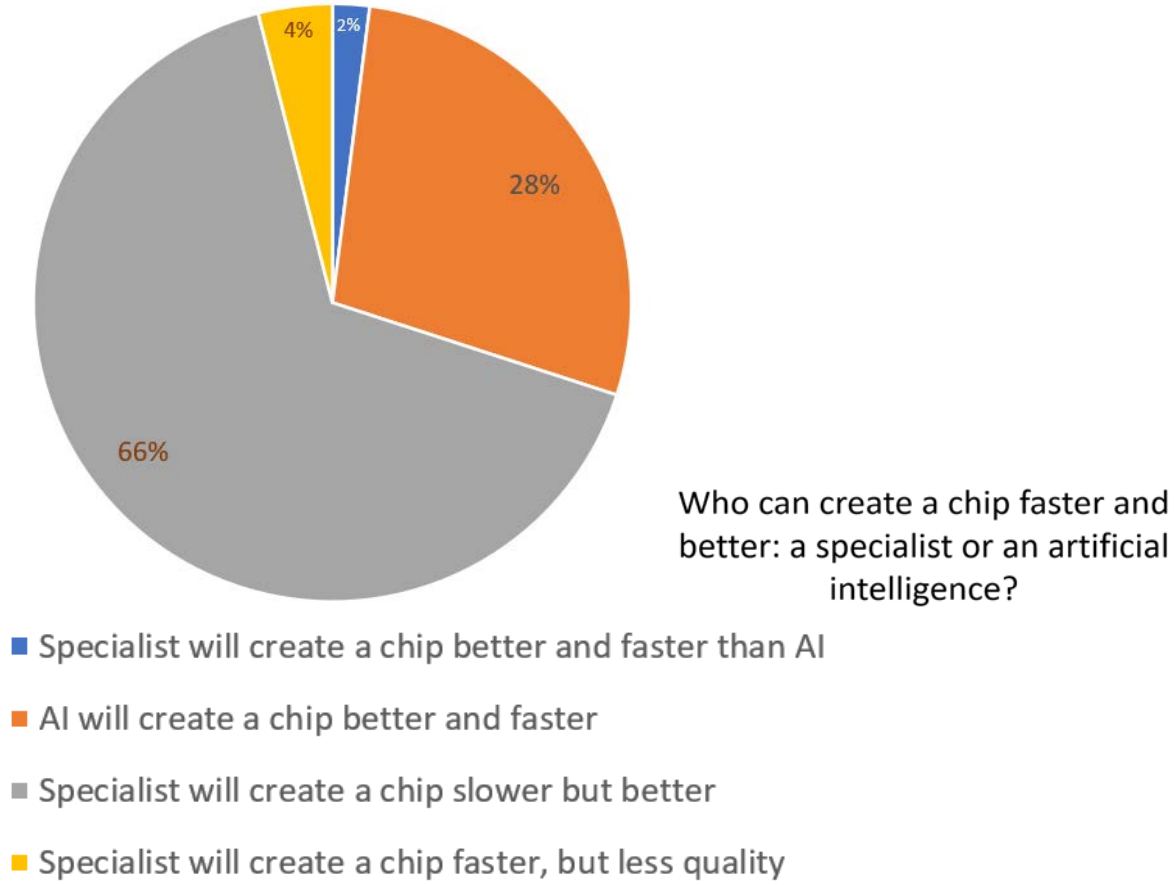


Fig. 1 Results of the survey

The chart (Fig. 1) shows the results of the interview conducted among the students of Dnipro University of Technology. 66% of the first-year students are sure that people are able to create better chips, but it will take more time. 28% of respondents think that AI creates them faster and better. Only 4% of the students believe that specialists will create a chip faster, but of less quality. The least number of students (2%) think that specialists are better and faster than AI.

Despite the fact that Google execution time is much shorter than that of experts, the design of the physical layout of the chip is still laborious and long. In order to optimize the process, researchers have developed a number of algorithms approaching layout generation like in a board game [2].

If we draw an analogy with chess, the board is a silicon crystal chip with computing cores as an analogy of chess pieces. In chess to make checkmate when one of the kings is under attack and cannot make a safe move means to win. For Google algorithms, this condition is the location of the components that ensure the maximum efficiency of the chip, i. e. its productivity and power consumption.

Google researchers have used the approach of deep reinforcement learning. They «scored» neural network dataset with 10 thousand chip design projects of various quality. Some of chip designs were generated randomly. The quality of each circuit from the dataset was assessed according to the power consumption indicators. The conductors` total length connecting the components was taken into account. All those data were used by Google to distinguish «good» designs from «bad» ones and generate their own.

According to The Verge [3], when it comes to the confrontation between man and machine in board games, the latter often takes unexpected decisions for the opponent. The chips designed by Google's neural network look quite unusual. If a person places components neatly and orderly, the machine does this operation chaotically scattering them on the crystal surface. However, external disorderliness, according to evidences of Google researchers, is narrated positively on the final results of the work [4].

The work of Google Research is really a significant achievement. Firstly, it could help to shape the future direction of the microelectronics industry. Secondly, AI will help people find different ways to increase the performance of chips. Therefore, knowledge and experience gained by the research team are applied by the corporation in practice. The algorithms help Google engineers develop the next generation of Google TPU tensor processors.

Tensor processors are hardware accelerators of AI algorithms that operate on special objects called tensors. They perfume a narrow spectrum of mathematical operations, such as matrix multiplication. Thus, Google AI is involved in accelerating the development of AI.

Google's artificial intelligence has discovered how to design new chips in six hours with better quality while people need several months to do the same job. Furthermore, AI has already been used to develop the latest iteration of Google's tensor processing unit chips. So, this technology has great perspectives in further research and development. But people must remember about interaction between human and AI as a symbiosis and convergence.

References

1. Shead, S.(2021). *Google claims it is using A.I. to design chips faster than humans*. Retrieved 11 June 2021 from https://www.cnbc.com/2021/06/10/google-is-using-ai-to-design-chip-floorplans-faster-than-humans.html
2. CNEWS (2021). Retrieved 11 June 2021 from https://www.cnews.ru/news/top/2021-06-11_google_nauchila_iskusstvennyj
3. The Verge edition from https://www.cnews.ru/book/The_Verge
4. Mirhoseini, A., Goldie, A., Yazgan, M. (2021). *A graph placement methodology for fast chip design.* Retrieved 9 June 2021 from https://www.nature.com/articles/s41586-021-03544-w.epdf?sharing_token-www.theverge.com

Dmytro Melnikov
I. G. Hulina, research supervisor
O.V. Khazova, language adviser
Dnipro University of Technology, Dnipro (Ukraine)

The issue of selecting the first programming language for students in universities

There are around 8,000 programming languages available today [1]. Some are no longer in use, while others are exclusively used for a certain type of device. However, the academic programming languages studied in Ukrainian universities count less than 20 [2].

When it comes to teaching future IT professionals and programmers, choosing the first programming language to learn is crucial. After all, it will determine the success of your future IT profession. A variety of factors can impact language selection. Among the most relevant arguments for choosing the initial course of programming (Computer Science 1, or CS1): syntax simplicity, labor market popularity, availability of all basic structures, language support in various programming environments, including compilers, ease of an integrated development environment (IDE) installation, educational benefits, online availability, maximum compatibility with other programming languages.

According to the subject area analysis, Java is used in 41.94% of CS1 courses in the United States, Python in 26.45%, C++ in 19.35%, C in 4.52%, C# in 0.65%, and other languages in 7.10% (Fig.1) [3]. On the other hand, C is the most extensively used language in Europe (30% to 45% in various European nations), followed by C++ (15-23%), Java (8-2%), Pascal (8%), and Python (6%) (Fig.2) [4].

Answer	%	Count
Java	41.94%	65
C	4.52%	7
C++	19.35%	30
Python	26.45%	41
C#	0.65%	1
Other	7.10%	11
Total	100%	155

Fig. 1. Programming language structure at universities in the United States.

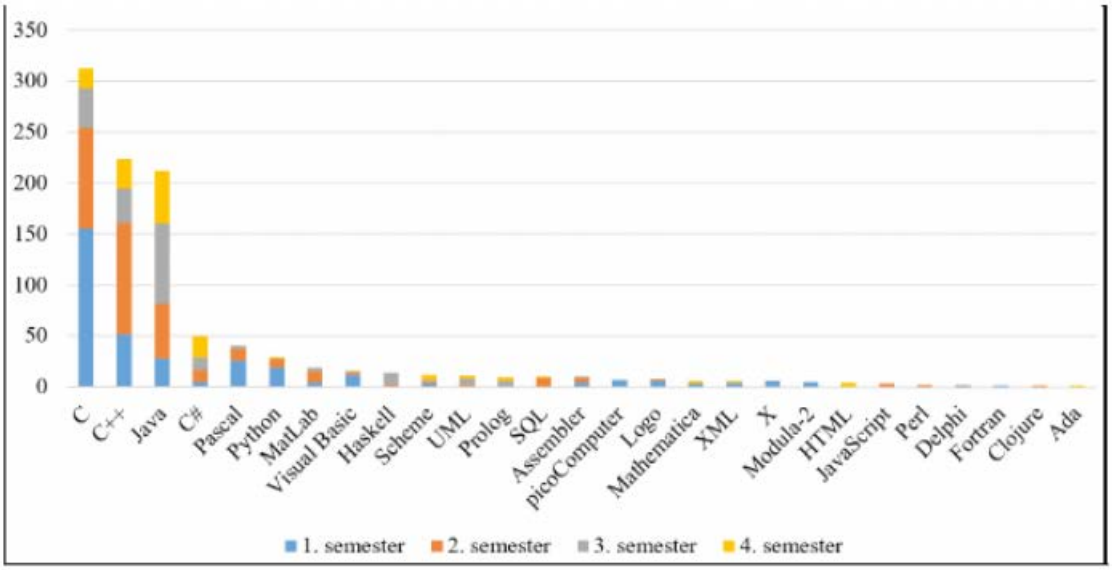


Fig. 2. Programming language structure at European universities.

Python has recently grown in prominence and caused a lot of discussion. In a comparison between C ++ and Python, students who used Python in an introductory programming course had more difficulties than students who used C ++ [5]. The authors who attempted to replace C with Python in the CS1 course, returned to C / C ++ languages after their study and recommend these languages to be taught in the CS1 course [6].

Transitioning from one course to another, such as from CS1 to CS2, is another critical topic. According to some research, most students who studied Python or Java in CS1 struggled to grasp dynamic data structures [7]. Some scientists propose using C ++ in the introductory programming course because of its support for several paradigms, which makes it easier to introduce functional, structured programming, and then object-oriented programming (OOP) - a language from the same family (C ++, C #, Java), given that languages belonging to the same family help with material assimilation.

It has been established that the organization of a flexible transition from the algorithmization and programming (AP) course and the presence of AP sections devoted to the study of structures, pointers, and memory management tools are important factors for the future IT professionals successfully mastering the material disciplines of algorithms and data structures (ADS) and OOP. According to the author, the following method of employing programming languages is suggested based on the need for programming languages in Ukraine and the necessity to develop a link between courses and their specifics: Java or C # - informed of OOP, C / C ++ - in the course AP, C / C ++ - in the course ADS.

References

1. Online Historical Encyclopedia of Programming Languages https://hopl.info
2. Rating of universities https://dou.ua/lenta/articles/ukrainian-universities-2019/
3. O. Ezenwoye, "What language? - The choice of an introductory programming language" (2018) DOI: 10.1109/FIE.2018.8658592

4. V. Aleksić, and M. Ivanović, "Introductory programming subject in European higher education" (2016) DOI: 10.15388/infedu.2016.09.
5. N. Alzahrani, F. Vahid, A. Edgcomb, K. Nguyen, and R. Lysecky, «Python versus C++: An analysis of student struggle on small coding exercises in introductory programming courses» (2018) DOI: 10.1145/3159450.3160586.
6. M. Madeja, and J. Porubän «Innovative approaches in C introductory programming courses» (2019)
7. Layman L., Song Y., Guinn C. «Toward Predicting Success and Failure in CS2: A Mixed-Method Analysis» (2019) DOI: 10.48550/arXiv.2002.11813
8. I. Damyanov, and N. Borisova, «Programming languages in undergraduate courses and in software industry in Bulgaria» (2017) DOI:10.12732/ijpam.v117i2.3

Hlib Monastyrov
I.G. Hulina, research supervisor
S.I. Kostrytska, language adviser
Dnipro University of Technology, Dnipro (Ukraine)

Chess engines evolution: computer-human confrontation

It is increasingly difficult to ignore the rising role of computers in our lives. The rate of technological breakthroughs during the recent decades has instilled the idea that computers may eventually become a threat to humanity. This notion has become popular to such an extent that the current debate in this field evolves around “AI takeover” and “Technological singularity” issues. At this stage, computers mostly remain instruments in human hands, not performers. There are, nonetheless, certain spheres where modern technologies engage in direct combat with people and manage to overplay and overthink them. In this research, we will focus on one of such battlefields – ancient strategic game of chess.

Computer engines have changed chess beyond recognition. Since computers entered the chess industry, an enormous number of theoretical game theories have been finalized and rethought. Modern grandmasters of chess learned and mastered their play within the computer era, and that resulted in dozens of new records, in the emergence of young talents and the general popularization of chess. When it comes directly to confrontation between a computer and a human player one may consider the results obvious, chiefly because the machines are more precise at calculations. Despite the persuasiveness of this argument, the issue is not that one-sided.

Firstly, human brain can reach unimaginable heights in terms of calculations. To elucidate that statement, it is relevant to refer to the data gathered during the last World Championship in 2021. According to Lichess organization’s assessment, in the third game between the current World Champion Magnus Carlsen and a Candidate Ian Nepomniachtchi the best game accuracy ever in history of modern chess was demonstrated [10]. There were registered no mistakes, inaccuracies or blunders, while average centipawn loss (a measure to show the deviation of player’s move from the most accurate move calculated by a computer) amounted to 2 and 3 respectively, which indicates almost perfect reliability of the moves. Furthermore, the record was broken during the seventh game and was re-set with centipawn loss of 2 per each player [11]. These results exemplify that a human is often capable of playing at a computer level.

Secondly, chess is an extremely complex game with an almost unlimited quantity of scenarios, and calculations as such are nothing without an understanding of a positional game. People have been learning chess for nearly 1500 years. Similarly, computers had to evolve to reach an average chess player level and to compete with the best player on Earth. Although this path was difficult, it took computers only a half of a century. In order to fully understand the abilities of modern chess engines and try to predict possible scenarios for the future of chess, it is vital to take a brief look at the key moments in history of computer chess development.

The beginning of a new chess era was marked shortly after the WWII. In 1949 American mathematician Claude Shannon wrote an article to shed light on programming chess for the first time. “Although perhaps of no practical importance, the question is of theoretical interest, and it is hoped that a satisfactory solution of this problem will act as a wedge in attacking other problems of a similar nature and of greater significance”, wrote Shannon [13]. Approximately at the same time Alan Turing, Shannon’s British vis-a-vis finished his work on “Turbochamp” – first computer chess playing algorithm, which was originally created on paper [15].

Computational abilities and calculation power of the computers have been rising steadily during the 1960s, 70s and 80s. Moreover, the first Computer Chess Tournaments appeared, where human players competed with each other and the computers on the Championships. It occurred that the participants of the battle between a computer chess world and a human one in the end of the 20th century were chess engine Deep Blue and World Champion Garry Kasparov.

In 1989 Garry Kasparov won a match against the Deep Thought, the most famous chess computer at that moment. Deep Thought was a previous version of Deep Blue. After Deep Blue was released, in a match of 6 games in 1996 Garry Kasparov lost the first game but was able to win a match with the total score of 4-2. In a year, during the rematch between Garry Kasparov and Deep Blue the last one finally beat him [6, 12]. “The result was met with astonishment and grief by those who took it as a symbol of mankind’s submission before the almighty computer”, opined Garry Kasparov [9].

The official dominance of computers, however, was delayed until nearly 2006. For almost 10 years different chess engines were coming up on the market thundering different grandmasters all over the world, while the very few still managed to withstand against computers. That was until 2006, when World Champion Vladimir Kramnik lost a match to a chess engine Deep Fritz [12].

Henceforth, abilities of chess engines took off and started to rise extremely fast. As computational abilities grew, new versions of popular chess engines Fritz, Komodo, StockFish appeared regularly. At present, it is practically impossible to beat a chess engine, considering that their abilities directly depend on the power of a computer.

