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TAX COMPLEXITY AND ITS NEGATIVE INFLUENCE ON THE BUSINESS ENVIRONMENT IN BRAZIL

Simone Amorim*
Arthur Diniz
Claudio Praxedes
Diego Souza



UNIT Tiradentes University, Brazil

**Corresponding author's e-mail: simone_silveira@unit.br*

Abstract. This article aims to present the direct relationship between the complexity of the tax system and an unfavorable business environment in Brazil, showing how the HDI growth relates to those topics. The source is the news released on websites, with the title: “Sergipe is among the states that facilitate the least opening of companies,” says the Ministry of Economy, which was analyzed using the Critical Pedagogical Image Analysis Framework. A qualitative approach and bibliographic research have made it possible to identify that Brazil still has much to improve in its accounting processes to become a country that attracts investors and generates jobs and income.

Keywords: business environment in Brazil, tax system, jobs and income.

1 Introduction

In an increasingly connected world, tax obligations generated from small businesses have broader connections than one can initially imagine. It is possible to exemplify this statement based on actions an Accountant needs to perform so that small, medium, or large businesses can work fluidly, following current legislation.

In Brazil, each state of the Federation has its control mechanisms that provide information used to generate public employment policies and, therefore, jobs and income for the population, which leads to the creation of tax and accounting mechanisms that will support sustainable development, among others. Worldwide, there are institutions that follow these and other

processes to shed light on the path that is being taken by nations to achieve development that provides their respective populations with the devices necessary for a decent life.

However, Brazil presents itself as one of the countries with the highest tax complexity in the world, which directly and negatively affects the business environment and the generation of employment and income. When we observe, for example, the HDI (Human Development Index) ranking under these two aspects, we note a favorable business environment and a simple and transparent tax system in countries with the best indicators.

Brazil is in the 84th position regarding its HDI (0.765), according to the latest UN report – United Nations (2020) [1]. Thus, we question: How does the tax burden affect economic and human indicators in Brazil? Given the above, this article aims to present the direct relationship between the complexity of the tax system and an unfavorable business environment in Brazil, presenting how both influence the growth of the country's HDI. It is necessary to mention that taxation, in a democratic system, constitutes an instrument of and for society. It is through tax incomes that the maintenance of the state's political and administrative structures and government actions are made possible [2].

To fulfill the objective, we will present the analysis of the news entitled “Sergipe is among the states that make it a less easy process to open a new small business” (Figure 1) [3] to reflect on aspects that impact companies and the job market, performed from the “Critical Pedagogical Image Analysis Framework” [4].



Figure 1. “Sergipe is among the states that make it a less easy process to open a new small business”

It will help us reflect on the complexity of the Brazilian tax system in contrast to other nations to clarify its impact on small and medium businesses, employment, and income, as well as the HDI of countries with a less complex tax system than the Brazilian, its positive and negative points as well.

Overview

- First impressions

It is a journalistic article that has as its source a survey conducted by the Ministry of Economy. The image makes a straightforward connection with the headlight showing a Work and Social Security Card (CTPS).

- Describing

The Ministry of Economy conducted a survey to identify the level of difficulty in the process of opening companies in each state of Brazil. The newspaper responsible for the article highlights the unfavorable position of the state of Sergipe in the research. In addition, it sought to make a direct connection with the subject by placing an image of an alleged employer signing the employee's work and social security portfolio. The focus of the image is a CTPS and, a little further, with an unclear focus, someone signing a document.

- Analyzing

The headline is: "Sergipe is among the states that make it a less easy process to open a new small business," says the Ministry of Economy. When we look at the image portrayed, one can make a connection with the subject since the admission process of a worker is one of the stages of the business opening. The article also cites other steps mentioned in the government survey, such as how someone can get a license and the licenses necessary to open a company.

- Developing critical awareness

Although the state of Sergipe occupies one of the worst positions in the national rank of making things difficult to open a new small business, this complexity is a problem throughout Brazil. Moreover, the country has a high number of litigations in labor lawsuits worldwide. Both facts cause enormous legal insecurity, driving potential investors away and making Brazilian companies less competitive when we compare Brazil to other nations.

- Justifying

To organize each country according to the quality of their business environment, the Doing Business Index was created as an initiative of The World Bank, which classifies countries and their respective states on business regulation issues. The ranking is based on a few indicators like opening companies, obtaining a permit, property registration, contract execution, tax

payments, etc. The index analyzed 190 economies around the globe and informed that countries in the first positions are necessarily nations with very high HDI.

- Connecting

The state of Sergipe is in the 15th place of the national doing business ranking, but when it comes to offering permits, it is in the 24th, with an average of 347 days long. In addition, it is also in the 24th place in the tax payment indicator, and the spending of 1,483 hours per year only for tax payment is estimated. When we analyze the international index, placing Brazil as a parameter, the country is in the 124th position among 190 countries, with an average of 1,501 hours only for tax payments. But in the criteria of less bureaucracy to open companies, it is at the 138th position in the rank. Compared to Australia, which occupies the 14th position of the overall ranking, we can see that a country that wants to prosper and develop economically needs to have a favorable business environment to attract both national and international investment.

- Expressing

It is possible to see that the state of Sergipe already presents itself with problems related to bureaucracy people face to start a low-risk business compared to other states in the country. The issue takes a much larger dimension when compared to the rest of the world.

Decision

The need for less bureaucracy in the business environment proves to be urgent. An unfavorable environment not only distances the country from developed nations but affects the exchange rate and the productivity of the Brazilian people. It can even influence an inflationary lack of control.

Conclusion

When the news was published, solutions were sought to avoid the collapse of the Brazilian economy, given the need for compulsory social detachment to decrease the Covid death numbers among the population. Many businesses did not resist the temporary closing period and were closed for good; others needed to adapt to the economic scenario and the sanitary crisis that plagued the world. Amid this situation, some individuals visualized opportunities, and others innovated by offering new products to maintain/resume their quality of life. Brazil needs to create and maintain a favorable environment to bring itself closer to the developed world, bringing quality of life to its population and stability to either small or large businesses.

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PRIORITIES AND KEY AREAS OF COMPETITIVE DEVELOPMENT OF UKRAINE

Larysa Antoniuk

Doctor of Economic Sciences, Professor

*Kyiv National Economic University named Vadym Hetman, Kyiv,
Kyiv, Ukraine 04050*

**Corresponding author's e-mail: antoniuk@kneu.edu.ua*

Karyna Anapriiuk

Scientific information specialist of the scientific information department

Kyiv National Economic University named after Vadym Hetman

**Corresponding author's e-mail: karynaanapriiuk@gmail.com*

Abstract. Ukraine is experiencing changes in the global economy and is in need of systemic transformational actions to effectively manage its potential, increase its competitiveness, and improve the welfare and quality of life of the population. However, attempts to reform the political, economic, and social spheres have not yielded enough positive changes. The Recovery and Development Plan of Ukraine focuses on macroeconomic stability, economic freedom, European integration, access to know-how, access to finance, and transformation of priority sectors. It includes a methodological concept for identifying innovative projects, global technological trends, and clusters of technologies that will ensure competitive leadership. The expansion of new dynamic opportunities for competitive advantage is achieved by increasing labor productivity, reducing energy intensity of GDP,

enhancing economic security and increasing Ukraine's innovative competitiveness.