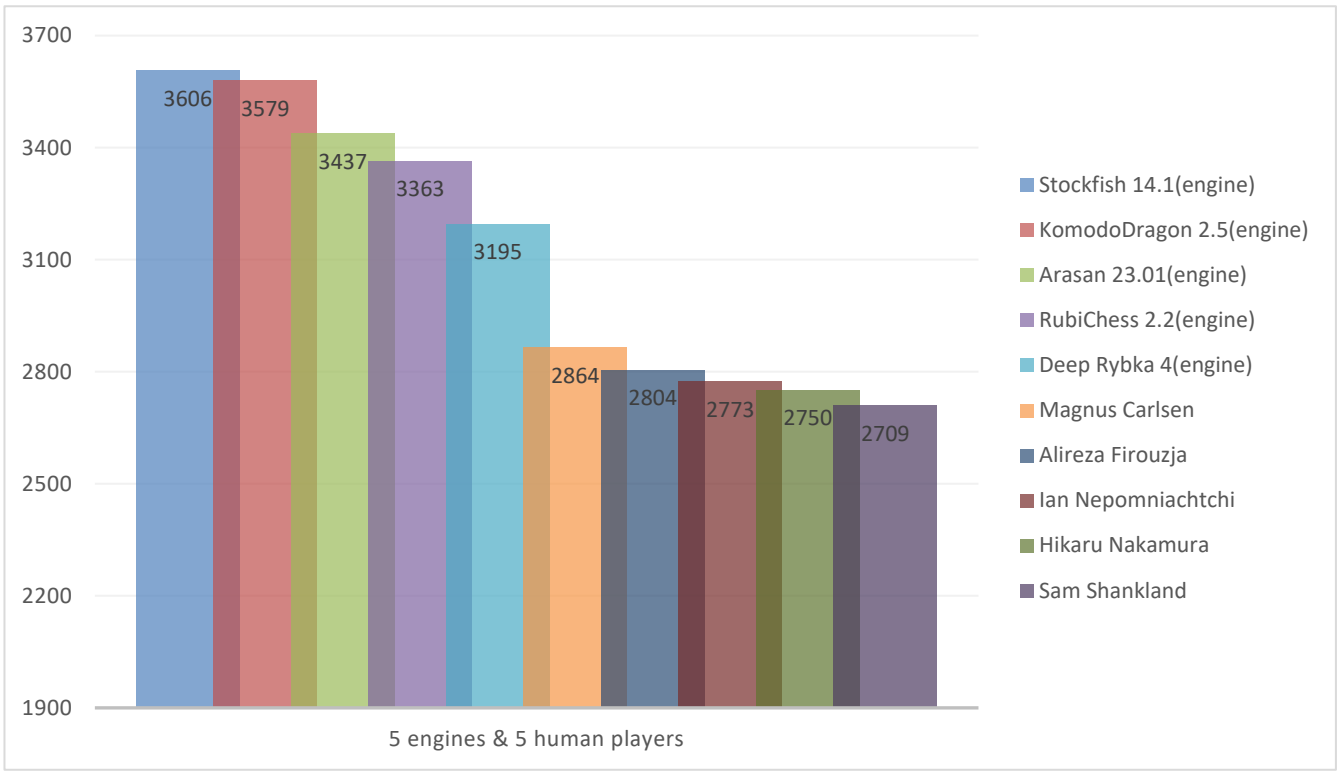


Fig.1 Elo rating: engine – human comparison

The bar chart (Fig.1) demonstrates the Elo ratings (the Elo rating system measures the relative strength of a player) of different modern chess engines and some of the world top 30 human players, including World Champion Magnus Carlsen [4, 8, 16]. The data indicate a substantial difference between a powerful chess engine and a grandmaster or even a champion. Taking into account the data given we can put forward the view that modern chess engine can only be beaten by another chess engine.

Therefore, we approach the latest stage of programming computer chess. In 2017, Google AI company Deep Mind presented AlphaZero, which uses neural networks to master chess by playing with itself [14]. AlphaZero quickly shocked the chess world after beating engine StockFish without a single loss. Yet, this data must be interpreted with caution because AlphaZero works on a supercomputer, as opposed to any other chess engine like StockFish. One could expect that AlphaZero was going to become a new breakthrough in chess world. On the contrary, some of the grandmasters showed scepticism. Referring to the views of Grandmaster Hikaru Nakamura, a comparable match is only possible, if StockFish is provided with the supercomputer as well [5].

Another key fact to remember is that AlphaZero's code is not accessible to the public, so regular users are not able to reach it at this point [3]. Because of this, there have likewise appeared dissenters to the view that AlphaZero is going to make a difference in the chess industry. Whatever the case may be, the fact that AI entered chess engine industry is remarkable and has chances to lead to a new revolution in chess.

In the final analysis we would like to turn on to what lies ahead. All things considered, there is some evidence to suggest that one day the game of chess may be actually solved, meaning all moves will be calculated by an engine until there are no more possibilities. At this juncture, even the most powerful chess programs are not able to avoid analyzing "on the fly", since there are billions of scenarios the game can go [1]. Michael Byrne stated that there are more possibilities in chess than there are atoms in the observable universe [2]. Based on that, he claims that solving chess is a quantum problem. Then again, it is still possible to succeed in solving it.

An equally significant aspect of future chess may become computers' ability to train people, provided that the computers are able to think like us. The key problem of modern chess engines in terms of computer-human communications is the fact that they do not explain their moves. In addition, computer logic is often not intuitive [7]. Thus, there is a long way to go. On considering the process of computer chess development, one can conclude that it is bilateral. Today chess engines can outplay any human player on Earth, hence direct competition is over. At the same time, computers expand an arsenal of possibilities of any professional or amateur player, thereby affecting the methods of learning and its efficiency. While chess engines are constantly improving, they likewise change the chess industry, the way the game is played, and the players themselves.

References

1. Baraniuk, C. (2015). *The cyborg chess players that can't be beaten.* BBC Future.
   Retrieved 25 April 2022 from https://www.bbc.com/future/article/20151201-the-cyborg-chess-players-that-cant-be-beaten
2. Byrne, M. (2015). *The Slow Race to Solve Chess.* Vice.
   Retrieved 12 March 2022 from https://www.vice.com/en/article/gvy8wq/the-race-to-solve-chess
3. Camacho Collados, J. (2017). *Is AlphaZero really a scientific breakthrough in AI.* Medium.
   Retrieved 10 March 2022 from https://josecamachocollados.medium.com/is-alphazero-really-a-scientific-breakthrough-in-ai-bf66ae1c84f2
4. Chess Engines Grand Tournament. (2022). [table of engine games results and ratings].
   Retrieved 10 March 2022 from
   http://www.cegt.net/40_40%20Rating%20List/40_40%20All%20Versions/rangliste.html
5. Doggers, P. (2018). *AlphaZero Chess: Reactions From Top GMs, Stockfish Author*. Chess.com. Retrieved 15 March 2022 from
   https://www.chess.com/news/view/alphazero-reactions-from-top-gms-stockfish-author
6. Eschner, K. (2017). *Computers Are Great at Chess, But That Doesn't Mean the Game Is 'Solved'*. Smithsonian Magazine. Retrieved 9 March 2022 from
   https://www.smithsonianmag.com/smart-news/what-first-man-lose-computer-said-about-chess-21st-century-180962046/

7. Follett, J., Knemeyer, D. (2019). *How 22 Years of AI Superiority Changed Chess*. Towards Data Science. Retrieved 5 April 2022 from https://towardsdatascience.com/how-22-years-of-ai-superiority-changed-chess-76eddd061cb0
8. International Chess Federation. (2022). *Standard Top 100 Players April 2022*. [Infographics]. Fide.com. Retrieved 20 April 2022 from https://ratings.fide.com/top.phtml?list=men
9. Kasparov, G. (2010). *The Chess Master and the Computer*. The New York Review. Retrieved 20 April 2022 from https://www.nybooks.com/articles/2010/02/11/the-chess-master-and-the-computer/
10. Lichess. (2021). *Carlsen versus Nepomniachtchi: FIDE World Championship Round 3*. lichess.org. Retrieved 9 March 2022 from https://lichess.org/blog/YaP2EBEAACMAnjMj/carlsen-versus-nepomniachtchi-fide-world-championship-round-3
11. Lichess. (2021). *Carlsen versus Nepomniachtchi: FIDE World Championship Round 7*. lichess.org. Retrieved 9 March 2022 from https://lichess.org/blog/YavcNxEAACEAwQNV/carlsen-versus-nepomniachtchi-fide-world-championship-round-7
12. Mistreaver. (2019). *History Of Chess Computer Engines*. Chessentials. Retrieved 18 February 2022 from https://chessentials.com/history-of-chess-computer-engines/
13. Shannon, C. (1950). Programming a Computer for Playing Chess. *Philosophical Magazine, Ser.7, Vol. 41, No. 314*.
14. Silver, D., Hubert, T., Schrittwieser, J., Antonoglou, I., Lai, M., Guez, A., Lanctot, M., Sifre, L., Kumaran, D., Graepel, T., Lillicrap, T., Simonyan, K., Hassabis, D. (2017). *Mastering Chess and Shogi by Self-Play with a General Reinforcement Learning Algorithm*. DeepMind. Retrieved 19 February 2022 from https://www.arxiv-vanity.com/papers/1712.01815/
15. Stezano, M. (2018). *In 1950, Alan Turing Created a Chess Computer Program That Prefigured A.I.* History. Retrieved 27 February 2022 from https://www.history.com/news/in-1950-alan-turing-created-a-chess-computer-program-that-prefigured-a-i
16. The Swedish Chess Computer Association. (2022). *158725 games played by 418 computers*. [Infographics]. SSDF. Retrieved 20 April 2022 from https://ssdf.bosjo.net/list.htm

Yelizaveta Nadreha
I.G. Hulina, research supervisor
V.V. Tykhonenko, language adviser
Dnipro University of Technology, Dnipro (Ukraine)

Social network for software engineers & Git technology

Nowadays, the world has a trend of growing technologies and abilities to develop and become better. The IT industry is developing like no other, creating new and new technologies that make our life easier.

So, one of the most popular technology for software developers was invented in 2005 and brought the opportunity to create programs much faster than before. It was a free and open-source distributed version control system designed to handle everything from small to very large projects with speed and efficiency [1].

Why is it so important to use Git in daily development? In the picture, we have a project that uses different technologies (Python, Java and database MySQL). Three developers divided their tasks and a Git tehnology helps to connect it with each other.

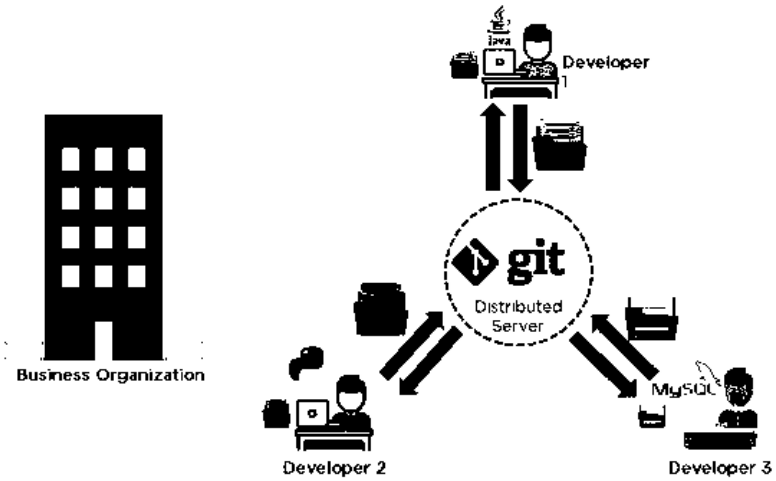


Fig.1. Working with Git [2].

Thus, Git allows programmers to save changes in particular project giving the possibility to return to the previous version. Just imagine: what can happened when a developer does not use one? It means that files and directories are stored locally in a computer. A programmer cannot see any real-time changes in the work introduced both by himself/herself and others. What will happen when a computer breaks down? All the performed operations will be lost without the possibility of any recovery! However, if he/she used Git it would not happen due the fact that, the actual version of a code is stored on a remote server during the work. Except this, Git has such necessary features as being scalable and branching; moreover, it supports non-linear development, collaboration and creation of backups [2].

This technology is popular with such huge companies and projects like Google, Facebook, Microsoft, Twitter, LinkedIn, Netflix, Android, Linux, PostgreSQL and others [3].

For using one, programmers must have an account at one of cloud platforms (GitHub, Bitbucket, GitLab and others) [4].

They have certain differences, however GitHub is one of the most popular Git repository hosting service. It offers the distributed version control and source code management functionality of Git plus its own features. This platform gives us an opportunity to share our own projects or ideas with a software engineering society. So, you can edit a stranger's code or create the new one, or even use someone's code like a library for your project. It is not forbidden unless an owner prohibits doing it.

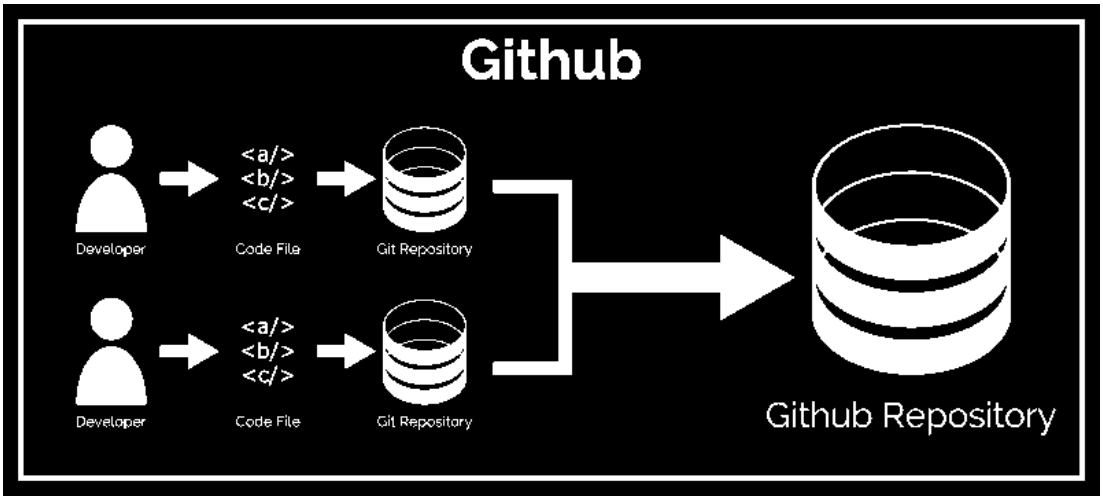


Fig.2. How are GitHub and Git connected? [5]

The picture shows how GitHub and Git are connected with each other. We have developers who send their code files to Git Repository that is located locally on their computers. Then they publish it in the GitHub Repository, where the project becomes full.

To sum up, what is the difference between Git and GitHub? Let's compare. Firstly, Git is installed and maintained on the local system (rather than in the cloud), but GitHub is exclusively cloud-based. Secondly, one thing that really sets Git apart is its branching model, when in GitHub a developer can share own code with others, giving them the power to make revisions or edits. So, Git is a high quality version control system, but GitHub is a cloud-based hosting service [6].

In addicion, GitHub is like Instagram, only for programmers, where you can publish something and be noticed by an employer. So, your Account can be your portfolio that displays information about your projects, activities, subscribers, sponsors, if there are some, and much other things. Git is a basic tool for team work while implementing some project. To start using it, a developer must follow the instructions which can be found on the official Git website.

In conclusion, we need to understand that GitHub, like other platforms, has its dark and white sides. This is a program that also has failures that can potentially affect the business. At the same time, Git technology and GitHub solve many problems. Nevertheless, the benefits of using them outweigh their disadvantages.

References:

1. "Getting Started - A Short History of Git" from "Pro Git book" by Scott Chacon and Ben Straub (2014). [Electronic resource]. Access mode: https://git-scm.com/book/en/v2/Getting-Started-A-Short-History-of-Git.

2. “Top 10 Best Java Tools | Java Development Company” by Sharmi N (September 22, 2020). [Electronic resource]. Access mode: https://www.perfomatix.com/what-are-top-ten-best-java-tools/.
3. “git --fast-version-control”. [Electronic resource]. Access mode: https://git-scm.com/.
4. “Why do companies centralize Git?” by Jaakko Pallari (May 12, 2020). [Electronic resource]. Access mode: https://polarsquad.com/blog/why-do-companies-centralize-git.
5. “Git vs Github; how do they compare?” by Seann Hicks (June 24, 2021). [Electronic resource]. Access mode: https://tangenttechnologies.ca/blog/git-vs-github/.
6. “Introduction to Git” by Code-Tutorials. [Electronic resource]. Access mode: https://code-tutorials.com/course/git/introduction.

Vassiliy Pliskounov
S.I. Halazdra, professeure de français
Université Nationale Polytechnique de Dnipro, Dnipro (Ukraine)

A propos de l'évolution de la technologie de l'information et de la communication

Parler de l'évolution c'est parler du progrès, de la progression. Dans le dictionnaire Larousse on donne la définition du mot « évolution » comme « passage progressif d'un état à un autre ». Evidemment, l'évolution est le développement à un haut degré, arrivé à un haut degré d'évolution [3].

Il faut dire que l'humanité est passé les étapes de l'invention de l'écriture puis de l'avènement de l'imprimerie. Il est évidemment connu que les TIC sont apparues avec la naissance des premiers appareils de communication, comme le télégraphe électrique (inventé en 1832), le téléphone (inventé en 1876) et la radiotéléphonie. Et après la télévision, le Minitel et l'Internet puis la télécommunication mobile et le GPS ont associé l'image au texte ainsi qu'à la parole "sans fil", l'internet et la télévision devenant accessibles sur le téléphone portable qui est aussi appareil photo [5].

Vraiment, notre vie quotidienne est marquée par les technologies de l'information et de la communication. Les technologies de l'information et de la communication regroupent l'ensemble des outils, services et techniques utilisés pour la création, l'enregistrement et la transmission des informations.

C'est impossible de s'imaginer actuellement sans information, Internet, radio-télévision (en direct et en différé) et sans télécommunications.

Il faut ajouter qu'on parle également de nouvelles technologies de l'information et de la communication pour désigner les outils nés du rapprochement de l'informatique, des télécommunications et de l'audiovisuel, tels que les smartphones, le micro-ordinateur, les tablettes, le Cloud, etc [1].

Selon Nathalie Bertrand depuis une trentaine d'années certaines analyses ont considéré le progrès technique comme une révolution qui permettrait d'abolir la distance physique et d'éclater les territoires traditionnels. Elle souligne que l'avènement des technologies de l'information et de la communication est alors capable de gommer progressivement les disparités régionales, réduisant les coûts et favorisant les mouvements d'entreprises vers les zones défavorisées [2].

On a déjà habitué que la technologie peut être utilisée à différentes fins : pour faciliter la communication entre les gens, les spécialistes de toutes professions; pour faire circuler l'information utile aux activités économiques en zones rurales; pour améliorer des services existants; pour en créer de nouveaux.

Evidemment, la technologie de l'information et de la communication possède la **capacité d'innovation** et de développement des projes. Elle pose la question de la réorganisation spatiale des services d'intérêt général et ceux qui touchent à la santé publique.

Actuellement, on utilise la la technologie de l'information et de la communication dans les différentes sphères de la vie. Elle regroupe un ensemble de ressources nécessaires pour manipuler de l'information et spécifiquement les

ordinateurs, programmes et réseaux nécessaires pour la convertir, la gérer, la transmettre et la retrouver.

Les savants regroupent la technologie de l'information et de la communication par secteurs suivants :

- L'équipement informatique, serveurs, matériel informatique ;
- La microélectronique et les composants ;
- Les télécommunications et les réseaux informatiques ;
- Le multimédia ;
- Les services informatiques et les logiciels ;
- Le commerce électronique et les médias électroniques [5].

Il faut également dire que la technologie de l'information et de la communication joue un grand rôle pour la pédagogie spécialisée, qui traite de la formation et de l'intégration des personnes connaissant une situation de handicap ou ayant des besoins éducatifs particuliers. Il existe tels aspects importants à savoir: - La TIC au service de l'enseignement spécialisé; - La TIC comme technologies d'assistance, destinés aux personnes ayant différentes déficiences; - L'Accessibilité numérique et ses directives : comment permettre à tout un chacun d'utiliser la TIC; - Les Compétences médiatiques : comment éviter les dangers liés à l'utilisation de TIC; - Les Dispositions légales concernant l'utilisation de TIC [4].

Il est bien connu que la technologie de l'information et de la communication est utilisée non seulement au travail, sur le lieu d'apprentissage, de formation ou de recherche, mais aussi dans les loisirs et à domicile. C'est pourquoi, le fait de savoir utiliser la technologie de l'information et de la communication est donc une nouvelle technique culturelle, qui fait aussi partie de la formation de base et qui s'inscrit dans l'apprentissage tout au long de la vie.

La technologie de l'information et de la communication ouvre également de nouvelles possibilités pour les personnes en situation de handicap, parce que ces technologies permettent de compenser certaines limitations et d'avoir accès à l'information et à la formation, mais également au monde du travail.

Bibliographie:

1. Bouzidi, L., Boulesnane, S. et Benaissa, M. (2017). L'évolution des Technologies de l'Information et de la Communication : la co-construction avec les usages. *Interfaces numériques*, 6(3).
2. **Nathalie Bertrand** Technologies d'information et de communication : quel rôle dans les dynamiques territoriales de développement ? **Revue d'Économie Régionale & Urbaine 2001/1 (février), p. 135-152**
3. https://www.larousse.fr/dictionnaires/francais/%C3%A9volution/31900
4. https://www.csps.ch/themes/tic
5. http://www.wiki-compta.com/technologies_de_l_information_et_de_la_communication.php

Maria Sak
A.A. Martynenko, research supervisor
I.I. Zuyenok, language adviser
Dnipro University of Technology, Dnipro (Ukraine)

Smartphones in students' life: psychological perspective

Nowadays, the role of smartphones in the life of students is increasing from day to day. According to Oxford Languages resource, smartphone is defined as a mobile phone that performs many of the functions of a computer which typically has a touchscreen interface, internet access, and an operating system capable of running downloaded apps. This kind of device provides many technical opportunities to make the studying process effective and simple and comfortable by using and providing access to digital textbooks, searching new data, joining virtual classrooms and many others.

Along with these benefits, with increasing awareness of mental health, we cannot ignore the psychological impact of mobile phones on students. Thus, the excessive amount of time the smartphone consumes brings to a variety of behavior patterns been changed that plays a direct role in psychological well-being of young people. That's why this topic needs to be examined thoroughly.

In terms of negative psychological consequences, modern studies of this problem show connection of smartphone use with stress and anxiety among students that may be explained by their addiction to smartphones. Boumosleh & Jaalouk (2017) lead a cross-sectional study with the sample of 668 random Lebanese undergraduate students. Their study proposed that depression and anxiety were also a positive predictor of smartphone addiction.

In this vein, researchers started paying attention to Nomophobia or NO MObile phone PHOBIA. Nomophobia is a psychological condition caused by fear of being disconnected from the smartphone (Yildirim and Correia, 2015; Bhattacharya et al., 2019). A simple reason for that may be the habit of constant consumption of information. For that reason, a person who gets away from their device feels discomfort for the lack of data to pay attention to.

That also goes hand with hand with the Fear of Missing Out – the need to be constantly connected over the possibility of missing "important" information, especially that got over social networks (Wolniewicz et al., 2018; Elhai et al., 2020). Unfortunately, such psychological conditions become more and more common nowadays - in the time of crucial and significant global events, especially right now.

Another state that causes a special concern of the behaviour of young people is social anxiety. Avoiding face-to-face communication with another person but interacting with people, mostly using their mobiles, and as the result, the overuse of smartphones leads to the behavioral tendency described in the study of Erzen, E., Odaci, H., and Yeniçeri, I. (2021). Moreover, the preference of chatting on mobile lowers students' motivation to develop their social skills. This must be considered a serious problem among the new generation because most of humanity's progress and efficiency is based on socializing that is proved by centuries.

However, focusing on the negative consequences, we cannot ignore technology potential as as both a tool for treating mental health issues and for improving the quality of people's lives and promoting emotional well-being.

The studying process is extremely stressful itself. So, students tend to use smartphones as a relief. For example, some students tend to play simple mobile games as a way to pay their attention to verbal lectures. Especially, such behavior is common among people with Autistic Spectrum Disorders that helps them be more productive.

Researcher David Haniff has created apps aimed at lifting the mood of people suffering from depression by showing them pleasant pictures, video and audio of, for example, their families. He has also developed a computer game that helps a person to examine the triggers of their depression. Meanwhile, smartphone apps that play subliminal relaxing music in order to distract from the noise and worries of everyday living have been proven to be beneficial for reducing stress and anxiety.

Smartphone use has both harmful impact and helpful potential in terms of mental well-being of students. From my perspective, increase of control on minimizing device usage may not be very effective. Here, the better solution to reduce the harm may be spreading among students the awareness of how to increase conscious smartphone use. This consciousness would contribute to the increase of their critical thinking, which is the most important cognitive element to be possessed by college students.

References:

1. Boumosleh JM, Jaalouk D. Depression, anxiety, and smartphone addiction in university students- a cross-sectional study. *PLos ONE*. 2017;12(8): e0182239.

2. Yildirim, C., and Correia, A.-P. (2015). Exploring the dimensions of nomophobia: development and validation of a self-reported questionnaire. *Comput. Hum. Behav.* 49, 130–137. doi: 10.1016/j.chb.2015.02.059

3. Bhattacharya, S., Bashar, M. A., Srivastava, A., and Singh, A. (2019). Nomophobia: no mobile phone phobia. *J. Family Med. Prim. Care* 8:1297. doi: 10.4103/jfmpc.jfmpc_71_19

4. Erzen, E., Odaci, H., and Yeniçeri, I. (2021). Phubbing: which personality traits are prone to phubbing? *Soc. Sci. Comput. Rev.* 39, 56–69. doi: 10.1177/0894439319847415

5. Wolniewicz, C. A., Tiamiyu, M. F., Weeks, J. W., and Elhai, J. D. (2018). Problematic smartphone use and relations with negative affect, fear of missing out, and fear of negative and positive evaluation. *Psychiatry Res.* 262, 618–623. doi: 10.1016/j.psychres.2017.09.058

6. https://www.surrey.ac.uk/mediacentre/features/could-smartphones-be-good-our-mental-health

Dmytro Schkurenko
I.G. Olischewskiy, Fachberater
I.A Yaremenko, Sprachberaterin
NTU “Dnipro Polytechnic”, Dnipro (Ukraine)

Cybersicherheit: Wo soll man anfangen und wo aufhören?

Aktuelle Untersuchungen zeigen, dass "Cyberangriffe" immer mehr Schaden anrichten, nun auch bei kleinen und mittleren Unternehmen . Infolgedessen rückt das Thema Cybersicherheit - als logisches Gegenstück zu Cyberangriffen - immer mehr in den Vordergrund.

Globale Cyber-Bedrohungen entwickeln sich extrem schnell, was zu einem Anstieg der Zahl der Datenschutzverletzungen führt. Die meisten Verstöße betreffen Gesundheitsdienste, Einzelhändler und Behörden, und die meisten Vorfälle werden von Kriminellen verübt. Einige dieser Bereiche sind für Cyberkriminelle attraktiver als andere, weil sie finanzielle und medizinische Daten sammeln, aber jedes Unternehmen, das das Netz nutzt, kann zur Zielscheibe werden: Kundendaten, Wirtschaftsspionage oder Angriffe auf Kunden.

Um geeignete, ausreichende und wirksame Maßnahmen zu finden und umzusetzen, müssen Sie zunächst die bestehende Systemumgebung kennen. Obwohl diese Anforderung relativ trivial erscheinen mag, stehen viele Unternehmen vor dem Problem, dass sie nicht wissen, welche Systeme und Anwendungen sie tatsächlich nutzen. Ohne dieses Wissen können Sie natürlich keine Systeme und Anwendungen bereitstellen.

Sobald ein Überblick geschaffen ist, ist der erste Schritt zu echter Sicherheit die Netzverwaltung. Im Grunde genommen muss das Netz abgetrennt werden. Von außen zugängliche Systeme wie Webserver, E-Mail-Server usw. sollten nach Möglichkeit in eine demilitarisierte Zone (DMZ) integriert werden. Die DMZ ist ein Bereich des Netzes, der durch Firewalls und deren Regeln eingeschränkt ist und von dem aus kein direkter Zugriff auf andere interne Systeme möglich ist.

Sobald das Netz isoliert ist, kann die Frage der sicheren Kommunikationskanäle angegangen werden. Wenn unsichere oder unverschlüsselte Kanäle verwendet werden, kann ein Angreifer die Daten lesen und die Informationen erhalten. Dies erfordert bestimmte Annahmen, wie das so genannte "Man-in-the-Middle"-Szenario, ist aber in der Praxis möglich [1].

Ein Überblick über die im Einsatz befindlichen Systeme und Anwendungen führt nicht nur zu einem besseren Verständnis der Möglichkeiten des Netzschutzes. Natürlich müssen auch die Systeme und Anwendungen selbst geschützt werden. Dies beginnt in der Regel mit dem grundlegendsten Problem: unzureichendes Patch-Management.

Alle Komponenten, ob Hardware oder Software, müssen aktualisiert werden, zumindest was die Sicherheit anbelangt. Wenn Komponenten mit bekannten Schwachstellen verwendet werden, können sie als Einfallstor für Angreifer dienen. Um dies zu vermeiden, sollten verschiedene Bezugsquellen erschlossen werden.

Sicherheitswarnungen und Aktualisierungskomponenten, insbesondere für Sicherheitswarnungen.

Neben der Aktualisierung von Hard- und Software müssen grundlegende Maßnahmen zum Schutz des Systems getroffen werden. Nur die Software, die wirklich benötigt wird, sollte daher auf allen Systemen verfügbar sein. Nicht genutzte Software und Systemfunktionen sollten nach Möglichkeit deaktiviert und entfernt werden. Ebenso sollten alle Standardkonten immer ersetzt oder sogar deaktiviert werden [2].

Wenn sich ein Eindringling Zugang zu den Unternehmenssystemen verschafft, sollten die Daten als kompromittiert und somit als wertlos betrachtet werden. Das bedeutet, dass sie auf die gleiche Weise verwendet werden können wie z. B. von Erpressern verschlüsselte Daten. In beiden Fällen ist es wichtig, dass die Daten aus einer Sicherungskopie wiederhergestellt werden können. Auch wenn Dateien versehentlich geändert oder gelöscht wurden, ist es wichtig, dass sie wiederhergestellt werden können. Zu diesem Zweck sollten die Daten ordnungsgemäß gesichert werden. Welche Technik und Verfahren dabei zum Einsatz kommen, hängt vom Unternehmen und seinen Gegebenheiten ab. Grundsätzlich sollten jedoch Sicherungen auf einem Backup-System vorgenommen werden, damit dieses im Falle einer Wiederherstellung nicht selbst in Mitleidenschaft gezogen wird. Während eigenständige Backups für ein Unternehmen lästig sind, sind sie für kritische Geschäftsdaten Gold wert.

Definieren Sie ein verständliches Rechtemanagement: Wenn ein Angreifer beispielsweise Zugriff auf den Client eines Benutzers erhält, kann er Aktionen im Namen des Benutzers durchführen. Wie viel Bewegungsfreiheit der Angreifer hat, hängt von seinen Nutzerrechten und damit von seinem rechtlichen Umfeld ab. Daher sollten die Rechte der Benutzer (und Administratoren) so weit wie möglich eingeschränkt werden. Die Schlüsselwörter sind hier der Grundsatz "Kenntnisnahme erforderlich" und der Grundsatz des geringsten Privilegs.

Eine der häufigsten Angriffsmethoden für Unternehmen ist bösartiger Code (oder Malware). Manchmal werden verschiedene Typen verwendet und kombiniert, um ein bestimmtes Ziel zu erreichen. Für ein Unternehmen ist es wichtig, dass es möglichst viele Arten von Aktivitäten bekämpfen kann. Zu diesem Zweck wird in der Regel ein Malware-Schutz (oder Anti-Virus oder Anti-Malware) eingesetzt. Grundsätzlich gilt, dass ein 100-prozentiger Schutz nie garantiert werden kann, auch wenn der Hersteller dies verspricht [1].