Keywords: international competitiveness of countries, innovations, recovery of Ukraine.

The evolutionary development of the global economy has led to the internationalization of competition, and the formation of a market economy is closely linked to the creation of a competitive environment, as competition is an integral part of the market and a prerequisite for its functioning. Competitiveness is one of the key criteria for the efficiency of any business entity. The competitive advantages of a country's economy, as well as its clusters, industries, enterprises and regions in global markets, in turn, determine the national security and global competitiveness of any state.

Ukraine, while defending its independence by military means, is experiencing changes in the global economy on a larger scale and is in dire need of systemic transformational actions to effectively use the state's potential and improve the welfare and quality of life of its population. Despite all the damage and destruction, Ukraine has a great innovation potential for the country's revival and post-war recovery. Every year, the World Intellectual Property Organization publishes a report on the Global Innovation Index, which ranks the world's economies according to their innovation potential, and Ukraine ranked 57th among 132 countries (Table 1).

Table 1

Ukraine in the Global Innovation Index ranking 2020-2022

Year	GII	Innovation inputs	Innovation outputs	Knowledge and technology outputs	Creative outputs
2020	45	71	37	25	44
2021	49	76	37	33	48
2022	57	75	48	36	63

Source: created by the authors based on [1]

The generalized results of the analysis of Ukraine's innovative development show that this is not enough for an economy that seeks to establish itself as an independent competitive state on the global stage. Among the reasons that slow down the role of the innovation factor in increasing the competitiveness of the Ukrainian economy are the following:

– lack of modern development institutions that ensure the functioning of the innovation economy in all its components (organization and management of developments, their financing, marketing, commercialization, etc.);

– lack of effective coordination of state economic, educational, scientific, technical, industrial and innovation policies. The practice of modern Ukrainian reality shows that all levels of economic management do not pay attention to the role and importance of organizational innovations, the implementation of which will not only increase the efficiency of the management system but also accelerate the development of the economy on an innovative basis.

In this context, Ukraine, as a country that is a candidate for EU membership and follows global development trends, can adopt foreign experience in introducing innovations into economic activity, including European experience. For many years, the European Union has been a leading supplier of innovations and innovative technological inventions that require in-depth research, development and large investments. Year after year, Europe has been strengthening its important role in shaping the environmental and digital transition to a sustainable economy. High-tech innovations continue to strengthen the EU's technological leadership and create new solutions to pressing societal challenges, such as climate change and cybersecurity.

The absence of a national strategic vision for the country's development and competitiveness has resulted in Ukraine being one of the least developed countries in Europe today. Years of underfunding of scientific progress have turned Ukraine into a region that stands out negatively in terms of economic development, and the war has exacerbated this negative trend. Our country needs radical innovative solutions for economic recovery and modernization. The experts of the Lugano Conference on Ukraine's Recovery outline six key priority areas for the economic recovery of our country [2]:

- 1) macroeconomic stability;
- 2) economic freedom (development of the banking and financial sectors, budget planning, reforms related to the status of a candidate for EU membership);
- 3) European integration and access to European markets;
- 4) access to know-how;
- 5) access to finance (access of Ukrainian businesses to the European market, qualified labor force and technology development);
- 6) transformation of priority sectors (relocation of businesses damaged during the war, a strong innovation ecosystem, launch of sectoral programs for rapid involvement in European supply chains).

One of the important components of the Recovery and Development Plan of Ukraine is the creation of the Digital Accelerator "Innovation Menu" developed by the Kyiv National Economic University named after Vadym Hetman jointly with the Ministry of Economy of Ukraine and aimed at laying the foundation for the innovative competitiveness of our country. The initiative to work together on the Innovation Menu, which opens up incredible opportunities for post-war reconstruction and competitive development of Ukraine in the field of high technology, was supported by the authors of innovative projects from different regions of Ukraine. The partners have already developed a web platform that presents the first 47 innovative projects of high-tech clusters that need investment support, namely the digital technology cluster, biotechnology, energy and environment, new materials, and high-tech development infrastructure.

In the process of creating the innovation menu, we have [3]:

- developed a methodological concept for identifying innovative projects;
- identified global technological trends;
- identified clusters of technologies that will ensure the competitive leadership of countries in the twenty-first century.

Thus, in our opinion, one of the main guidelines for Ukraine's economic activity in the global environment is the accumulation and realization of material and intellectual resources that can change the structure of the country's economy and create new jobs. The development of the intellectualization model of the economy is characterized by the increasing role of research and development as a key factor in economic development. The expansion of new dynamic opportunities for competitive advantage is achieved by increasing labor productivity, reducing the energy intensity of GDP, enhancing economic security and increasing Ukraine's innovative competitiveness.

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AUTHORS



Larysa Antoniuk, 01.06.1966 Ukraine

Current position: Doctor of Economic Sciences, Professor, Vice-Rector for Research Work, Kyiv National Economic University named Vadym Hetman, Kyiv, Ukraine

University studies: Lviv Polytechnic National University, Degree in Economics

Scientific interest: international competitiveness of countries, world-class universities, strategic planning of universities

Publications: more than 250 works

Experience: more than 30 years of teaching and scientific activity



Karyna Anapriuk, 24.09.1999 Ukraine

Current position: Postgraduate (International economics), scientific information specialist of the scientific information department Kyiv National Economic University named after Vadym Hetman

University studies: Kyiv National Economic University named after Vadym Hetman

Scientific interest: international competitiveness of countries, globalization, international investment activity

Publications: 3 publications

Experience: 6 years of scientific activity

OVERVIEW OF MACHINE LEARNING TECHNOLOGIES: NEURAL NETWORK

Madiyar Baitemirov* , Mukhanova A.A.

L.N. Gumilyov Eurasian National University (ENU), Kazakhstan

**Corresponding author's e-mail: madiyar5155@mail.ru*



Abstract

Currently, DSS are a popular tool in the information technology industry. Such systems are important for decision support in various industries, including marketing, finance, project management and companies. They help to analyse a large amount of data, identify correlations and make predictions, which allows you to make more informed decisions. [1] The mathematical support of the DSS itself is based on artificial intelligence methods. [2] Since the creation of a full-fledged "artificial intelligence" opens up new horizons of development for humanity. [3]

Keywords: neural network, machine learning, data science, data analysis, mathematical model

Introduction

Every year the volume of data increases at an incredible rate. People generate more information than they can process. It is at this stage that there is a great demand for the development of decision support systems.

Decision support systems can be based on various artificial intelligence methods, depending on the needs and goals of the system. Artificial intelligence methods are an effective way to support the decision-making process in organizations, as they can help decision makers quickly analyze complex data and identify patterns that may not be obvious to people. [4]

The main subject of study is a person's thinking abilities and ways to implement them with the help of technical means. Technically, the software implementation is carried out using machine learning and artificial neural networks.

Machine learning is a method of creating artificial intelligence that involves training a computer to recognize patterns and make predictions based on data. Machine learning algorithms can be used in DSS to predict results or recommend actions based on historical data.

And neural networks, in turn, are a machine learning algorithm based on the structure of the human brain. [5] They can be used in DSS to process and analyse large amounts of data, as well as to make forecasts or recommendations based on this data. [6]

A single-neuron architecture called a single-layer perceptron was considered. In the perceptron (Figure 1) similarly, the connections between a neuron and input signals have certain weights.