Unsichere Passwörter sind ein häufiges und leider oft sehr leichtes Ziel für Angriffe. Diese Gefahr kann durch entsprechende sichere Passwortdefinitionen weitgehend verhindert werden. Organisationen sollten organisatorische Spezifikationen für die Entwicklung starker Passwörter festlegen, die idealerweise auf technisch begrenzte Weise in Systeme implementiert werden können. Der Grundsatz "Länge vor Komplexität" sollte immer beachtet werden. Komplexere Passwörter sind schwieriger zu merken, daher werden sie oft im Klartext gespeichert, um sie später zu verwenden. Längere Passwörter hingegen lassen sich leicht aus zufälligen Wörtern und Sätzen zusammensetzen, so dass sie leichter zu merken sind. Zu kurze regelmäßige Änderungszyklen sollten ebenfalls vermieden werden, da oft nur

minimale Änderungen anstelle eines neuen Passworts vorgenommen werden. Studien haben gezeigt, dass die Qualität Ihres Passworts abnimmt, wenn Sie es häufig ändern.

Zwar können viele Vorfälle durch technische Maßnahmen verhindert werden, doch ist auch der Faktor Mensch ein wichtiger Aspekt der Cybersicherheit, so dass technische Komponenten allein wenig bewirken, wenn keine Maßnahmen zur Verhinderung menschlichen Versagens getroffen werden. Daher sollte das gesamte Personal regelmäßig und gezielt informiert werden. Im Allgemeinen sollten seit langem etablierte Themen (z. B. "Umgang mit verdächtigen E-Mails") angewandt werden, mit spezifischen Erweiterungen, um unterschiedliche Risiken im Laufe der Zeit abzudecken. Die Bedeutung des Sicherheitsproblems sollte von der Geschäftsleitung vermittelt und erläutert werden. Auf diese Weise können Sicherheitsmaßnahmen zur Bekämpfung der Entstehung von Irritationen eingesetzt werden.

Für viele Unternehmen, insbesondere im Zeitalter der Digitalisierung, scheint die Cloud das Allheilmittel für alle Probleme des IT-Betriebs zu sein. Einzelne Anwendungen, ganze Systeme oder sogar ein ganzes Rechenzentrum können an einen oder mehrere Cloud-Service-Anbieter ausgelagert werden. Die Vorteile sind in diesem Fall vor allem die (manchmal als solche empfundene) höhere Verfügbarkeit, die Betriebskosten, ohne dass dafür gezahlt werden muss, und die einfache Verwaltung. Häufig übersehen werden Nachteile wie Abhängigkeit, grundlegende Risiken für die Privatsphäre, fehlende direkte Auswirkungen oder die Abhängigkeit von einem gemeinsamen Internetzugang.

Sobald die grundlegenden IT-Sicherheits- und Cybersicherheitsmaßnahmen eingerichtet sind, besteht ein nachhaltiger Weg darin, einen Sicherheitsmanagementprozess zu etablieren. Der erste Schritt auf dem Weg zu einer nachhaltigen Cybersicherheit sollte die Definition und Einrichtung eines Sicherheitsmanagementprozesses sein. So sinnlos diese Aussage auch klingen mag, es reicht aus, einfach "miteinander zu reden" [1].

Cybersicherheit ist nicht klar definiert, und der Begriff ist nicht immer willkommen. Diese Schritte stellen jedoch keine umfassende Verteidigung dar und sind in der Praxis die häufigsten und wichtigsten Problembereiche. Das Managementsystem steht ganz oben auf der Liste, aber es sollte nur eine Grundlage und ein Instrument für die Umsetzung neuer Maßnahmen in dem betreffenden Unternehmen sein. Dadurch wird ein äußerst nachhaltiger Ansatz gewährleistet [2].

Quellen:

1. https://www.informatik-aktuell.de/betrieb/sicherheit/cybersicherheit-wo-anfangen-und-wo-aufhoeren.html
2. https://www.kaspersky.de/resource-center/definitions/what-is-cyber-security

Ivan Shevchenko
M.A. Alekseev, research supervisor
S.I. Kostrytska, language adviser
Dnipro University of Technology, Dnipro (Ukraine)

The best search engine to use in 2022

Search engines started out by simplifying our lives, but as for today, the demands for a universal all-in-one software system have reached levels that would not have been conceivable just a couple of decades ago. The purpose of this research is to find out which search engine meets those requirements.

Every type of content available for browsing on the Internet has its own web address, known as URL. There is no way a user can access web pages without that unique set of symbols and characters. Therefore, most web browsers have a special search box at the top of the page. Though it would be an impossible task to type the URL on the keyboard because this would probably mean becoming familiar with a specialized language used for creating URLs, and most importantly, its syntax, in order to learn how to convert the desired keyword or phrase into a complex address. If it was not for a search engine, the users would be forced to go through that every time they need to look something up online.

The definition of a search engine is obvious to most people. There is no need to elaborate on that point. Nevertheless, there is a lot of confusion around these two terms quite frequently used in this study: search engine and browser.

A search engine is a kind of website designed to search for various web pages. For this purpose, a client enters the desired keywords into the search field. Then, the search engine launches its algorithms and starts looking for relevant web pages and then displays them in the form of a list [1].

A browser is an application program installed on a computer. A browser helps clients navigate safely through the Internet and view information from the web. As previously mentioned, it also features the address bar where the user can paste the URL. In fact, there is another interesting thing to note. A search engine would be useless without a browser, because these two systems are directly linked and deliver as one. For example, the user launches Opera, Safari or Edge and then types the web address of a search engine such as Baidu.com or Bing.com [2]. At this stage, the users will find themselves free to surf the Internet. It is, however, not necessary, as most browsers nowadays automatically use Google as a search provider. Optionally, the user can set another default search engine instead.

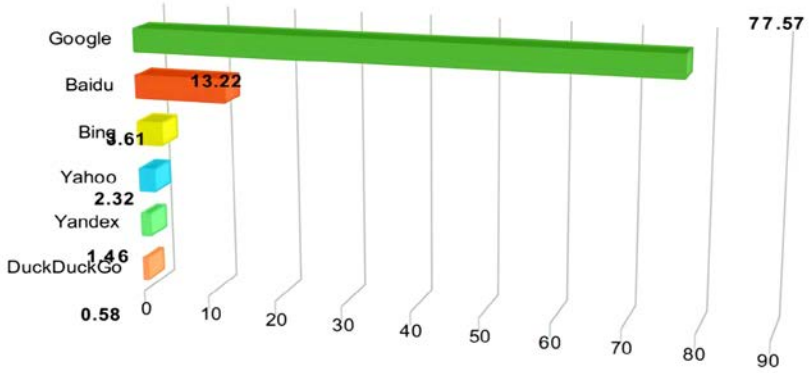


Fig.1 Search engine market share

The bar chart (Fig. 1) illustrates the top 6 search engines worldwide in terms of market share as of 2019 [3].

Google has been proving itself to be the most commonly used search engine for decades and is likely to maintain the upper hand. Having the highest figure (77,57%), Google does not seem to have a competition soon. Baidu, being the most restrictive search engine and conducting censorship on demand of the CCP, will never be able to expand globally. Still, the rate of 13,22% keeps it in the second place. As for Bing and Yahoo, they have always been competing against each other. Their current figures are 3,61% and 2,32% respectively. Yandex gains 1,46%. Although DuckDuckGo's current rate is pretty low (0,58%), the users increasingly tend to recognize its immense potential.

It is obvious that there is no search engine which would be suitable for everyone. Besides, there is always a polarization between those who want a plain search engine and those who prefer glancing at the latest news headlines, weather forecast, sports events, and other useful widgets. In fact, focusing only on customers' satisfaction leads to direct losses and eventually to the collapse of the company. Precisely for this reason, every company is looking out for its own interests in the first place. Moreover, most search engines can barely follow all three basic rules, which make a search engine brilliant. Those include putting users first, providing relevant results and protecting data security.

Providing meaningful and more accurate results allows the search engine to be considered a reliable resource for finding not just webpages, but also images, videos, goods, maps, and a lot more.

Performing that function means being an all-in-one search engine, and that is what Google excelled at. As for data security, Google is strongly engaged in this subject. Over the last decade, Google was involved in major data privacy scandals, in one of which the private data of over 52.5 million users was exposed [4]. Another Google data breach of this magnitude might severely damage its reputation. Still, on an average day, only nine in 1 million Google accounts get compromised [5].

Confirmed Yahoo hacks could be the largest ever. The first significant data breach occurred in 2013. Yahoo has been holding back that information for three years. It was later revealed that all 3 billion of its user accounts were affected [6]. In retrospect though, Yahoo used to be the most popular and dominant search engine.

Security is one of Yahoo's highest priorities if the company endeavours to regain credibility.

DuckDuckGo claims to be “the search engine that doesn’t track you” [7]. DuckDuckGo concentrates on avoiding personalized search results and protecting users’ privacy. Thus, it does not collect any personal data. This type of approach excludes the possibility of any information leaks, but at the cost of irrelevant ads.

Another aspect is advanced search options. Those are filters and settings that can be enabled to help narrow down the search. Google, Yahoo, Bing are examples of search engines that might be helpful at this point. Baidu and Yandex, on the contrary, do not even have a wide language spectrum.

The main conclusion to be drawn is that Google is the best search engine to use in 2022, and for good reason. They have really put a lot of work and tremendous effort into their product. They managed to create a giant that is fairly safe and provides decent search results. The job they have done is amazing and the growth they have shown is astonishing. However, the rest of search engines are not ready to be put out to pasture because under certain circumstances they might be somewhat better than Google.

References

1. *Difference between Search Engine and Web Browser*. (2020, January 17). GeeksforGeeks. Retrieved April 4, 2022, from https://www.geeksforgeeks.org/difference-between-search-engine-and-web-browser/
2. *Difference Between Search Engine And Browser*. (2011, July 20). Differencebetween. Retrieved April 4, 2022, from http://www.differencebetween.net/technology/internet/difference-between-search-engine-and-browser/
3. [Data Is Beautiful]. (2019, September 20). *Most popular search engines 1994-2019* [Video]. YouTube. Retrieved April 10, 2022, from https://youtu.be/yMpj33Y95ZU
4. Romm, T. and Timberg, C. (2018, December 10). Google reveals new security bug affecting more than 52 million users. *Washington Post.* Retrieved April 29, 2022, from New Google+ security bug could affect more than 52 million users, Google says - The Washington Post
5. Pagliery, J. (2014, December 29). This is how your Gmail account got hacked. *Money CNN*. Retrieved April 29, 2022, from http://cnnmon.ie/111QeT8
6. Perlroth, N. (2017, October 3). All 3 Billion Yahoo Accounts Were Affected by 2013 Attack. *The New York Times.* Retrieved April 29, 2022, from https://www.nytimes.com/2017/10/03/technology/yahoo-hack-3-billion-users.html
7. Burgess, M. and Woolaston-Webber, V. (2017, February 1). DuckDuckGo: what is it and how does it work? *Wired.* Retrieved May 2, 2022, from https://www.wired.co.uk/article/duckduckgo-anonymous-privacy

Oleksandr Shvets
K. C. Rodna, research supervisor
V.V. Hubkina, language adviser
Dnipro University of Technology, Dnipro (Ukraine)

Neural networks using human support robots for disinfection

The year of 2020 greatly changed people's perception of how the world can function while subjecting everyday routines to multiple limitations. Due to COVID-19 humanity faced various constraints on travel, personal contacts, and minimal social distance requirements. Those actions have a direct influence on health and spread speed of the Coronavirus. All areas of human's vital activities have had to been adjusted to new life standards.

Currently, people who have the possibility to work from home are forced to do so. However, the digitalization is not an easy process resulting in reducing the number of personal contacts directly connected with the spread of the virus. Limited human resources and the high infection risk of COVID-19 create the necessity to find new automated solutions for regular disinfection of space and surfaces in such publicly frequented spaces as door handles, elevator buttons, etc.

In this situation using robots is a very viable solution to save lives and provide aid in the evolution of how we can deal with such pandemics in the future. It should be emphasized that human support robot is a great solution for fulfilling this task as it meets the following requirements:

- perform cleaning or disinfection
- identify objects or surfaces that require cleaning
- avoid possible negative obstacles
- complete the task in a timely manner

Let us consider robot sensors to be applied for these purposes. The first and a very important sensor widely used in robots, game industry, smartphones and other related areas is LiDAR (Light Detection and Ranging). Its working principle is shown in Figure 1. As it can be noticed the laser (light) being transmitted from LiDAR to the measuring object is based on a material of the object light and is reflected within some time and returns to LiDAR to transmitter area (sensor).

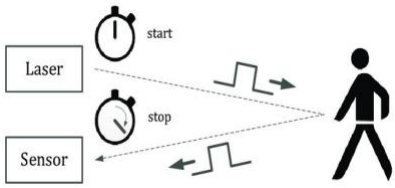


Fig. 1. LiDAR. Time of Flight [8]

Retrieved equation1 represents distance evaluation calculated through multiplication of **c** (light speed) and time **t** required to travel from sending light and its receiving. LiDAR is widely used for distance measuring, object scanning, reconstruction, and 3D photography. Nowadays, it has various usage with artificial

intelligence, game development etc. and Microsoft Kinect can be used as an example for this case.

$$d = \frac{ct}{2}$$

The second device used in HSR and to be considered is IMU (Inertial Measurement Unit). It contains several sensors to provide the following functionality:

- measurement of several axes using gyroscope
- body's specific force
- angular rate
- integration GPS-services to IMU.

The important aspects to be mentioned there are a robot object detection and an arm manipulation using DOF (Degrees of Freedom) where forward and backward kinematics are applied. Figure 2 represents a robotic arm with Degrees of Freedom.

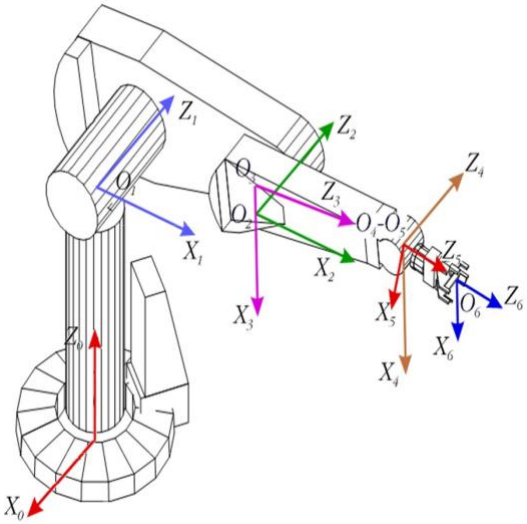


Fig. 2. Schematic image of 6-DOF robot.

In robotics, the number DOF equals to the number of movement joints in the space. As it is shown on Figure 2 there are 6 degrees of freedom. Every joint can be moved in one or multiple axes that provide a larger functionality for the used device. A counting number of joints can be started from every first joint where X0 and Z0 can be named as parent joints because almost every action to be used and all further movement mechanisms are built on the first ones. Nodes X6, Z6 can be named as "children". Terms "children" and "parent" are invented for an easier and better explanation of kinematics.

To make the robot perform the actions with moving parts or joints, kinematics is used to compute the end position of the node. There are two ways to identify the node parameters in kinematics: forward and inverse that are different in approach of equation formation.

Forward kinematics follows the pattern of positioning the end effector on a correct place. The equation is obtained from each joint placed in a sequence from node 0 to node 6. The position of each node is expressed with the Cartesian system. For example, the arm should pick up a toy following to the forward kinematics of the first

joint. Then it is moved to a correct position identified as node 0 and is followed by node1 till the last node is placed correctly. The calibration phase is required and is implemented by robot developers or manufacturers or by the developers having applied the device for their own research purposes.

Inverse kinematics differs from forward kinematics. In this form, the equation is constructed from node 6 going down to node 0. Using the same example, as in forwarding kinematics, arm node 6 should be placed the first on the correct position, while other 5 nodes are placed as needed prior to an actuator fixed on node 6. Such type of kinematics is much more challenging compared to forward kinematics

The main purpose of a disinfection robot is to clean door handles existing in the area where the robot is located. The proposed solution is based on Human Support Robot manufactured by Toyota (Figure 3). As it could be seen from Fig. 3 the robot has an RGBD-Camera mounted on the top which functions as eyes and receives the image in color (RGB) and depth (D) with the resolution on 1280 x 1024 pixels, and 30 frames per second. Image depth is achieved by integrating a LiDAR sensor mentioned above. Below the camera you can see a display placed for a possible human-robot interaction applying several stereo cameras.