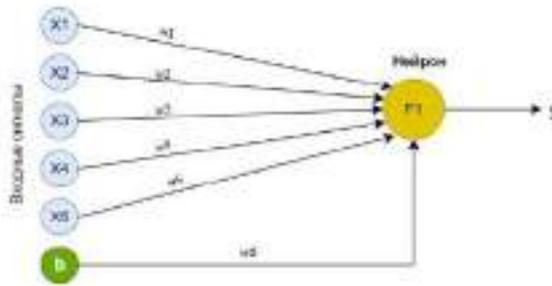


Figure 1. Diagram of a neural network with one neuron

The operation of a single-layer perceptron can be described by one mathematical formula (1), where all input data are summed taking into account the weight of each compound. Next, the generated amount passes through the activation function in the form of a logistic function:

$$y = \frac{1}{1 + e^{-(W_1 * X_1 - W_2 * X_2 + W_3 * X_3 - W_4 * X_4 - W_5 * X_5 + W_6 * b)}} \quad (1)$$

where W is a weights between the input signals of the neuron and; X is a input signals; d is a output value of the neural network; e is a exponent; b is a bias (threshold value);

The resulting y value is the output signal of the neural network. The perceptron works in such a simple and understandable way.

And perceptron training takes place according to certain formulas (2-4):

$$E = y - d \quad (2)$$

where E is a neural network error; y is a output value of the neural network; d is a desired required value.

$$Q = E * y * (1 - y) \quad (3)$$

where Q is a local gradient; E is a error of the neural network; y is a output value of the neural network:

$$\begin{aligned} W_1 &= W_1 - L * Q * X_1 \\ W_2 &= W_2 - L * Q * X_2 \\ W_3 &= W_3 - L * Q * X_3 \\ W_4 &= W_4 - L * Q * X_4 \\ W_5 &= W_5 - L * Q * X_5 \\ W_6 &= W_6 - L * Q * b \end{aligned} \quad (4)$$

where l is the convergence step; b is the threshold value; c is the local gradient; W is the weights between the input signals and the neuron; x is the input signals;

The learning process is the process of adjusting weights, which is performed in the opposite direction. Starting from the very last layer and ending with the very first.

To train a neural network, its structure, initial weights of connections, as well as input signals were created. Input signals are observations that are fed to the input of a neural network, and each observation has the desired value. The threshold value is determined to be equal to one [7].

Having done numerous iterations of the learning process, the result was obtained:

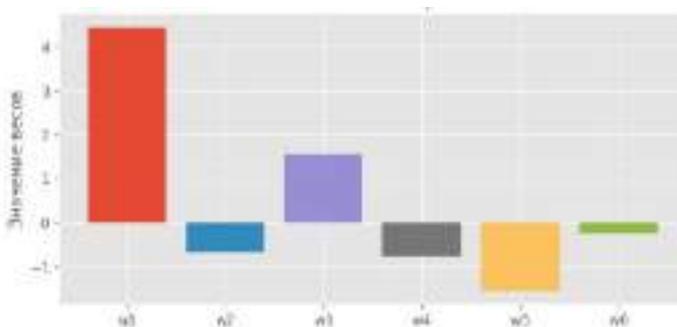


Figure 2. The values of the weights of the trained perceptron

Analysing the changed weights of the neural network, the coefficients of the relative importance of each input signal were determined (Figure 2).

Substituting the obtained values of the weights, the formula naturally turns out:

$$y = \frac{1}{1 + e^{-(4.81 \cdot X_1 - 0.75 \cdot X_2 + 1.71 \cdot X_3 - 0.83 \cdot X_4 - 1.64 \cdot X_5 - 0.2 \cdot b)}} \quad (5)$$

where y is the output value of the neural network; e is a exponent; X is the input signals; b – bias (threshold value);

Passing through the neural network, the output signal of the network is calculated by the formula (5), which should be similar to the required value. The result obtained and the input signal vector are shown in Table 1.

Table 1

An example of input signals that should be fed to the input of a neural network

X_1	X_2	X_3	X_4	X_5	b	d	y
(500-300)/100	0	50/100	2	0	1	1	0.9999
(150-200)/100	1	30/100	2	1	1	0	0.0057

Analysis of the neural network learning process. Before the software implementation of training, the entire data set was divided into a training sample and a test sample (Figure 3). The neural network was not trained on test data; such a process was created in order to detect the retraining of a neuron.

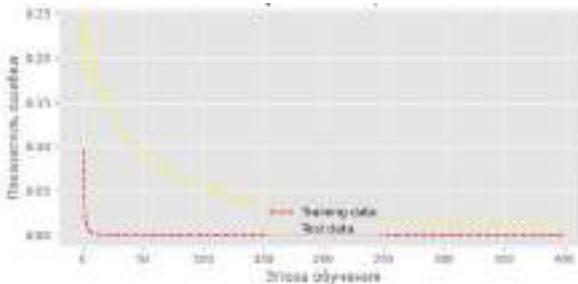


Figure 3. Graph of perceptron losses during training.

horizontally – the era of neural network learning;
 vertically – an indicator of the average error.

There is no explicit retraining, since the neural network finds a common pattern between the test data and the training data (Figure 3). Next, the analysis of changes in the local gradient was carried out.

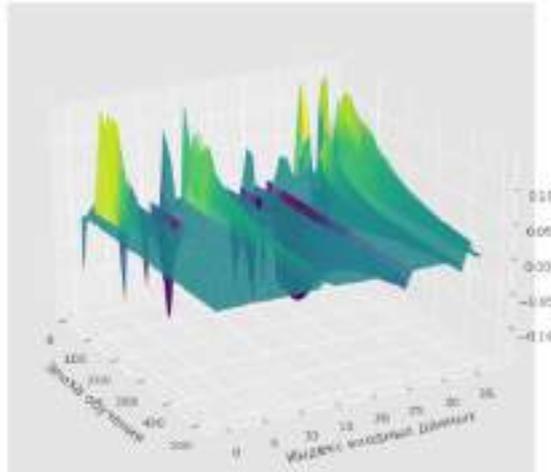


Figure 4. Gradient descent in 3d

The analysis revealed a high learning rate (Figure 4). In just 500 iterations, the neuron reached the minimum required value. This effect carries information about a high learning rate.

Conclusion.

In this article, the development of a classifying neural network was considered as one of the machine learning models for DSS. An increase in the learning rate was revealed with a high parameter of the convergence step and with a large number of training iterations. But it is important to exercise control over such parameters, since there is a risk of retraining the network on a specific data sample. To avoid the risk of retraining, it is recommended to divide the sample into a training (on which the network is trained) and a test (on which the network was not trained). Thus, an analysis of a single-neuron architecture called a single-layer perceptron was carried out. In the problem under study, the choice of a perceptron was the optimal solution compared to other neural network architectures. Since a large number of neurons does not always guarantee high accuracy, and at the same time requires more calculations during training.

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Authors

Madiyar Baitemirov, 2002, Nur-Sultan, Kazakhstan.



Current position, grades: 4th year student of the Eurasian National University

Scientific interest: data science, machine learning, big data, data analysis, neural networks, artificial intelligence

Mukhanova A.A. Nur-Sultan, Kazakhstan.



Current position, grades: Doctor of Philosophy (PhD), Acting Associate Professor of the Department of Information Systems.