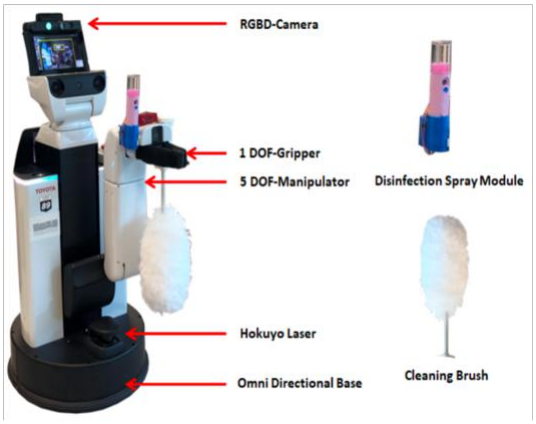


Fig. 3. Disinfection human support robot.

This robot has 1DOF-Gripper providing a big variety of sensors inside to process information of objects lifted by the robot. On the same level as 1 DOF-Gripper, a disinfection spray module is placed. The 5 DOF-manipulator is used to manipulate the cleaning brush using a built-in wide-angle camera to locate the position of the door handle. The inertial measurement unit located inside of the Hokuo Laser is used for localization and mapping. At the bottom of the robot, there is an Omni Directional Base installed secured by pneumatic bumpers to prevent any possible collisions.

It should be concluded that Human Support Robot is widespread in the research industry, especially for human-robot interaction. Its accuracy is estimated on the level of 94.56% under real-time conditions, thus providing a big potential for using in everyday life. Overall, this system is really promising but some improvement should be done in terms of avoiding some obstacles while robot movement way and advanced human-robot interaction.

References:

1. Ramalingam, B.; Yin, J.; Rajesh Elara, M.; Tamilselvam, Y.K.; Mohan Rayguru, M.; Muthugala, M.A.V.J.; Félix Gómez, B. A Human Support Robot for the Cleaning and Maintenance of Door Handles Using a Deep-Learning Frame-work. Sensors 2020, 20, 3543.
2. Yin, J.; Apuroop, K.G.S.; Tamilselvam, Y.K.; Mohan, R.E.; Ramalingam, B.; Le, A.V. Table Cleaning Task by Human Support Robot Using Deep Learning Technique. Sensors 2020, 20, 1698.
3. J. Yi and S. Yi, "Mobile Manipulation for the HSR Intelligent Home Service Robot," 2019 16th International Conference on Ubiquitous Robots (UR), Jeju, Korea (South), 2019, pp. 169-173, doi: 10.1109/URAI.2019.8768782.
4. LiDAR Remote Sensing and Applications Pinliang Dong, Qi Chen, 2018
5. U. Wandinger, “Introduction to LiDAR,” Springer Series in Optical Sciences, Springer, vol. 102, 2005.
6. Lu, C.; Uchiyama, H.; Thomas, D.; Shimada, A.; Taniguchi, R.-i. Indoor Positioning System Based on Chest-Mounted IMU. Sensors 2019, 19, 420.
7. Electronic Sensor Circuits & Projects, Volume III, 2006 III Mims, Forrest M
8. Beer, M.; Haase, J.F.; Ruskowski, J.; Kokozinski, R. Back-ground Light Rejection in SPAD-Based LiDAR Sensors by Adaptive Photon Coincidence Detection. Sensors 2018, 18, 4338.
9. Kinematics: Theory and Applications. Jens Wittenburg, 2016.
10. Guzmán-Giménez, J.; Valera Fernández, Á.; Mata Amela, V.; Díaz-Rodríguez, M.Á. Synthesis of the Inverse Kinematic Model of Non-Redundant Open-Chain Robotic Systems Using Groebner Basis Theory. Appl. Sci. 2020, 10, 2781.
11. Theory of Applied Robotics: Kinematics, Dynamics, and Con-trol (2nd Edition) Reza N. Jazar

Kateryna Shyshatska
A.A Martynenko, Fachbetreuer
I.A. Yaremenko, Sprachbetreuerin
Nationale Technische Universität "Dniprovska Polytechnika", Dnipro, Ukraine

Künstliche Intelligenz in der Medizin

Künstliche Intelligenz ist die Fähigkeit intelligenter Systeme, kreative Funktionen auszuführen, die traditionell als das Vorrecht des Menschen angesehen wurden.

Im Allgemeinen funktionieren KI-Systeme so, dass sie große Datenmengen auf Korrelationen und Muster hin analysieren, um Vorhersagen für die Zukunft zu treffen. Auf diese Weise kann beispielsweise ein Chatbot, der Beispiele von Textchats erhält, lernen, eine realistische Kommunikation mit Menschen wiederzugeben.

Künstliche Intelligenz verändert die gesamte Welt der Medizin grundlegend. In Gesundheitseinrichtungen haben sich riesige Datenmengen angesammelt: medizinische Aufzeichnungen und Bildgebung, demografische Daten, Versicherungsansprüche und Ergebnisse klinischer Studien. Technologien der künstlichen Intelligenz sind ideal für die Analyse dieser Daten geeignet und ermöglichen die Entdeckung von Mustern und Zusammenhängen, die für den Menschen unsichtbar sind. Deep-Learning-Algorithmen helfen Fachkräften im Gesundheitswesen nicht nur dabei, fundierte medizinische Entscheidungen zu treffen, sondern auch die Qualität und Effizienz der Gesundheitsversorgung insgesamt zu verbessern [3].

Der Einsatz von künstlicher Intelligenz hat eine Reihe von Vorteilen:

- Verringerung des Zeitaufwands für die Diagnose: KI-basierte Programme haben aufgrund der großen Menge an verarbeiteten Daten einen großen Vorteil bei der Entwicklung genauer Diagnosen von Krankheiten in kurzer Zeit.
- Verringerung der täglichen Aufgaben für Ärzte: KI kann beispielsweise ohne menschliches Zutun nach verfügbaren Geräten suchen, Patienten Zimmern zuodnen, die Funktionalität medizinischer Geräte kontrollieren usw [4].
- Bessere Erreichbarkeit der Patientenberatung: Eine große Anzahl von Patiente hat Behandlungsbedarf außerhalb der Arbeitszeiten. KI kann ihnen rund um die Uhr Unterstützung durch Chatbots bieten, die grundlegende Fragen beantworten, wenn der Arzt nicht im Dienst ist [3].

Allerdings laufen die Dinge im Moment nicht glatt:

- Undurchsichtiger Entscheidungsalgorithmus: KI-Systeme arbeiten nach dem Blackbox-Prinzip [1]: Der Anwender kann nicht erkennen, warum die Software eine bestimmte Entscheidung getroffen hat und eine andere nicht.
- Hohe Kosten, vor allem aufgrund der Notwendigkeit, die Software zu schulen und sie an die in einer bestimmten Klinik gesammelten Daten anzupassen.
- Sicherheit: Damit die Qualität und Geschwindigkeit der KI funktioniert, ist eine

hohe Rechenleistung erforderlich, die in den medizinischen Zentren oft nicht vorhanden ist. Und wenn sich das Computernetz außerhalb des Zentrums befindet, wächst die Gefahr von Hackerangriffen [1].

Beispiele für den Einsatz von KI im Gesundheitswesen:

1. Diagnosen

PathAI [2] entwickelt eine Technologie für maschinelles Lernen, die Pathologen helfen soll, genauere Diagnosen zu stellen. Zu den aktuellen Zielen des Unternehmens gehören die Reduzierung von Fehlern bei der Krebsdiagnose und die Entwicklung personalisierter medizinischer Therapien.

2. Klinische Untersuchungen

Atomwise [2] setzt KI ein, um einige der schwersten Krankheiten unserer Zeit zu bekämpfen, wie Ebola und Multiple Sklerose. Das neuronale Netz hilft bei der Vorhersage der biologischen Aktivität und der Identifizierung von Patientenmerkmalen für klinische Studien. Die KI-Technologie testet täglich 10 bis 20 Millionen genetische Verbindungen und kann 100 Mal schneller Ergebnisse liefern als herkömmliche Pharmaunternehmen.

3. Automatisierung

Die KI-Plattform von Olive wurde entwickelt, um die sich am häufigsten wiederholenden Aufgaben zu automatisieren und Administratoren die Möglichkeit zu geben, Aufgaben auf höherer Stufe zu erledigen. Die Plattform automatisiert alles, von der Überprüfung der Einhaltung von Vorschriften bis zur Datenübertragung, so dass sich die Mitarbeiter auf die bestmögliche Patientenversorgung konzentrieren können [2].

Schlussfolgerung

Das Potenzial der künstlichen Intelligenz ermutigt die Wissenschaftler, trotz der Nachteile nach Lösungen zur Überwindung aller Hindernisse zu suchen.

Viele Probleme im medizinischen Bereich sind bereits gelöst: automatisierte tägliche Aufgaben für Ärzte, vereinfachte Kommunikations- und Konsultationsprozesse für Patienten, immer präzisere Diagnoseergebnisse und klinische Studienergebnisse für Ärzte um ein Vielfaches schneller als üblich.

Und natürlich entwickelt sich KI im Gesundheitswesen weiter: Zahlreiche Start-ups entstehen und neue Technologien werden entwickelt. Dadurch werden Patienten in Zukunft in kürzerer Zeit eine bessere medizinische Versorgung erhalten, es werden Heilmethoden für Krankheiten gefunden, die heute als unheilbar gelten, und ganz allgemein wird das Potenzial der Medizin immer größer.

Quellen

1. «Artificial Intelligence in Medicine | IBM» www.ibm.com/topics/artificialintelligence-medicine
2. «35 Examples of AI in Healthcare That Will Make You Feel Better About the

Future | Built In» – builtin.com/artificial-intelligence/artificialintelligence-healthcare

3. «Künstliche Intelligenz in der Medizin: Technologie, Methoden und Nutzen» https://center2m.ru/ai-medicine

4. «Die Leistungsfähigkeit der KI in der Medizin: Anwendungsbeispiele | M Health Congress» – mhealthcongress.ru/ru/article/vozmognosti-ii-v-meditsineprimeri-primeneniya-96282

Yegor Tymoshchuk
A.A. Martynenko, supervisor
I.A. Ivanchenko, language consultant
Dnipro University of Technology (Ukraine)

Programming languages in their study

In today's society, almost everything around us is computerized, which means that it runs on a certain kind of software. Most of the programming languages which are actively used are brought to a high level of perfection and are capable of solving almost any task assigned to them. However, to achieve their goals, you need to study them painstakingly, which is not always a simple enough task.

The experience of learning programming has shown that the programming language must provide simplicity, clarity and readability of constructions. Excessive flexibility, "permissiveness" of syntax can make it difficult to understand programs. Languages that encourage the use of various "programming tricks" are not too good for learning.

When choosing a programming language, such factors as its novelty and efficiency of implementation do not play a role. The programming language should provide a smooth transition from pseudocode to actual programming. The ability to use national vocabulary for keywords and identifiers can be useful in training.

The first programming language to become widespread for teaching beginners was BASIC (Beginner's All-purpose Symbolic Instruction Code). However, it received harsh criticism for its inconsistency with the principles of structured programming and the ease of creating spaghetti code. Under the influence of this criticism, the creators of BASIC expanded the language with structural tools and abandoned the practice of GOTO.

Later an updated version of the language, called True BASIC, was created. The current popular BASIC dialects (Q BASIC, Visual BASIC) differ from this variant and are of "Microsoft" origin, being quite modern structural programming languages.

An alternative to the relatively time-consuming to learn complex general-purpose programming languages can be simple mini languages that, for clarity, have a graphical performer, like the turtle in Logo, the first and one of the most famous of such languages. The Logo language, born between BASIC and Pascal, was the first programming language originally designed to teach children.

This language can be seen as a dialect of Lisp, the language with which functional programming began. Although this language is better known for its turtle graphics and is regarded as the first of the graphical executables, such features of Lisp as sequence control via recursion and lists as the main data structure also remain properties of this language.

The modern "academic" dialect of Lisp - the language Scheme - was originally oriented to education. It is used in such a famous computer programming course as "Structure and Interpretation of Computer Programs".

Haskell has become a serious competitor to various variants of Lisp in university functional programming courses. It is distinguished by the fact that it is a purely functional programming language, implementing typed lambda-calculus, its syntax is close to traditional mathematical notation.

Developed as a development of the Algol-60 line, the Pascal programming language was used from the beginning for an introductory programming course for students. This language quickly began to gain popularity as such. Turbo Pascal, Delphi, and Free Pascal were and still are widely used to teach students and schoolchildren.

Which popular programming language should I choose? Figure 1 shows the most popular programming languages in 2022.

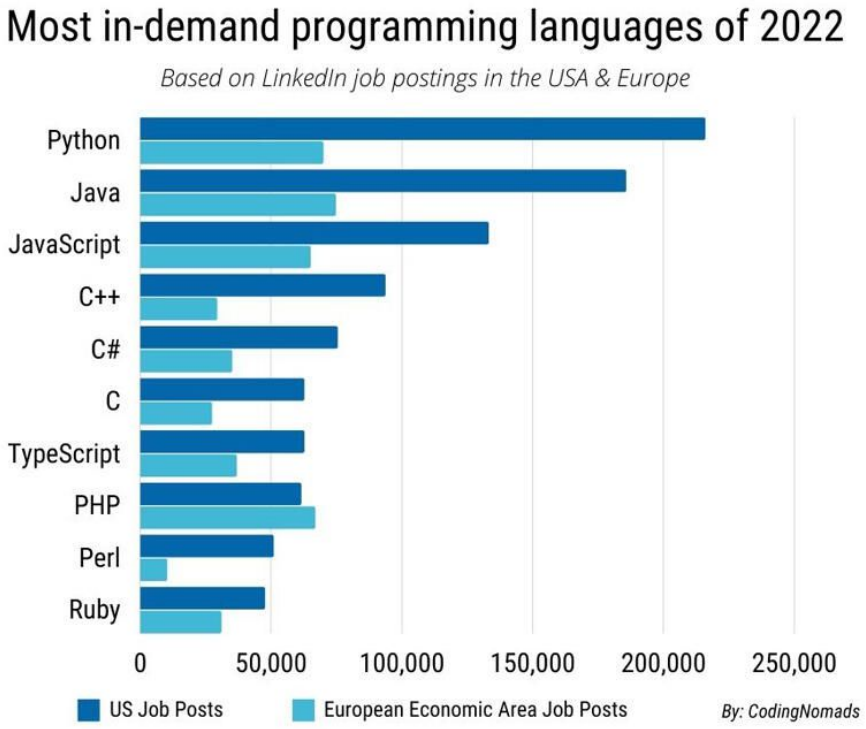


Figure 1 The most popular programming languages in 2022

PHP - used in web development to create programs that run on a server and help process client requests. PHP is gradually losing popularity, because the servers can be created using other languages. PHP facilitates the work of online stores - you can not create 1 thousand identical pages, and to generate them automatically from a database of customer requests. With knowledge of PHP is easy to begin a career as a developer. Such a developer will be able to find a job, even if he has little experience.

C is one of the oldest and most popular programming languages. It is "light" and fast, so it is used where high performance is needed. C is used to create drivers, write operating system kernels, and write libraries for Python and other languages. But it's a

good place to start when you're learning programming languages. It's not easy to learn, but if you get the hang of it, you'll understand how almost every other language works.

C# (C-sharp) is a language originally invented by Microsoft to create Windows applications. It is an object-oriented language - it is harder to learn but easier to use, e.g. to write the same code less. With C#, you can work with the WPF platform, which helps to create "beautiful" windowed applications. C# is most often used to write Windows applications and to create computer games.

C++ is a cross-platform C language with advanced features. A huge number of programmers write code in it, share libraries and templates, and answer beginners' questions. Most often C++ is used to create operating systems, drivers and utilities. They make popular desktop applications of Adobe and Office series. Because of the high speed and performance C++ is used to develop computer games. C++ is poorly suited for simple "home" tasks, but it is a good starting point for learning languages to understand their structure and principles.

JavaScript is a fast, cross-platform language for web development. With JavaScript code, the developer "tells" the page how it will respond to user actions. JS can be used to show the user information without reloading the page - that's how drop-down menus, pop-up windows, and windowed keyboards work. JS is constantly used for web development. It is convenient to create mobile and desktop applications that will work through the browser.

Java is a cross-platform language with many libraries and a large community of developers. Thanks to the libraries Java is suitable for almost everything: working with graphics, sound, creating small games. And in the large community of developers it's easy to find ready-made pieces of code for different tasks and answers to almost any question. Java is a language for everything. It's used to write mobile applications for Android, programs for microwave ovens, and servers.

Python is a logical and relatively simple language with a minimalist syntax. It has a small set of basic rules, the language is easy to read and easy to write in it. Developers have written many libraries for Python, so in new projects you can use ready-made solutions. The main disadvantage of Python is its low speed. Programs on it will run on average slower than in other languages. Most often Python is used to create servers, process data and develop neural networks. After learning Python, you can work as a backend developer or data science developer.