Scientific interest: artificial intelligence, decision support systems

IMPROVE AUTOMATIC SPEECH RECOGNITION FOR KAZAKH LANGUAGE USING EXTENDED LANGUAGE MODEL

Akbayan Bekarystankyzy^{1,*}, Orken Mamyrbayev²

Satbayev University, Kazakhstan

Institute of Information and Computational Technologies, Kazakhstan

**Corresponding author's e-mail: akbayan.b@gmail.com*



Abstract

Nowadays speech recognition is widely used in different areas of human life: in mobile devices, different information systems, smart home systems and more. However, speech recognition features available only for common languages like English, Chinese or Russian. For low-resource languages which have insufficient amount transcribed data, such systems are unavailable due to the expensiveness of data collection. Kazakh language also belongs to the group of low-resource languages, thus implemented solutions for Kazakh language are very expensive or unavailable. This work proposes the way of improving Automatic Speech Recognition (ASR) for Kazakh language using the most available data – raw texts without audio. Language Model (LM) distinctly trained on enhanced text data is used in the decoding stage of recognition process. Inclusion of enhanced LM had very good effect of Word Error Rate shortage.

Keywords: automatic speech recognition, language model, word embeddings, transformer.

1 Introduction

Low-resource languages need the implementation of ASR systems, but lack of necessary data makes this task impossible. Kazakh language is also one of low-resource languages, but despite this problem a group of researchers applied well-known Recurrent Neural Networks types and architecture models to the Kazakh language [1, 2]. The results of these researches proves the necessity of enlarging data corpus for training.

Another group of researchers studied the ways of combining data to improve resulting ASR applying transfer learning [3] and multilingual training [4, 5].

One of the solutions for decreasing error rates of recognition in ASR is enrich a set of parameters which describe the relations among recognized tokens-words. Some studies try to improve language models and apply them in ASR by using distinct language models trained on enhanced text data [6-8]. This approach also can be called the relatively cheaper way of ASR improvement; raw text data collection is much easier than transcribe an audio data.

This research studies improvement methods of ASR model. Proposed the enhancement of the text corpus with additional texts for improving the decoding process and encoder of ASR model for other language is used to improve the encoder of ASR.

Overview

This work discusses improvement of Automatic Speech Recognition using next approaches:

- Enhanced language model inclusion in the joint decoding stage
- Use of other language ASR model's encoder in the encoding stage

Decision

This study proposes the decoding improvement distinct language model. Distinct language model trained on extended text corpus, which also includes text corpus entire dataset. Proposed decoder is given in Figure 1.

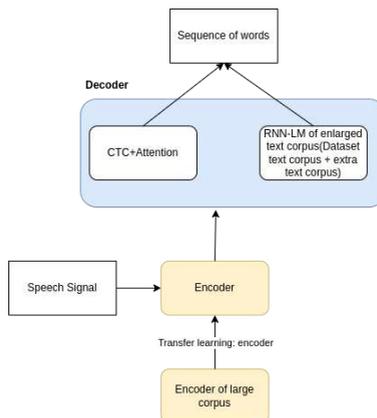


Figure 1. Improved decoder with the LM of enlarged raw text and transferred encoder of other language

LM enhancing

ESPnet was chosen as a tool for experiments, because it supports novel architectures for ASR: transformer and conformer, branchformer which use Convolutional Neural Networks (CNNs) for processing input raw signals and apply joint decoing (CTC + attention mechanism) for output. Moreover, it allows to train distinct Language Model (LM) [9, 10] and use it in decoding process to predict the next word (1)

$$\log p(y_n|y_{1:n-1}, h_{1:T}) = \log p^{hyp}(y_n|y_{1:n-1}, h_{1:T}) + \beta \log p^{lm}(y_n|y_{1:n-1}, h_{1:T}) \quad (1)$$

P^{hy} where p is the probability of the next word, is the probability of word given as hypotese calculated by entire ASR model, p^{lm} is the next word probability calculated by external language model, β is the LM coefficient (float value between 0 and 1).

Inclusion of extra text corpus can improve featurized representations of words, using different variations of words' usage in an enormous number of contexts. This improves hot vectors (E) and increases the number of word features.

LM architectures

The enhanced text corpus was trained on the Transformer Architecture Perplexity value taken with enlarged data on transformer architecture is the lowest: 2.99. Also, Table 1 shows that transformer architecture can extract much more trainable parameters in comparison with Sequential RNN LM (50.54 M).

Table 1

Perplexity values of different language models			
LM architecture	Perplexity	# of trainable parameters	# of sentences
RNN LM (text of entire dataset)	9.09	6.83 M	5774
Transformer LM (enlarged text corpus)	2.99	50.54 M	139810

All types of language models were with a ESPnet's Conformer ASR architecture. Results of experiments on 15 hours of transcribed data for Kazakh language are given in Table 2. Decoding's LM weight for was set to 0.3.

Table 2

**WER(test) and CER(test) of ASR with 15 h of Kazakh Language
with different combinations of LMs**

LM type	WER/test (%)	CER/test (%)
Sequential RNN LM with entire dataset text	54.0	20.1
TransformerLM of enhanced raw text	46.8	18.2
TransformerLM with enhanced raw text + cross lingual transfer learning with Encoder	46.3	18.3

Conclusion

Enhanced LM, taken by training big raw text decreases both error rates: WER and CER. Significant impact is seen on WER. Transformer LM of big text decreased WER by 7.2%. Results of experiments showed that LM of enhanced text data is more effective as it can decrease perplexity and increase the number of trainable parameters.

The result of cross-lingual transfer learning from ASR model for English language in joint usage with Enhanced Transformer LM could further decrease ASR error rates.

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Authors

Akbayan Bekarystankyzy, Almaty, Kazakhstan.



Current position, grades: PhD student at Satbayev University.

Scientific interest: Artificial intelligence, machine learning, natural language processing

Orken Mamyrbayev, Almaty, Kazakhstan.



Current position, grades: Deputy Director General of the RSE "Institute of Information and Computing Technologies" of the

KN MES RK, Head of the laboratory

Scientific interest: Artificial intelligence, machine learning, natural language processing

PROBLEMS OF FUNCTIONING OF THE AGRARIAN SECTOR IN THE CONDITIONS OF WAR

Anastasiia Bevz*, Deniss Djakons, Iryna Dernova

ISMA University of Applied Sciences, Latvia

ISMA University of Applied Sciences Rector, Latvia

Cherkassy State Business College, Economics,

Entrepreneurship and Marketing Department, V, Ukraine

**Corresponding author's e-mail: anastayha.bevz@gmail.com*



Abstract

Agriculture plays an important role in the development of the Ukrainian economy, annually creating a significant part of the country's GDP, providing the population's needs for agricultural products on the domestic and world markets, and making up a significant share of Ukrainian exports.

Keywords: agriculture, agro-industrial complex, agrarian sector, crop production.

1 Introduction

The agricultural sector is one of the main budget-forming areas of Ukraine's economy and accounts for about 43% of the country's export commodity structure. The agro-industrial complex is also the main source of constant currency inflow to the budget of Ukraine and forms about 10% of the domestic GDP. According to the State Statistics Service, as of the end of 2021, there were 336.3 thousand registered entities in the agricultural sector in Ukraine, which is 13.9% of the total number of economic entities. As of January 1, 2021, agricultural land occupied 42 million hectares, or 70% of the country's total land fund. 78.9% of agricultural land is arable land and perennial plantations, 13.0% is pastures, and 8.4% is hayfields. [1].