The general problems of programming languages and their study include the following:

- with the emergence of radically new thoughts and ideas about programming, new languages will be needed;
- ideas embodied in programming languages may be very good, but their implementation in a particular language is unsuccessful;
- because of the stagnation in language development, it may be worth looking at the creation of a single programming language;
- not all programs can interact with each other due to different tools and approaches in their writing;

- structures and data previously considered ineffective may now lead to a new organization of languages.

The analysis of programming systems and languages allows us to conclude that it is advisable to use the principle from simple to complex, from mastering basic principles and concepts in procedural programming to object-oriented programming - using various class libraries and templates as the main approach to the study of programming languages. In this connection, it makes sense to consider the possibilities of programming languages of C and C++ family, which allow successfully solving a wide range of problems in both system and applied programming.

Literature:

1. https://studfile. net/preview/1867577/page:11/
2. https://www. techrepublic. com/article/the-best-programming-languages-to-learn-in-2022/.
3. Wirth N. Recollections about the development of Pascal (HOPL II), 3.3
4. Patrick Mendelson, T. R. G. Green and Paul Brna. Ch. 2.5. Programming Languages in Education: The Search for an Easy Start // Psychology of Programming / M. Hoc, T. R. G. Green, R. Samurçay, and D. J. Gilmore (eds.). - Academic Press, 1990. - P. 175-200. - ISBN 0-12-350772-3.
5. Dijkstra Edsger on the History of the Computer website
6. Leonov A.G., Pervin Y.A. The role and place of the theme "Elements of programming" in general school informatics education // Computer tools in education. Informatization of education. - SPb: CPO, 1999. - No. - 5.P. 14-23.Archived February9 2019.
7. Seymour Peypert. A History of the Computer. Date of reference: March 25, 2014.
8. Gerald Jay Sussman and Guy Lewis Steele, Jr. Scheme: An Interpreter for Extended Lambda Calculus. - MIT AI Lab. AI Lab Memo AIM-349. December 1975. [1] Archived September 3, 2013 at the Wayback Machine from Lambda Papers.
9. Richard Bird. Introduction to Functional Programming using Haskell. 2nd edition. - Prentice Hall, 1998. - P. 66.

Glib Ventskovskyi
O. A. Zhukova, research supervisor
N. M. Nechai, language adviser
Dnipro University of Technology, Dnipro (Ukraine)

Free and open source software: definition and difference

Many people and companies buy, install and use different software, but not many of them think about its licenses and permissions. For the start, we need to know what open-source software is. It is a software category that gives you an opportunity to read, edit and copy the source of the product. But what is free software? It is a good question because the definition of this term is the same with a little remark that it is about liberty, not about money – so sometimes you can use the term “libre software”. But what is the difference? Many people would stop at this point and would think that these are two terms with the same sense, but it is a mistake.

The meaning is hidden in the motives of these two schools. The philosophy of people who create open source programs is to increase the productivity of product development and to give proof to a user about the safety of their personal data and hardware. Everybody can open the source and take part in product modification, send some useful information about code improvements, and at the same time, the user can make sure that the program does not track him.

Free software has been created with the goal to give the freedom and the control which every user deserves. Even if it comes to selling copies of the product. That is one of many reasons why big companies hate this idea. So, to distribute the importance of free software and not to give a chance for the “proprietary” programs to win, many free licenses forbid you to use libre software to create and sell the non-free software, but the others can just oblige to include notices in their original work. Some of such licenses are:

- MIT license (MIT)
- Apache License 2.0 (Apache-2.0)
- 3-clause BSD license (BSD-3-Clause)
- GNU General Public License (GPL)
- Common Development and Distribution License 1.0 (CDDL-1.0)

But in fact, many development teams use open source projects as building blocks for proprietary software. In addition, a 2018 report found that 96% of applications have open source components. And the average percentage of codebases that are open source in applications grew from 36% in 2017 to 57% in 2018.

A program, as free software, has to give users the four essential freedoms:

- The freedom to run the program as you wish, for any purpose.
- The freedom to study how the program works, and change it so it does your computing as you wish. Access to the source code is a precondition for this.
- The freedom to redistribute copies so you can help others.

- The freedom to distribute copies of your modified versions to others. By doing this you can give the whole community a chance to benefit from your changes. Access to the source code is a precondition for this.

In fact, despite the differences between these two concepts, their goals are similar at the most, so many open source products are also free. The term FOSS or FLOSS was coined to simplify and generalize them. This means Free/libre and open-source software. The most popular open source products which can be installed on your computer at the moment are listed below:

- LibreOffice is a big package of different programs to create and edit presentations, documents, spreadsheets and databases.
- Blender is one of the most popular 3D editors with a countless amount of mods and capabilities.
- OBS Studio is the most popular and stable working program for screen recording.
- Firefox is a good internet browser that can become a good solution for your information needs.
- VLC is the best audio, media and video player for optimizing image and sound for a particular hardware configuration. It also offers a plethora of extensions and skins to create customized designs.
- GNU is a big project of operating system (including numerous utility programs) working with one of the most widely used kernels Linux, Now the GNU project aims to create **GNU/Hurt** – an operating system with the first modular kernel in the world.

Also, there is another program that is walking on the edge. It is Telegram messenger which has an open source client program, but the service part remains closed to the user's eyes.

The information about FLOSS can be used to make findings and know more about the theme. Products like the GNU/Linux system or VLC player are a victory of freedom as many people around the world use them and there are no such good analogs in the proprietary world. The more people know about it, the more opportunities open to create and improve our free future without "digital slavery".

References:

1. Free and open-source software. URL: https://en.wikipedia.org/wiki/Free_and_open-source_software
2. Top 10 Open Source Software Examples Of 2022. URL: https://www.designrush.com/agency/software-development/trends/open-source-software-examples#mcetoc_1end6ngbip
3. What is Free Software? URL: https://www.gnu.org/philosophy/free-sw.en.html
4. Software. URL: https://en.wikipedia.org/wiki/Software#Sources
5. How to Use Open Source Code in Proprietary Software. URL:

https://www.perforce.com/blog/vcs/using-open-source-code-in-proprietary-software

6. GNU Project. URL: https://en.wikipedia.org/wiki/GNU_Project

7. Linux. URL: https://en.wikipedia.org/wiki/Linux

Yeva Ziabrieva
A.A. Martynenko, research supervisor
S.I. Kostrytska, language adviser
Dnipro University of Technology, Dnipro (Ukraine)

Future with the metaverse

These days, we spend time on the Internet in so many different ways: communicate, have fun, play, and work. The metaverse, the next generation of the Internet, is designed to help users interact with a computer-generated environment. The new technology is changing our lives in a virtual universe. The research explores the future of the environment in VR where people can interact with other users in a digital space.

This paper explores what different kinds of metaverse experiences could feel like. The first one is connecting with people, and it is the most important. Facebook come out with the idea that we will be able to feel present, like we are right there with people. This does not depend on the real distance between people. As a result, that is going to unlock a lot of amazing new experiences. For example, while playing a game with friends, we will feel like we are right there together in a different world. To give another example, being in a meeting in the metaverse, it will feel like we are making eye contact, having a shared sense of space [5].

Another application for the metaverse is learning. Learning will be completely different. The reason for this is the ability to teleport to any place at any time. For example, a doctor with apps like Osso VR can learn techniques in surgery firsthand practicing until getting it right. Another example is swimming through the Great Barrier Reef, if you study Earth Science [1].

In addition, gaming in the metaverse is going to bring simple games into our everyday lives through holograms [3]. Companies like Rockstar and Roblox have pitched the metaverse as the ideal platform for gaming, but there is no limit to the potential applications in the enterprise [2].

Moreover, a lot more unique experiences are emerging around fitness. Facebook fitness accessories make Quest 2 more comfortable thanks to the new controller. A facial interface makes your work out sessions more comfortable. Facebook announced that it would all come out soon [1].

Distance work have become quite a demand. People need better tools to work together. With the help of the metaverse, we will be able to have our perfect work setup, and do more than we could in our regular work setup still having the sense of presence [1].

Potential metaverse users may be frightened by such an invention because of the moral ethical issues. At this point, the Internet has done more good than harm, and the metaverse is likely to do the same. The results of the survey including the question if

there are metauniverses right now and how much respondents perceive the risk of not adding to, but displacing, live communication are given in Fig.1.

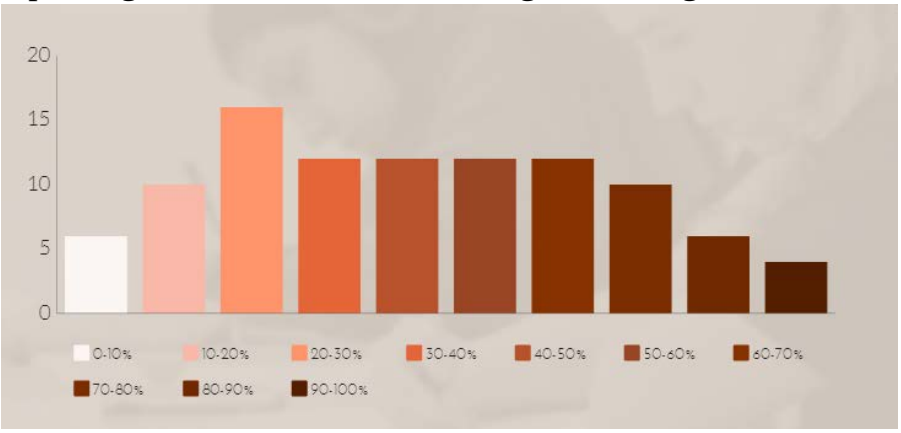


Fig.1 Survey results

It is important to note that the Metauniverse can only be realized with the technology that makes this possible. Augmented reality (AR) and virtual reality (VR) provide the primary connection to enter this alternate universe. It is quite an inconvenient device for constant use, but Meta are sure to come up with a more convenient option in the near future [6]. NVIDIA is ready to distribute Omniverse free of charge. Omniverse is designed to develop resources for the metauniverse. The developer of graphics processors and systems on the chip (SoC) continues to work on new software of this type.

Furthermore, there are avatars to represent users in the metaverse giving not a static image, but 3D representations of a person. Avatars in metaverse will be able to copy your expressions, your gestures to make interactions much richer. There are a lot of options of avatars. For example, a photo-realistic avatar for work, a stylized one for hanging out, and even a fantasy one for gaming (Fig.2). In addition, there will be virtual clothes for different occasions, designed by different creators and from different apps and experiences.

Fig.2 Examples of avatars

(adapted from *Meta showed an impressive demo of its Codec Avatars*, By Mitchell Clark, 2021, The Verge)

Importantly, avatars and digital items will be used across different apps and experiences in the metaverse. Beyond avatars, there is your home space. From your home you can teleport to anywhere you want or to invite people over, play games, and hang out [1].

Another important topic is that there will be all kinds of different spaces that people make. For example, rooms in your home, the whole worlds that you can teleport in and out of whenever you want. Teleporting around the metaverse is going to be like clicking a link on the internet.

Privacy and safety need to be built into the metaverse from day one to get to decide when to be with other people, block someone from appearing in your space or teleport to a private bubble to be alone. Users will be able to bring things from the physical world into the metaverse. Almost any type of media can be represented digitally: photos, videos, art, music, movies, books, games etc. [4].

The Metaverse concept can be fully realized in about ten years, as it requires cooperation between the world's largest technology companies. However, several companies, such as Epic Games, B Roblox, Microsoft, Roundhill Investments, Nvidia Corp, Meta (formerly Facebook) etc. are already working on creating parts of what may eventually become an interconnected metaverse [5]. Mark Zuckerberg announced the introduction of room customization, a new office space in Horizon Home, and 2D Progressive Web Apps for the Quest Store. This gives us at least some insight into the metaverse.

The following conclusion may be drawn from the above. The developers and the creators of the VR have used its potential to entertain and educate. Researchers still have a lot farther to go. They believe that eventually the metaverse will be invented and help improve our time online.

References

1. Zuckerberg, M. (2021). *The Metaverse and How We'll Build It Together*. Meta. Retrieved 20 April 2022 from: https://www.youtube.com/watch?v=Uvufun6xer8.
2. Wiggers, K. (2022). *How the metaverse will let you simulate everything.* VentureBeat. Retrieved 29 April, 2022 from: https://venturebeat.com/2022/01/26/omniverse-ability-to-simulate-anything-self-driving-cars-energy-power-consumption/.
3. Ravenscraft, E. (2021). *What is the metaverse, exactly?* Wired. Retrieved 29 April, 2022, from: https://www.wired.com/story/what-is-the-metaverse/.
4. Baker-White, E. (2022). *Meta wouldn't tell us how it enforces its rules in VR, so we ran a test to find out*. BuzzFeed News. Retrieved 30 April, 2022, from: https://www.buzzfeednews.com/article/emilybakerwhite/meta-facebook-horizon-vr-content-rules-test.

5. Alvim L. (2022). *How the metaverse could impact the world and the future of technology*. abcNEWS. Retrieved 3 May, 2022, from: https://abcnews.go.com/Technology/metaverse-impact-world-future-technology/story?id=82519587.
6. Marshall, M. (2022*). The metaverse: Where we are and where we're headed*. VentureBeat. Retrieved 5 May, 2022, from: https://venturebeat.com/2022/01/26/the-metaverse-where-we-are-and-where-wed-headed/.

Section 05 Humanities: Challenges and Issues (Social Studies, Philosophy, Pedagogics, Law, Applied Linguistics, Theory and Practice of Translation)

Kyrylo Hladkov, postgraduate student
Ye.I. Borodin, research supervisor
L.V. Pavlenko, language adviser
Dnipro University of Technology, Dnipro (Ukraine)

Extracurricular education at the crossroads of educational and youth policy

Education is an integral part of society and one of the priorities of domestic policy of many countries, and Ukraine as well. Through this process, people acquire or/and improve knowledge and skills, which are used by them in various spheres of life, including professional (mastering the relevant skills and knowledge allows you to "gain access" to certain professions). Therefore, there is a relationship between the quality of education and the development of the state as a geopolitical entity: the more people covered by educational services that meet current requirements, the more efficient the state will perform its functions. Education and youth policy of the state is the basis for the education of the individual from an early age and the foundation for supporting the younger generation in the process of their formation as independent parts of society.

Education has different levels, components and forms. But the point of view of education and personal development component of the national structure of education as extracurricular education is interesting and should be considered. Whereas it aims to form young people the same practical competencies that complement theoretical knowledge. Acquired in other components of education (and conversely – theoretical knowledge is the basis for further extracurricular education). That is, extracurricular education acts as a "connecting link" in the structure of education, covering all elements of the system.

Extracurricular education is education obtained in after school time and aimed at developing children's and young people's own skills and abilities in accordance with their interests, predispositions and needs. It is exclusively voluntary and can be obtained both in specialized extracurricular educational institutions of state, communal and private property and in the informal form independently (self-education) [3]. The main task is to provide children with a favourable environment for creative, intellectual and professional self-realization (according to individual interests) and to form the necessary practical competencies.

According to the current legislation of Ukraine, extracurricular education is provided for persons from 4 to 18 years [2]. In addition, the fact that children and young people (up to 18 years old) are formally covered, allows for considering extracurricular education as a component of both educational and youth policy of the state (as it covers the category of "youth" 14-18 years). Moreover, extracurricular

education is a tool to help the state to involve children and young people in acquiring the necessary competencies for personal and professional development, providing civic education. That is, the state has to create conditions in order to identify as soon as possible the needs of the individual in his/her self-development and properly meet them. This requires first of all:

- optimal and effective network of extracurricular educational institutions (possibly other informal education centers for children and young people, who are not legal entities);
- appropriate staffing and their further potential provision (training of relevant staff);
- availability of standardized educational programs that meet the current requirements of society;
- material and technical support that allows the educational process.

Thus, public authorities should consider the above components in the implementation of policies in relevant areas and provide for expenditures from the local budget and attract other funds, including investment from international organizations, partners, donors, etc. (there are opportunities to create new relevant projects and receive support in their implementation).

Also, extracurricular education has an informal component, which allows mastering some competencies in certain educational programs (alternative to formal education). It does not provide for the award of state-recognized educational qualifications by the level of education, but contributes to the more effective acquisition of knowledge, in particular by students of higher education institutions that belong to the category of "youth". Types of such education can be thematic trainings, seminars, courses (including online), youth exchanges, round tables, etc. Relevant measures contribute to the consolidation of society and integrate young people into public life, which is one of the main tasks of the state youth policy of Ukraine (according to the Law of Ukraine "On Basic Principles of Youth Policy") [1].