According to Article 3 of the Ukrainian Commercial Code, the economic activity of agricultural enterprises is the activity of subjects of agrarian business in the sphere of social production aimed at the production and sale of products, performance of works, or provision of services [2].

The main means of production in agriculture is land, as opposed to other sectors of the economy. When used correctly (timely and proper crop rotation, rational use of fertilizers), its properties improve with each year, which is not typical for means of production in other sectors of production. However, with the start of full-scale Russian Federation invasion of Ukraine, the area of land suitable for cultivation has significantly decreased. According to the State Statistics Service, as of the end of 2022, of the 28.4 million hectares of all cultivated areas that were under cultivation in 2021 throughout Ukraine, 86% remained on the territory of Ukraine-controlled areas, which is 24.6 million hectares, of which 3.8 million hectares are impossible to cultivate due to proximity to the front line, shell fragments, landmines, etc.

According to the results of the winter crop sowing in 2022, there is a significant reduction in the sown area of winter crops. Compared to the autumn figures of 2021, the sown area of winter crops on the controlled territory of Ukraine decreased by 26% and amounted to 3.8 million hectares, and taking into account the occupied territories, the sown area of winter crops decreased by 43%. Apart from the military aggression, this trend is explained by unfavorable weather conditions in the autumn of 2022, high logistics costs, and limited export opportunities due to the blockade of Ukrainian seaports.

One of the main problems of agriculture during the war is the blockade of seaports, through which the majority of goods were transported from Ukraine. The prolonged blockade of Ukrainian ports has greatly affected the ability to store last year's harvest properly. Grain loses its quality characteristics over time and subsequently ends up in the fodder group, which leads to a decrease in price. Under these conditions, processing this grain into compound feed to meet domestic demand becomes a promising option. This will help increase domestic consumption of fodder grain while reducing the burden on the transport infrastructure intended for export shipments.

Taking into account the significant share of logistics in the price of grain crops in 2023, there is a decrease in the area sown with grain crops, with a simultaneous increase in the area sown with oil crops. According to data from the Ministry of Finance of Ukraine, the price of oil crops on the world market exceeds the price of grain crops by 2 times (Figure 1) [3]. Therefore, according to preliminary estimates by the Ukrainian Agribusiness Club (UCAB), the area sown with grain crops in 2023 will be 8.7 million hectares, which is 22% less than the 2022 indicator and 45% less than the 2021 indicator. At the same time, the area sown with oil crops is forecasted to be at the level of 9.7 million hectares, which is 32% higher than the 2022 indicator and 9% higher than the 2021 indicator. This is the first time in the history of independent Ukraine that the area sown with oil crops will be greater than the area sown with grain crops [4].

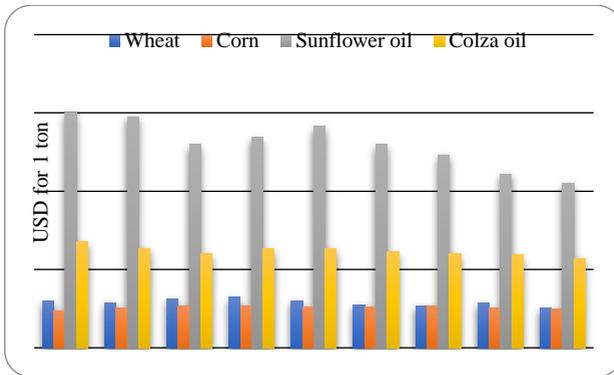


Figure 1. Dynamics of changes in world prices for grain crops and vegetable oils in 2022-2023

In 2022, a Memorandum was signed between Ukraine and Poland for the construction of a cross-border pipeline to export plant oil from Ukraine to Gdansk (Poland), which is also a significant factor that influenced the increase in the area of oilseed crops cultivation. It should be noted that in 2022, sunflower oil ranked second in terms of export value, with a value of \$5.46 billion. The decrease compared to 2021 was 14.4% in money terms and 16.3% in volume (4.29 million tons). At the same time, it should be taken into account that sunflower seeds also entered the TOP-10. Ukraine exported 2.7 million tons of this product worth \$1.255 billion, which is 33 times more than in 2021. The construction of a pipeline for transporting plant oil will help Ukraine reduce the export of sunflower seeds, while proportionally increasing the export of oil and fully loading oil extraction plants.

Overview

In the study, trends are considered and conclusions are drawn on the following issues:

- Number of business entities in the agricultural sector of the economy
- Export of agricultural products
- Dynamics of prices for the main types of products

Decision

The functioning of agriculture is strategically important for maintaining the economy of the country. Recognizing this, companies in this sector continue to work despite all the difficulties of war. Among the main problems currently facing the industry are: expensive logistics, limited sales markets, financial issues, mined fields, and reduced crop areas. This situation forces

domestic farmers to adapt their work and seek alternative ways of selling their products (such as railway transport).

Resources needed to restore and support the industry come from two sources – farmers' own funds and donor international support. The most costly item in wartime conditions is landmine clearance. According to estimates by the Ukrainian Association of Sappers, currently about 83,000 square kilometers are contaminated with various types of landmines, making it impossible to cultivate the land. Based on rough estimates, the cost of demining is \$10 billion.

Ukraine receives great assistance from the FAO, which actively supports small farmers and rural families. Currently, they are receiving winter wheat seeds to meet production needs for the 2023 harvest. The FAO also provides animal feed to farms, multi-purpose financial assistance, and vouchers for the purchase of other production resources.

Conclusion

The agricultural sector remains one of the leading industries in the Ukrainian economy, despite the challenges it has faced since the beginning of the full-scale war. During the war, agriculture plays a crucial role in ensuring the country's food security and supporting the economy as a whole.

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DEVELOPMENT OF A BASIC SECURITY POLICY IN THE COMPANY RETAIL CHAIN ZOBOS

Piyush Bhardwaj

ISMA University of Applied Sciences, Latvia

Corresponding author's e-mail: Piysushbhardwaj630@gmail.com

Abstract

The purpose of this article is to analyze the human factor in the field of information security, an analysis of how information security understanding can become the main tool to overcome these shortcomings. The heightened threats of information technology have led to new technology-based solutions, while research related to human factors has been limited.

The evaluation of Zobos data has shown that several risks pose significant threats to the organization's operations. To mitigate these risks, the organization must implement appropriate measures such as disaster recovery plans, security protocols, and employee training programs to ensure the safety and security of its operations and data. To address these risks, the organization must develop a comprehensive security policy that outlines the necessary measures to ensure the safety and security of its operations and data. The security policy should include guidelines on disaster recovery plans, access controls, data backups, encryption, employee training, and incident response.

Keywords: basic security policy, retail, India.