Moreover, considering the current global trends in the activities of children and youth, extracurricular education should be perceived not only as a component of education, which is obtained by institutional form, but also as informal education, which can be obtained directly by the person at school age in institutional form (formal/informal) and does not include in its structure self-education). The current legislation of Ukraine does not take this into account. Children and young people can now acquire knowledge and practical skills on their own at home (or in a professional/community environment) and through the Internet, which allows them to freely share experiences between users.

It should be noted that education and youth policies are usually coordinated by different public authorities, which leads to some collision in the functioning of extracurricular education deals with its subordination to different entities. In addition, extracurricular education has areas defined by the current legislation of Ukraine, which also relate to various directions of public regulation. For example, extracurricular educational institutions that provide services in the field of art are

subordinated to the sphere of cultural authorities, however, institutions of scientific and technical direction, artistic-aesthetic or ecological-naturalistic – are in the sphere of education authorities. That is, extracurricular education can be regulated by different entities (different structural units of the public authority). But there is a practice that such bodies are represented by one unit, for example, the department of education, culture, tourism, youth and sports of the rural/settlement/city council.

Besides, the level at which extracurricular education is managed and the powers of the relevant bodies should be considered. Today, in Ukraine it is possible to clearly distinguish four levels of organization of the vertical power: national (state), regional (oblast), subregional (district) and territorial (local community). At each of these levels, there are relevant bodies and institutions that have certain powers and resources to carry out operational and management activities. Given this state of affairs and the decentralization process, there is a need for high-quality coordination of decisions of executive bodies of the central government, departments, divisions of education and science of regional and district state administrations, education authorities of rural, settlement and city councils, and directly supervisors extracurricular education institutions. That is a common vision of how extracurricular education should function in the context of education and youth policy at the territorial, district, regional and national levels, considering the individual characteristics of the territory and available resources (human, financial, natural, etc.).

In view of the above, there is a need to streamline public management activities on the organization and functioning of extracurricular education to children and young people and to expand its conceptual component, considering non-institutional forms of education. There is a need to establish communication between the vertical levels of government and horizontal ones in the implementation of the appropriate levels of education and youth policy.

References:

1. On Basic Principles of Youth Policy: Law of Ukraine on April 27, 2021 № 1414-IX (current version – Adoption of April 27, 2021) / [Electronic source]. – Access mode : https://zakon.rada.gov.ua/laws/show/1414-20#Text – Name from the screen.

2. On Education: Law of Ukraine on September 5, 2017 № 2145-VIII (current version – Revision on April 6, 2022, on the basis – 1986-IX) / [Electronic source]. – Access mode : https://zakon.rada.gov.ua/laws/show/en/2145-19#Text – Name from the screen.

3. On Extracurricular Education: Law of Ukraine on June 22, 2000 № 1841-III (current version – Revision on May 22, 2021, on the basis – 1414-IX) / [Electronic source]. – Access mode : https://zakon.rada.gov.ua/laws/show/1841-14#Text – Name from the screen.

Viktoriia Holubovych
S.O. Gerashchenko, research supervisor
L.V. Pavlenko, language adviser
Dnipro University of Technology (Ukraine)
Wyższa Szkoła Bankowa we Wrocławiu (Poland)

Compromises in problem solving

For a manager of any level, the ability to effectively resolve and prevent production and labour conflicts is professional competence, and in leading companies, the ability to build a constructive conflict appears among corporate values.

For many, conflict in an organization is associated with disruption of relationships, loss of psychological balance, and emotional imbalance. However, the conflict can be useful both to the conflicting parties and the company. The task is to ensure that the conflict does not shift from the business context to the area of personal relationships, does not turn into mutual discrediting, and does not destroy the compatibility that has been formed over the years.

Conflict resolution is a complex multi-stage process, which, based on the diagnosis of conflicts, is expressed in the prevention, containment, and regulation of conflicts.

You probably think giving in is a good thing. And indeed it is. We were taught that the truth is somewhere in between, right? Go to meet your opponent and he will go to meet you. And approximately in the middle of your beliefs – there is a compromise that not only satisfies both parties but exactly the opposite – it does NOT satisfy both parties. Both sides did NOT get what they originally wanted. Moreover, a concession is still good and right. Moreover, concession does not have to lead to compromise. This concession is called flexibility.

Mankind knows only 6 options for resolving the conflict (or ways out of the conflict):

- Flight (avoidance) – you are not involved in the conflict;
- Destruction (of the second side) – the second side ceases to exist, therefore the conflict disappears;
- Submission (of the second side) – you push through the second side, fully achieving your goals, the second side does not receive anything (or receives something, but by accident, and not because it was agreed so);
- Delegation of authority (to a third party) – flip a coin, give the right to decide the fate of the conflict to a third party;
- Compromise – both give up part of their Wish list, getting another part that does not intersect with the Wish list of the other side;
- Consensus – both get exactly what we want.

If we take into account the French word “compromise” and the Latin word “compromissum”, then the term compromise should be interpreted as “an agreement, a mutual promise”.

The most accurate description of this word was given by the famous ethnographer and writer of the 9th century V.I. Dal: “compromise is nothing more than mutual concessions, a deal, and an agreement”.

Compromise is temporary! It is an intermediate stage in conflict resolution. What is the most common mistake we make? We believe that compromise is the final step. But we have not resolved the conflict. Its cause remains unknown to us. The second party that initiated the conflict did not get what they wanted, which means that with a huge probability close to 100%, the conflict will arise again. Moreover, the second conflict will be stronger, more destructive and tougher than the first.

Compromises are often spoken about by those who are not going to make them, for example, large companies with big names. Here is their typical negotiating argument: “If you want us to sign this contract, you have to compromise and reduce the price”. You are forced to give in without offering anything in return. Apparently, such companies feel that they have already done a favour by agreeing to work with you and not with your competitors.

In conclusion, it should be emphasised that before making a compromise or even a one-sided concession, you need to ask yourself: “What will happen if I refuse? What threatens me? What will help? What do I not know about the task and the client? How can I find out?" Don't be afraid of the client rejects you at first. This will allow you to ask “why?” and learn additional facts, and then formulate a new proposal taking into account the information that has appeared, and not blindly worsen your original version, without even understanding the reasons.

So, compromise only when you have exhausted all possibilities to formulate a proposal that does not require concessions.

References:

1. https://www.mediate.com/articles/eilermanD7.cfm#:~:text=Compromise%20is%20described%20in%20the,the%20goal%20for%20both%20sides.
2. https://vseosvita.ua/library/urok-konfikti-u-menedzmenti-425002.html
3. https://consultpm.com/why-compromise-is-not-a-solution/
4. https://smallbusiness.chron.com/difference-between-assertivecollaborative-assertivecompetitive-communication-35080.html

Vladislava Kachurina
Yu. O. Shabanova, research supervisor
L.V. Pavlenko, language adviser
Dnipro University of Technology, Dnipro (Ukraine)

Cossack educational policy and culture as a basis for teaching in the 21st century

The problem of parents and children has always been, especially in the field of education. Today, parents want their children to have everything. Usually, in this case, they think about material security, completely forgetting about spiritual possessions and customs. But during the reign of the Cossacks, parents cared about both.

Having analysed and compared the pedagogy of the Cossacks and modern times, we will consider the difference between spiritual and material views on life, upbringing and education of children of the Cossacks and modern times. And also learn about what is missing in modern education and pedagogy, but it was in the days of the Cossacks?

The Ukrainian state has a long history, so during this time it has developed a unique system of customs and traditions, moral norms and values of our people. The Ukrainian people have long focused on the love of knowledge and wisdom.

Schools and libraries appeared in the times of Rus'-Ukraine. Princes and princesses knew several languages, could write, unlike the common people, and were well versed in politics and economics, law, religion and military affairs. Literacy was taught in schools, but education was not available to everyone, in most cases only to the wealthy. Therefore, children learned a lot from their parents or hired teachers if possible. It was especially problematic to get an education in times of feudal fragmentation. At that time, children were taught only by parents or monks from nearby monasteries. At home, parents taught not only household chores, but also the ability to defend their homeland. During the time of the Cossacks, and especially the Hetmanate, more schools and academies began to open. Cossack's pedagogy aimed to form a comprehensively developed and knowledgeable personality. The Cossacks raised highly educated individuals, hardened and courageous warriors, knights of honour and victory. All were brought up according to unwritten codes of chivalrous honour: love for parents, native language, homeland, fidelity in friendship and love; readiness to protect the weak, to defend the full freedom and independence of the individual, people, state; unshakable devotion to the ideas and principles of folk morality and spirituality (nobility, diligence, honesty, shyness, etc.), care for the development of national traditions, customs and rituals, caring for native nature, land.

Then schools were not only in monasteries and churches but also in the Sich, palanquins, regiments and others. In addition to the usual schools, there were music and craft schools. Cossack schools taught not only to read, write and count, but also paid special attention to moral and psychological education: to be ready to give their lives for the freedom, honour and glory of the state; to help relatives, friends and

colleagues in a difficult moment; heroism. Martial art and how to own cold steel were taught. Not only children studied in schools, but also experienced Cossacks, who were preparing to hold such senior positions as military commanders – chieftain, military judge, military chieftain, military clerk; military officials – cornet, dovbysh, pushkar, garmash, interpreter, shafar; palanquin chiefs – colonel, clerk, osavul. Clerical work was taught. [1]

These positions were elective – elected as colleagues. And they could be removed from this position if they saw that the Cossack was unable to perform his duties or behaved improperly.

Instead, modern officials are able to buy positions and the votes of the electorate. And, unfortunately, many do not care or they are afraid to go against the officials. This is another problem of today: Ukrainians should unite to solve most issues.

The education of modern independent Ukraine is more developed than the education of the Cossack era. There are public schools and private, lyceums, gymnasiums. In addition, students have the opportunity to choose full-time, distance or home education. Also, there was preschool education (kindergartens) and extracurricular development activities (music and art schools, sports schools, and dance schools), etc. The number of academic disciplines in schools has increased.

There is specialized and higher education. Specialized institutions include schools, colleges and universities. Institutions of higher education include institutes, academies and universities. There are many specialities and areas of higher education. The possibilities of education are now endless. Not only children but also adults study. Many receive more than one higher education. The technical capabilities that save during a pandemic have been developed. There are also orphanages and boarding schools, which did not exist before and all the children lived in large families. Children were not expelled or given away, parents raised everyone.

Nowadays, parents pay little attention to their children. In this way, they provide children with money, food, travel, and quality education, but not attention, because they are constantly at work, and it does not pay attention to the profession of parents or they are businessmen or ordinary workers. The rich work much to support their business and the poor – to survive. So in most cases, children are left to grandparents, or nannies and housewives. In the evening after work, parents do not have the opportunity to pay much attention to the child, because, firstly, they come tired, and secondly, there are household chores that need to be done and most often it falls on the shoulders of the mother and not the father. There are a very small percentage of families in which children are given enough attention. There are also parents who load their children with clubs and others so that the child does not get bored.

Parents raise a child up to the age of three until he or she goes to kindergarten. Then this upbringing in some cases recedes into the background. Not all children are explained moral norms and principles, or told and not taught to follow them. Many parents do not learn to respect the language, do not learn to be patriots, help others, but only hang the so-called labels: "you're a boy" and "you're a girl." They don't learn

to appreciate what they have, and adults don't do that, they just say they're missing something. What kind of spiritual and moral education can we talk about if the world turns from spiritual to material things? Even family holidays lose the possibility of existence. If another generation of grandparents communicates with relatives, then parents do not know half of the relatives, because they communicate very rarely, and teenagers, if they know at least the names of some relatives and at least have seen them a couple of times live, and that's good. This means that the importance of the family has fallen. And before it was like a holiday, so only 200 relatives, and everyone knows each other.

Nowadays, few children are hardened, have good willpower, and are willing to go for a breakthrough to achieve a goal, will read books instead of surfing social networks, or prefer some kind of board or intellectual games instead of online games. Who will be ready to forget about gadgets and be able to endure three or four days in the forest? These days, not all adults are capable of this. Few people without training will be able to walk more than 25 km a day, especially when behind a heavy hiking backpack. When you ask people this question, you often hear the question: why do we need it? In the XXI century, you can get this distance by car; the products will always be in stores. On the one hand and so, and on the other hand, no one is insured against wars and epidemics, or natural disasters, ordinary people do not have much knowledge about how to escape, and not everyone can survive without food and water for several days.

Modern educational reforms are aimed at raising the spirit of patriotism and nationality, the formation of spiritual development, the development of access to education for all and the promotion of a healthy lifestyle. Subjects are introduced to teach children how to act in emergencies and to provide medical care to victims.

Nowadays, Cossack schools of education and public organizations have also been established, which are engaged in the spiritual development of children and adolescents, which show the real achievements of the Ukrainian people, revive the traditions and customs of the Cossacks. But they are few, and not all children go there with great desire, and not all parents agree to send their child to such a school. And children who have come and studied for more than a year are beginning to see and perceive the world differently. They are hardened to any living conditions. They grow up to be courageous, noble, brave and truly worthy people. They become true patriots of their country such as all Ukrainians should be. In addition, these schools pay attention to health, not only spiritually, but physically and psychologically.

So, in my opinion, in the days of the Cossacks, everything was built on spiritual values, and in our time on material values. Cossacks and guardians were invincible only because they were ready to lay down their lives for their family and their homeland. They raised children to be honest and worthy, brave and free-spirited. Children grew up hardened and strong in spirit, learned to respect their ancestors, their traditions and customs. The Cossacks respected their wives and brothers. Children were not just told what they should do and how they should live, they were shown it. As proof of this, many Cossack old treasures have come down to us: "They

(ancestors) are strong – while we protect, we (descendants) are strong – while we respect" and "We will preserve our land", etc. [2].

Modern children lack parental attention and their examples of how to behave. On February 24, 2022, a full-scale war broke out in Ukraine, which forced a change in views on life values around the world. The world has seen what the people of Ukraine are capable of. Maidan showed Ukrainians that they can be together, they are patriots and they are brave. The modern war has proved that Ukrainians are invincible and ready to give their lives for their homeland and family. We must educate young people with such qualities, and harden them to any circumstances of life. Parents should give their children first attention and love, and then money and other material goods. Education should help to foster unity, equality and promote the full development of the individual. Then we will have the state to which we all aspire.

References:

1. Yavornyckyj D. I. Istoriya zaporizkyh kozakiv.T.1-3.
2. Konax A.P., Prytula O.L., Ryzhov K.A. Ukrayins"kyj rukopash «Spas». Pravyl"nyk kozaka: Navchal"nyj posibnyk – Zaporizhzhya: Vydavnyctvo komunal"noho vyshhoho navchal"noho zakladu «Xortyc"ka nacional"na navchal"no-reabilitacijna akademiya» Zaporiz"koyi oblasnoyi rady, 2016. – 88 s. URL: https://moodle.znu.edu.ua/mod/resource/view.php?id=89911 (accessed 19.11.2021)

Daria Norova
S.I. Halazdra, professeure de français
Université Nationale de Dnipro Oles Hontchar, Dnipro (Ukraine)

Méthode préfixale de la formation des néologismes en français (basé sur des matériaux authentiques de contes de fées français)

Il est bien connu que la communication entre les êtres humains passe en effet originellement par la création de mots pour désigner l'univers qu'ils expriment, les sentiments et les pensées qui les animent [4].

Il existe beaucoup d'articles qui abordent les problèmes de reconstitution du lexique français et les moyens de former de nouveaux mots à l'aide de la formation de mots préfixés. On examine les préfixes qui sont décisifs dans la formation des mots, et donc l'analyse de leurs caractéristiques sémantiques est non seulement tout à fait pertinente, mais permet également d'avoir une idée des schémas de fonctionnement des nouveaux mots.

Selon I. Kovalik, la formation des mots est une branche de la linguistique qui étudie le sous-système de formation des mots du langage, le mécanisme de formation des mots sur la base du système de morphèmes disponibles dans la langue et les voies de leur combinaison. Les unités du sous-système de formation des mots sont des morphèmes en tant qu'invariants représentés dans le discours par des morphèmes. Les morphèmes ont certaines lois de syntagmatique, réalisent des traits paradigmatiques sur la base de leur synonymie, homonymie et antonymie [1].