Introduction

Information security in the broadest sense is a set of means of protecting information from accidental or intentional exposure. Regardless of what underlies the impact: natural factors or artificial causes – the owner of the information bears losses. The integrity of information data means the ability of information to retain its original form and structure both during storage and after repeated transmission. Only the owner or user with legal access to the data has the right to make changes, delete or supplement information. Confidentiality is a characteristic that indicates the need to restrict access to information resources for a certain circle of people. In the process of actions and operations, information becomes available only to users who are included in information systems and have successfully passed identification. The availability of information resources means that information that is freely available must be provided to full users of the resources in a timely manner and without hindrance. Reliability indicates that the information belongs to a

trusted person or owner, who simultaneously acts as a source of information. Ensuring and maintaining information security includes a set of diverse measures that prevent, monitor and eliminate unauthorized access by third parties. Information security measures are also aimed at protection against damage, distortion, blocking or copying of information. It is important that all tasks be solved simultaneously, only then a full-fledged, reliable protection is provided.[1] An information threat is a potential impact or impact on an automated system, followed by damage to someone's needs. Today, there are more than 100 positions and varieties of threats to the information system. It is important to analyze all risks using different diagnostic methods. Based on the analyzed indicators with their details, it is possible to competently build a system of protection against threats in the information space. Threats to information (computer) security are various actions that can lead to violations of the state of information protection. In other words, these are potentially possible events, processes or actions that can cause damage to information and computer systems. Information security threats can be divided into two types: natural and artificial. Natural phenomena include natural phenomena that are not dependent on humans, such as hurricanes, floods, fires, etc. Man-made threats depend directly on the person and can be intentional and unintentional. Unintentional threats arise due to negligence, inattention and ignorance.[2] An example of such threats can be the installation of programs that are not among the necessary ones for work and further disrupt the system, which leads to the loss of information. [3] Deliberate threats, unlike the previous ones, are created on purpose. These include attacks by intruders both from outside and from within the company. The result of the implementation of this type of threat is the loss of funds and intellectual property of the organization. Violation of the information security regime can be caused by both the planned operations of intruders and the inexperience of employees. The user must have at least some understanding of information security, malicious software, so that his actions do not harm the company and himself. Incidents such as the loss or leakage of information may also be due to the targeted actions of company employees who are interested in making a profit in exchange for valuable data of the organization in which they work or have worked. It is necessary to assess information security threats in a comprehensive manner, while assessment methods will differ in each specific case.[1] The purpose of this article is to analyze the human factor in the field of information security, an analysis of how information security understanding can become the main tool to overcome these shortcomings. The heightened threats of information technology have led to new technology-based solutions, while research related to human factors has been limited.

Overview

It is widely recognized that the employees of an organization are often the weak link in protecting their information assets. Information security has not received enough attention in terms of the influence of the human factor. [1] The human factor has a huge impact on the success and failure of efforts to provide and protect businesses, services, systems and information. If system security is overlooked by the developer, the IT system becomes vulnerable and can be exploited by an attacker. Social engineering attackers try to obtain sensitive information by targeting people's vulnerabilities – that is, weaknesses in an organization due to people's characteristics and behaviors.[2] Organizations often ignore the human factor. A security study from Cisco Systems has shown that users who work remotely will still engage in activities that threaten security. A study of employee behavior showed that upon receiving a suspicious email, 37% would not only open the email but also click on the link, while 13% would open the attached file. In addition, after receiving a regular email, 42% clicked on a link and provided confidential information, and 30% opened a file that would supposedly improve computer performance. [4] A survey was conducted among security professionals and IT departments to determine their top priorities over the next few months. About 44% of respondents said their IT and security teams spent less than 20% of their time on daily operational security. Another 32 percent said they devoted 20 to 40 percent of their time to safety. Only 20 percent of participants dedicated a significant portion of their daily and weekly administrative activities to securing their systems and networks. [5] 45 percent of all data breaches that occurred worldwide in 2019 were the result of hacking. With a presence rate of 22 percent, errors were the second most common cause after accidents. The vast majority of data breaches were the result of actions taken by third parties.

The relevance and significance of studying the socio-organizational and psychological aspects of information security will remain and even increase despite the increasingly successful introduction of technologies, tightening of legislation, improvement of internal labor acts and security policies at enterprises. Creating an information security subculture in the future may be the key to managing the human factor, while employee compliance with all prescribed rules will continue to be of concern to leaders of organizations.[3] Typical controls used to encourage safe employee behavior will invariably include awareness programs, the development of clear and consistent information security policies, and the use of various deterrence methods.

India, which has the second-largest population connected to the internet in the world, was not an exception to the expanding digital village. The

expansion of connectedness made possible by the world wide web holds the prospect of massive social advancement; but, it also exposes our digital society to the emergence of new threats. Cybercrime does not respect national boundaries and has advanced at a rate that is comparable to that of new technologies. [6] In a poll conducted in 2022 among Chief Information Security Officers (CISO) in Canada, 87 percent of respondents reported that employees in their firms were aware of the role that they had in defending the organization against cyber threats. This number climbed almost twice as much as it did in 2021, and as a result, employees in Canada are the ones who are the most conscious of the role they play in comparison to employees in other markets. Seventy-five percent of people who took the study held this opinion about Australia, giving it the second place spot. [7] As a result, the accompanying repercussions are at an all-time peak level of significance for India: The frequency, complexity, and specificity of cyberattacks against corporations are all on the rise. The obvious financial repercussions of a cyber assault are only the beginning of the damage that can be done. The majority of respondents believed that rising expenses associated with alerting customers will be the most significant repercussion of cyber warfare in 2021. It is worth noting that According to a survey conducted by the web security company Indusface in 2022, India was a prime goal for assaults. Companies are likely to increase their spending on cybercrime as the government works to remedy the policy gap.[8, 9] Nevertheless, the finances designated for cybersecurity have been underutilized, where only Rs 98.31 crore spent of the total Rs 213 crore allocated. This is despite the fact that the frequency of cyber attacks across the country has undergone a multiple growth over the course of the same period of time. The Indian Computer Emergency Response Team (CERT-In) recorded a total of 3,94,499 cyber security breaches in 2019, as indicated by data given by the government. The figure skyrocketed to 1158208 in the year 2020 and continued to rise, reaching 1402809 the following year. This year, there have been as many as 674021 instances of breaches in cyber security registered through June with the majority of the cause by the human factor. [10]

Decision

Zobox Retail is a mobile retail company, that now unites 13 stores around Gujarat, Rajasthan, and Uttar Pradesh in India. It has been opened during the pandemics on the wave of the increased demand for the mobile phones for Internet access. The business model is that company renews broken phones and sells them and accessories for the half price, that has gained high demand due to the cost reduction and value of the goods. Consequently, the chain has grown more than three times in two years. Zobox has acquired a number of

new retail spots in 2022 and in November 2022 the new shops were unified under the Zobox brand. Consequently, the number of stores expanded rapidly and the security policy in the company is different from spot to spot that leads to the increased human factor impact as soon as the number of employees increased. Consequently, increased the number of errors and issues with the firewall and security breaches, given the existing statistics from the company. Right now the company when employing the personnel provides the leaflet about basic requirements to the use of the internal and external system and behaviour. Employees need to be trained and the basic common security policy should be developed.

The information system in Zobox is a distributed network, which consists of workstations and servers. For the planned activities for the distribution of encryption (cryptographic) and processing of protected information, the enterprise allocates a separate room that does not have access to the public networks of the enterprise. The security of the main office of the enterprise is organized by a round-the-clock post at the entrance to the protected territory of the enterprise. The protection of individual stores is carried out with the help of contracts with security companies or the protection of retail space. The stores are under video surveillance, where the data is written to the company's server system.