Les tâches principales de la formation des mots sont 1) l'inventaire des morphèmes disponibles dans la langue et l'établissement de leur variabilité dans le discours ; 2) développement de la classification des méthodes de formation des mots ; 3) analyse de la dérivation, qui détermine la dérivation formelle et sémantique des mots dérivés des mots créatifs, et la motivation en tant qu'opération psychomentale linguistique approfondie de formation de la structure nominative du mot; 4) systématisation des significations, types, catégories de formation des mots; 5) reconstruction des méthodes de formation des mots, des structures de formation des mots et de leurs changements historiques dans le processus de développement du langage, établissement de la dynamique historique du sous-système de formation des mots du langage ; 6) justification des règles de formation des mots en tant que régularités des processus de dérivation (formation des mots), signes de leur productivité ; 7) modélisation des nids de formation de mots et compiler des dictionnaires de morphèmes et de formation de mots [1].

On souligne souvent que la structure sémantique des préfixes n'est pas complètement étudiée, ce qui s'explique par le manque d'approches généralement acceptées pour sa classification. L'analyse des systèmes sémantiques de morphèmes dérivationnels est l'une des tâches auxquelles une attention particulière est accordée en linguistique moderne. Les préfixes sont décisifs dans la formation des mots, et donc l'analyse de leurs caractéristiques sémantiques est non seulement tout à fait pertinente, mais permet également d'avoir une idée des schémas de fonctionnement des nouveaux mots.

Il faut dire que les jetons verbaux sont une partie importante de la structure grammaticale de la langue littéraire française moderne. Les dérivés préfixés en sont séparés. Le sens du mot dérivé, en conséquence de l'interaction de la sémantique de la base créatrice et des moyens de formation du mot, acquiert des caractéristiques spécifiques et provoque les phénomènes de polysémie.

On indique la préfixation comme un processus, une manière dont un mot dérivé est formé à l'aide d'un formant, dont le composant principal est un préfixe. La spécificité de ce type de formation de mots est que les préfixes en tant que formants de formation de mots rejoignent le mot entier, formant de nouveaux mots (parties du discours) [1].

La recherche et l'analyse des oeuvres d'écrivains français tels que A. France «Abeille chez le roi des nains»,, M. Lahmann «La cigale et la fourmi » nous permet d'affirmer que le préfixe est le plus souvent utilisé dans la création des verbes, moins fréquent dans la création des noms, adjectifs, adverbes. Exemple,

1. « Ma **com**mère, suggère-elle, me prêtera bien quelques grains pour **sub**siter jusqu'au printemps » (substantif, verbe) [2].

2. Quand je pense à la façon dont je vous ai **a**ccueillie l'hiver dernier, je suis si confuse, que je ne sais comment vous **re**mercier, et comment **re**connaître tant de bonté (verbes) [2].

3. .Abeille, fille de la duchesse des Clarides, s'est aventurée loin du château de sa mère. Elle s'est **en**dormie au bord d'un lac, près du royaume des Nains (verbe) [3].

Ainsi, le système de formation des mots du français moderne est unifié et homogène. Le vocabulaire de la langue française reflète largement la vie sociale de l'homme, sa culture matérielle et spirituelle, et est donc en constante évolution.

Chaque nouveau phénomène, invention, découvert dans la science reçoit son nom, et soit de nouveaux mots et expressions sont créés, soit d'anciens mots dans un nouveau sens sont utilisés. L'analyse de la méthode préfixe de formation des mots considérée dans le travail permet de parler de sa viabilité et de son activité.

En conclusion, il convient de noter la très haute performance des préfixes d'intensité, comme en témoignent les exemples ci-dessus, ainsi que le fait que ces préfixes s'attachent facilement aussi bien aux noms qu'aux adjectifs et aux verbes.

RÉFÉRENCES:

1) Ковалик І.І. Вчення про словотвір.- Л., 1961.- 131 с.
2) Anatole France «Abeille chez le roi des nains». 1 c. http://touslescontes.com/biblio/conte.php?iDconte=405
3) Laumann E. M. «La cigale et la fourmi». 1-2 c. http://touslescontes.com/biblio/conte.php?iDconte=401
4) https://www.cairn.info/les-neologismes--9782130815914-page-3.htm

Polina Korsa
G.V.Pidvysotska, language adviser
Prydniprovska State Academy of Physical Culture and Sport, Dnipro (Ukraine)

Modern approaches to organization of sport health work with school children

School must create the proper conditions for education of every pupil. At present the development of our state for all types of education mission of new Ukrainian will be realized by high schools, lyceums, colleges, schools – complexes, private schools, the best general schools. Introduction of educational establishments of new type is directed on a revival and strengthening of intellectual potential of Ukraine. Efficiency of studies, norms of the educational loading depend on the state of health .

However, population's health, in particular children and teenagers continues to worsen. Quantity of healthy schoolchildren has been decreasing 3-4 times and, unfortunately, level of motor functioning reduces. These factors have negative influence on child's physical condition, weak development of physical qualities: strength, quickness, endurance, flexibility, etc.[2]. So protection and strengthening of children's health, development and further perfection of main physical qualities are the main tasks of schoolchildren's physical education.[3, 4]. Saving of physical and psychic health of the young generation - one of major tasks of our society. It is necessary to search the new ways of improvement of the physical education system, taking into account the specific of educational establishment for the increase of an educational process.

Present system of physical education is only realized on 50% because of two principal reasons: weak educational process organization and one-sidedness of programme conceptions. Understanding of physical culture content enables a teacher to manage the school process of mastering knowledge, abilities and skills. Leading idea of the personality qualities in a child, to develop the mechanisms of self-realization, self-educations, sufficient for becoming of creative personality and its cooperating with people, nature, culture. The system of physical education humanitarian approach to the education of children, to observe that children become more adult, to respect their dignity, acknowledge their rights, to feel success or failure; to perceive them as individuality, to proclaim their achievements in the process of studies.

There are basic principles of organization of sport - oriented physical education.

- Organization of schoolchildren's physical education must provide possibilities in accordance with their capabilities and interests.
- Principle of obligation of the use of sport technologies, athletic and sport education.
- Principle of uniting schoolchildren education - trainings groups, after interests and level of physical preparedness.

The study of the physical education systems in different countries of the world must help in determination of directions to improve Ukrainian system of physical education.

Today the crisis of the system of preschool education is marked in connection with existence of disparity, when a legislative and scientifically - metholodical base is

created for the valuable decision of problems of underfives not realized through the economic "social and other obstacles of departments." It is necessary to understand that we should change the content of physical education as organic combination of 2 components: oriented to the physical culture and practical activity.

First component: to form physical culture as element of general culture of person. It is achieved through the theory and history of physical education, anatomy, physiology, biomechanics of physical exercises, and also - opening of links: "person is nature", "person is a person", "person is a society".The second component orients the process of physical education on the creative meaning of athletic-health and sport activity. The system of physical education will be able to execute the tasks put before modern school. The modern health state of schoolchildren, scientists, leaders of educational establishments of education, came to the conclusion, that physical perfection and health of children can be provided by the complex decision of pedagogical, medical, and social tasks. Thus, the major task of modern school in Ukraine is to develop new approaches to organization of athletic health work which is directed on saving and strengthening of children's health.

The following pedagogic principles were the determining for us:

1. Complex approach to development of physical qualities;

2. Rational construction of trainings and complexes of exercises, which would comprehensively influence on child’s organism. The exercises were selected, considering age peculiarities of primary school children’s organism. Every complex includes exercises, requiring work of different muscles’ groups and oriented on training of physical qualities;

3. Application of play method for strengthening of child’s motivation for physical exercises’ practicing. In primary school age it is necessary to stimulate child’s creative abilities, help him (her) to awake interest for self-education, to acquire steady demand in creative thinking;

4. Application of self-control system for determination of physical qualities’ increment [1].

Physical culture is a part of society’s general culture and one of social functioning spheres, oriented on health strengthening, development of human physical abilities. It is a process of pedagogic assistance to a child in formation of his (her) as a subject, cultural identification, socialization, self-affirmation in life.

References:

1. Diatlenko SM. *Fizichna kul'tura v shkoli* [Physical culture at school], Kiev: Letter LTD; 2009. (in Ukrainian)

2. Shuba LV. *Formuvannia rukhovikh umin' ta navichok uchniv pochatkovoi shkoli u procesi zaniat' tenisom* [Formation of motor skills and abilities of primary school pupils in the process of tennis trainings], Zaporozhye: LLC "Lips" LTD; 2015. (in Ukrainian)

3. Kirk D. *Physical education futures*. London, England: Routledge; 2010.

4. Rink J.E. *Designing the physical education carriculum: promoting active life styles*. Boston: McGraw-Hill Higher Education; 2009.

Kateryna Shashkina, Yelyzaveta Tiahleieva
I. O. Zabolotska, directrice de recherche
I. O. Zabolotska, conseilleuse linguistique
Université Nationale Polytechnique de Dnipro, Dnipro (Ukraine)

Pourquoi il vaut s'inscrire dans l'enseignement supérieur ?

Après l'école, chacun de nous s'est demandé quoi faire ensuite : aller à l'université ou commencer à travailler tout de suite. Cependant, la disponibilité de l'enseignement supérieur et les connaissances, l'éducation sont les concepts pas toujours communs et interdépendants. Parce que tout dépend avant tout d'une personne, de son éducation, de son caractère et des objectifs de la vie qu'elle se fixe [1]. Bien sûr, chacun prend ses propres décisions, mais essayons de comprendre pourquoi cela vaut toujours la peine d'entrer dans l'enseignement supérieur et quelles opportunités l'enseignement supérieur nous ouvre.

Certainement, obtenir un métier est la première chose qui vient à l'esprit lorsqu'il s'agit des études supérieures. Cependant, nous ne devons pas oublier que la plus grande valeur de l'éducation est l'acquisition de la capacite de réfléchir, d'analyser, de penser et d'améliorer leur éducation afin de se développer et d'avoir un avenir prometteur. L'université nous donne beaucoup de connaissances et propose des programmes d'échanges, des programmes de subventions et de bourses, des stages avec lesquels vous pourrez faire les études et faire de recherches à l'étranger. Cette expérience vous aidera à devenir un bon spécialiste et à avoir un emploi bien rémunéré à l'avenir. N'oubliez pas non plus que l'université est une excellente occasion d'acquérir une nouvelle expérience, de faire des connaissances utiles, de faire partie de la communauté, de rejoindre un groupe d'intérêt. C'est un environnement de personnes influentes avec des relations.

D'autre part, de nombreux adolescents considèrent qu'il n’est pas nécessaire d'entrer à l'université pour acquérir des connaissances et de grandes perspectives. Ils croient que la self-éducation est la meilleure façon pour eux-mêmes. En raison du fait que l'éducation offerte par l'université prend beaucoup de temps et comprend des matières inutiles qui ne sont pas liées à la spécialité. Selon eux, il est possible de faire des choses plus importantes comme apprendre des langues étrangères, faire du sport ou cours divers liés à la spécialité choisie.

Bien sûr, les arguments sont solides, mais l'aphorisme d'Isocrate : « L'érudition est le fruit doux de la racine amère » prouve qu'un ensemble de matières non liées aux spécialités, au contraire, développe notre réflexion, notre esprit et élargit nos horizons [2]. nous permettant de devenir des professionnels qualifiés et formés non seulement dans les activités choisies.

Ainsi, l'enseignement supérieur est l'une des étapes les plus importantes de notre vie afin que nous puissions facilement surmonter tous les obstacles, pouvoir nous réaliser et réussir. L'enseignement nous apprend à trouver des moyens de sortir de n'importe quelle situation, à penser sainement et de manière créative et en plus fournit la compétence dans notre travail.

Donc, nous pouvons conclure que l'université nous offre de nombreuses opportunités utiles pour nous-mêmes afin de pouvoir nous réaliser et démontrer nos compétences et capacités que nous avons acquises à l'université. Il convient de rappeler que tout ne dépend que de vous et de vos efforts, et l'université vous aidera, vous poussera, vous guidera.

Bibliographie:

1. Мисник О. Высшее образование – признак ума? / Учебный центр «Стимул». URL: https://stimul.kiev.ua/articles.htm?a=vysshee-obrazovanie---priznak-uma-1

2. Афоризми про освіту і знання / Національний технічний університет України «Київський політехнічний інститут імені Ігоря Сікорського». URL: https://kpi.ua/aphorism-education%20

Kateryna Yershova
O.S. Petrenko, research supervisor
O.V. Khazova, language adviser
Dnipro University of Technology, Dnipro (Ukraine)

Corruption and war in Ukraine

Ukraine has been suffering from the war since February 24, 2022. Thousands of lives have been lost, a lot of houses were destroyed. Men go to the front to defend the independence and unity of the state. But in addition to this struggle, we continue to fight against a very serious enemy – corruption which is ingrained in Ukrainian society [1].

Firstly, we have to say about some statistics. According to Transparency International's 2021 Corruption Perceptions Index, a scale of least to most corrupt nations, Ukraine ranked 122nd out of 180 countries in 2021, the second most corrupted in Europe, with Russia the most at 136 [2].

But what is corruption? According to Wikipedia, corruption is a form of dishonesty or a criminal offense which is undertaken by a person or an organization which is entrusted with a position of authority, in order to acquire illicit benefits or abuse power for one's personal gain [3]. In general, there are different understandings of the concept of corruption, but it is always an unfair distribution of public resources under the influence of private interests.

Someone can say that it is not necessary to fight corruption during the war because of other more important priorities. But, there are some facts which can show this necessity:

- Corruption directly affects defense capabilities.
- It leads to the purchase of lower quality equipment and reduces operational efficiency, which endangers the lives and security of the military and civilians.
- Corruption lacks scarce resources, and the money spent on the army may end up in the wrong hands, including in the hands of the enemy.
- Corruption undermines confidence in the defense sector, provokes threats such as international and organized crime and terrorism, undermines the rules of law and cultivates impunity [4].

Since the beginning of the war, a large number of state institutions have completely refocused their work on achieving Ukraine's victory in the war. Russia's war against Ukraine has forced authorities and local governments to adapt to new challenges through practical and legislative changes. Some NABU and SAP officers have gone to the front, some other detectives and prosecutors are continuing their investigations, and the WACS is administering justice, passing sentences and reviewing precautionary measures, and transferring funds to the Armed Forces [5].

Saying about National Agency on Corruption Prevention, we can point their huge contribution to the fight against corruption. This agency even has its own TOP-5 anticorruption actions:

1. Sanctions with the continuing increase of the sanction list from the current 900 people to 6,000 people.

2. Task-force to identify the assets of sanctioned persons for their seizure for the reconstruction of Ukraine.

3. Creation of a Portal to report on the assets of the Russians who organized this war. Soon everyone will be able to report on the assets of Russians known to him, who are already under international sanctions or will soon be on the lists.

4. Humanitarian Aid Headquarters at the NAPC - UA Headquarters. In recent weeks, the UA Headquarters has already provided tens of tons of aid to the Territorial Defense, local administrations and hospitals in Kharkiv, Sumy oblasts and Kyiv.

5. Transparent and non-corrupt humanitarian aid, as well as anti-corruption expertise. The NAPC is already analyzing corruption risks within the framework of humanitarian aid [5].

But these measures are not enough to fight corruption effectively. We also have to do more including:

- internal control and risk management
- purposeful activities to eliminate the conditions of corruption in the most corrupted areas.
- ensuring the inevitability of responsibility.
- educating intolerance to corruption.

To conclude, it is obvious that countering corruption is really an important part of public administration not only in peacetime. Government is arranging different anti-corruption activities even now, when it is a war in our country. We have to do all what we can to win. Even the smallest contribution will lead us to victory.

References

1. The most corrupt nation in Europe is earning millions every day due to the Ukraine war [Online]. Available at: https://tfiglobalnews.com/2022/05/23/the-most-corrupt-nation-in-europe-is-earning-millions-every-day-due-to-the-ukraine-war/
2. Corruption Perceptions Index [Online]. Available at: https://www.transparency.org/en/countries/ukraine
3. https://en.wikipedia.org/wiki/Corruption
4. https://blogs.pravda.com.ua/authors/drik/5dee9cbbee446/
5. https://ti-ukraine.org/news/antykoruptsijni-organy-pid-chas-vijny-chym-zajmayetsya-nazk/

Розширюючи обрії

Збірник тез сімнадцятого міжнародного форуму студентів і молодих учених

16 – 20 травня 2022 р.

Збірник видається за загальною редакцією
зав. кафедри іноземних мов, проф. С.І. Кострицької.
Відповідальний секретар М.Л. Ісакова