Further, the analysis and classification of sources of threats to information circulating at the facility was carried out. About the analysis and classification of sources of threats to information circulating at the facility, it should be assumed that for the same threat, the methods of reflection, depending on the location of the threat source (internal or external), may vary. A separate group of internal sources of threats to information can be specially introduced and recruited employees who are among the auxiliary, main, or technical personnel, as well as employees of the information security department. All possible sources

Anthropogenic sources of threats to information are subjects who have access to work with the regular means of the object of information, authorized, unauthorized, whose actions can be committed both by negligence and intentionally. This group of information threat sources is of the greatest interest, because the actions of the subject can always be predicted, evaluated, and appropriate measures taken. Countermeasures in this case directly depend on the actions of employees of the information security department. Technogenic sources of threats are determined by human technocratic activities and the development of technology. Next, the threat factor Y will be determined by the ratio $Y = X \cdot Z$, where X is the level of protection of this system/strength of reduction of this risk in Zobox (3 – low, 1 – high) and Z is

how common this threat is to Zobox according to author's knowledge (1 – not common, 3 – very common). The threats are based on the ISO appendices . Risk analysis is carried out based on the immediate goals and objectives for protecting a particular type of confidential information. The purpose of the analysis is to identify the risk characteristics of an automated system and its resources. When conducting a risk analysis, the following main factors are taken into account: the value of information, software and hardware resources of an automated system, the significance of vulnerabilities and threats, the effectiveness of existing or / and planned means of ensuring information security. The highest evaluation means the most risk in the information system. The possibility of realizing a threat is determined by the probability of its realization within a given period of time for a certain resource of an automated system. The probability of a threat being realized is determined by indicators such as: the attractiveness of the resource (the indicator is used when considering the threat from intentional human impact), the possibility of using the resource for financial gain, the technical possibilities of realizing the threat, and the degree of ease of implementing the vulnerability.

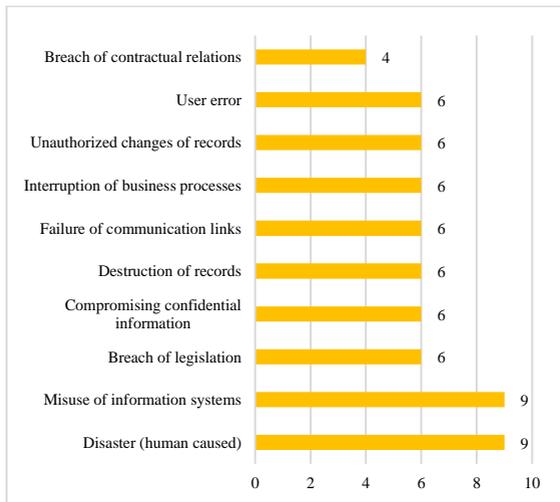


Figure 1. Most common and impacting threats

The evaluation of Zobox data has revealed that several risks pose significant threats to the organization's operations. The most exposed and vulnerable risks

were found to be disaster (human caused), misuse of information systems, breach of legislation, compromising confidential information, destruction of records, failure of communication links, interruption of business processes, unauthorized changes of records, and user error.

Disaster, whether natural or human-caused, is a risk that can have devastating effects on the organization. It can cause damage to physical infrastructure, disrupt operations, and result in significant financial losses. Misuse of information systems is another risk that can compromise the security of the organization's data. This can occur through intentional or unintentional actions, such as accessing or sharing sensitive information without proper authorization.

Breach of legislation is a risk that can lead to legal and financial penalties, damage to the organization's reputation, and loss of customer trust. Compromising confidential information, whether intentional or unintentional, can also result in significant harm to the organization. This includes the theft or unauthorized disclosure of sensitive data such as financial information, personal data, or trade secrets. Destruction of records, whether through intentional or unintentional means, can result in the loss of important information that is crucial to the organization's operations. Failure of communication links can result in the inability to communicate with customers, partners, or suppliers, and interrupt business processes, resulting in delays or even the inability to deliver products or services.

Unauthorized changes of records can result in data inconsistencies and errors, compromising the integrity of the organization's data. Finally, user error is a risk that can lead to accidental data loss or exposure, which can be costly to the organization.

Conclusion

In conclusion, the evaluation of Zobox data has shown that several risks pose significant threats to the organization's operations. To mitigate these risks, the organization must implement appropriate measures such as disaster recovery plans, security protocols, and employee training programs to ensure the safety and security of its operations and data. To address these risks, the organization must develop a comprehensive security policy that outlines the necessary measures to ensure the safety and security of its operations and data.

The security policy should include guidelines on disaster recovery plans, access controls, data backups, encryption, employee training, and incident response. The policy should also address how the organization will comply with relevant laws and regulations and ensure the confidentiality and integrity of sensitive information. By creating a basic security policy that takes into account the risks identified through the evaluation of Zobox data, the organization can improve its overall security posture and minimize the impact of potential threats. This will help to protect the organization's reputation,

ensure business continuity, and maintain the trust of its customers and partners. Therefore, it is imperative for the organization to take action and prioritize the development and implementation of a security policy to address the identified risks.

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SOCIAL ENTREPRENEURSHIP IN LATVIA

Dionisii Bielientsov

*ISMA University of Applied Sciences,
Lomonosov str. 1, Rīga, LV-1019, Latvia*

Corresponding author's e-mail: qualitywinnerone@gmail.com

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Abstract

The study looks at organisations that provide support for social entrepreneurship in Latvia. Social entrepreneurship projects that have been successfully implemented in Latvia have been identified. It has been established that Latvia has a legal and regulatory framework which regulates the functioning of social entrepreneurship, a structure which provides financial support for social entrepreneurship has been created. The problems, which do not allow effective functioning and development of social entrepreneurship in Latvia, have been determined. The ways of solving the problems of development of entrepreneurship are proposed and the necessity of using information technologies in the development of social entrepreneurship in Latvia is pointed out.

Keywords: social entrepreneurship, projects, state support, information technologies, Latvia.

Introduction

Social entrepreneurship as an effective tool for solving social problems is a rapidly developing sector in Europe, including Latvia. Although it is, still a relatively new concept in Latvia, every year more and more social enterprises are addressing a variety of social problems and challenges by offering a wide range of solutions. Social enterprises as an interdisciplinary type of entrepreneurship often face obstacles and challenges that conventional businesses and civil society organisations have already overcome: lack of legal framework, complex business models, identity issues, lack of awareness among the public, low visibility, and problems accessing investment markets. These problems cannot be solved overnight. This requires not only that social enterprises themselves find rational and effective solutions, but also that they have a strong and functioning social enterprise ecosystem that enables them to find long-term, collaborative, integrated solutions.

Results

Social entrepreneurship in Latvia is an actively developing field. Currently there are several organisations in Latvia providing support and information for social entrepreneurs. One such organisation is Social Entrepreneurship Association of Latvia (SEAL), which provides information and assistance in

planning, developing and managing social enterprises and marketing strategies. In addition, it provides practical tools for social entrepreneurs and support in obtaining investment, and develops and supports a network of Latvian social entrepreneurs. It also offers trainings and events on social entrepreneurship [1].

There are several social enterprise projects in Latvia, namely: the “Mentor” educational project, “My Business Plans” project, “Economic Support” project, “Social Protection” project, “Social Entrepreneurship” project.

In Latvia the state provides support for social entrepreneurship on different levels. The state provides financial support for social entrepreneurship in the form of grants, potential development, training and support for business ideas. State agencies and other authorities provide additional support in the form of information, advice, training, referrals, legal assistance, etc.

The Investment and Development Agency of Latvia provides money for social entrepreneurship in the form of grants and loans. They can be used to finance various social projects, including projects aimed at social inclusion, business development, job creation, etc. [6].

The Latvian government is also constantly looking for new ways to support social entrepreneurship. Recently new legislative initiatives have been proposed which aim to support the development of social entrepreneurship in Latvia. Public and private donors also provide financial support for social entrepreneurs and initiatives.

There are also a number of other programmes in Latvia, which support social entrepreneurship. For example, the Latvian government programme “Investment in Social Entrepreneurship” is designed to support innovative social enterprises and projects. The programme allows entrepreneurs to receive financial support for social entrepreneurship related projects [7].

There are also a number of non-governmental organisations and social movements in Latvia that promote and strengthen social entrepreneurship in Latvia. For example, the Regional Centre for Social Entrepreneurship offers advice, training and marketing services for social entrepreneurs. Other organisations, such as the Social Entrepreneurship Centre, provide advice on planning and entrepreneurial thinking as well as tools and information on social entrepreneurship in Latvia [8].

We have identified the problems of social entrepreneurship in Latvia:

low knowledge and understanding of entrepreneurship: entrepreneurs have insufficient knowledge and understanding of how to successfully launch and run a business. Having insufficient education and experience is a big problem for social entrepreneurs in Latvia;

lack of finance for small businesses: access to finance for SMEs remains a problem for social entrepreneurs in Latvia. Access to credit is the main source of funding for small businesses, but entrepreneurs face high interest rates and other obstacles;

insufficient government support: there is a lack of political support for social entrepreneurship in Latvia. The lack of government support for social enterprises significantly limits their ability to attract investment;

low level of social responsibility of enterprises: the existence of a low level of social responsibility of enterprises is another serious problem for social entrepreneurship in Latvia. Businesses do not appreciate the potential and importance of socially responsible business practices.

Conclusions and Proposals

There are many organisations supporting the development of social entrepreneurship in Latvia. They provide information, tools and practical support for social entrepreneurs as well as financial assistance.

The state also supports and promotes social entrepreneurship. A legal and regulatory framework has been formed and funding is available for social enterprise projects.

In our opinion, the main directions for solving the problems of social entrepreneurship in Latvia could be:

- creating a favourable legal and financial environment for social entrepreneurs. This can include the development of supportive regulations and guidelines, as well as the provision of tax incentives and funding support;

- improving access to information and training. This could include creating training and information exchange programmes for social entrepreneurs and providing access to data and research that can help them improve their projects;

- supporting social start-ups and innovation. This can include economic instruments, such as investments and support services, as well as the creation of financial support programmes;

- supporting networks and clusters of social entrepreneurs. This may include creating platforms for exchange of ideas, cooperation and support, as well as regular meetings and events;

- supporting initiatives to raise awareness of social entrepreneurship. This could include funding education programmes and information campaigns.

In addition, we think that information technology can significantly develop social entrepreneurship in Latvia. They make it possible to create and disseminate information about projects, provide the opportunity to conduct surveys and research, and support dialogue with partners and donors. Information technology will allow social entrepreneurs to create innovations quickly and efficiently, reducing the time it takes to implement them. This will allow entrepreneurs to reach their goals faster while reducing costs.

Information technology also helps social entrepreneurs to produce market research and provide information on target audiences, which allows social entrepreneurs to target their resources and increase their social impact.

Overall, information technology offers great opportunities for social entrepreneurs, allowing them to achieve greater results at minimal cost. They help entrepreneurs achieve greater social impact and success.

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Authors

Dionisii Bielientsov, 13 June 2002, Ukraine



Current position, grades: Bachelor student, study programme “Business administration”

University studies: ISMA University of Applied Sciences

Scientific interest: social entrepreneurship

Publications (number or main): published 3 thesis in conference proceedings in Latvia, Bulgaria, Ukraine

Experience: n/a

FINANCIAL ASPECTS OF SMART CITY DEVELOPMENT

Bohun Maksym

*PhD student of department of international economy,
Kyiv National Economic University Named After Vadym Hetman,
Kyiv, Ukraine, e-mail: bohunm@i.ua*

Gradual urbanization in the world leads to the strengthening of the need to solve problems that arise due to the complexity of city systems, their growth and the formation of a whole ecosystem of a new level. In general, more than 4 billion people live in cities, and according to forecasts, the urban population will grow to 7 billion by 2050 [1]. In accordance with this, the issues of organizing a comfortable space for living in cities, improving the quality of life, and improving technology as a tool for implementing these tasks are being updated.

In the world, there are currently numerous examples of the implementation of strategies for the implementation of such solutions, the implementation of smartization in order to increase the comfort of living in cities. This is helped by technologies that alleviate or solve the problems of traffic jams, control of water and air quality and their purification, garbage removal and its disposal and processing, use of resources, improvement of energy efficiency, etc. [2] Smart cities use the latest technologies and innovations to create more efficient, safe and sustainable living conditions. Modern smart cities can use intelligent waste management systems to reduce the amount of garbage and optimize the process of its collection and recycling, smart lighting systems that provide automatic switching on of lights depending on the ambient light, which reduces electricity costs and reduces carbon dioxide emissions.

The creation and development of smart cities requires the performance of several key tasks, in particular: the development of smart city infrastructure, the use of smart technologies, the involvement of the public in solving problems, and the provision of financing for smart city development projects. The development of the infrastructure involves, first of all, the strengthening of control and analysis of the life of the city, which means: the installation of various sensors and sensors, data collection systems, the formation of communication networks and systems that provide data processing and their systematization. Smart technologies involve the use of artificial intelligence, blockchain and Internet of Things technologies to collect and process data, as well as to develop innovative solutions. Involvement of the public involves, first of all, increasing the motivation of the local population to solve certain problems.

An important task in the process of creating and functioning of a smart city is the provision of the necessary financing, the inflow of financial resources to solve the special tasks of a smart city. The financing of smart cities is an important problem, as it forms the prerequisites for the implementation of certain projects. The transition of an ordinary city to the concept of smart cities requires significant expenses for R&D, infrastructure development, improving the skills of employees, educating the population, etc.

In general, the key financing tools for smart cities are:

1. State investment, which involves the allocation of budget funds for the development of innovative technologies that can stimulate the development of the smart economy.

2. Private investments: venture funds, banks and other private investors can invest funds in the research and development of new technologies, the implementation of specific projects that can become important steps in the development of the smart economy.

3. Lending: banks can provide loans for the development of smart projects, in particular for the expansion of infrastructure and the development of new technologies.

4. Tax Incentives: Governments can provide tax breaks and rebates to companies developing technologies that can become important for a smart economy and smart city infrastructure.

5. International investment: foreign investors can provide financial support for the development of the smart economy in countries where they see the potential to increase their profits, the introduction of smart technologies.

6. Budget optimization: cities can reduce costs of energy and other resources thanks to the use of smart technologies that allow for more efficient use of resources

7. Public-Private Partnerships: Financing of smart cities can also be organized in the form of public-private partnerships, which involve cooperation between the public and private sectors. Partnerships with private companies may provide funding and expertise in exchange for profit sharing or other financial incentives.

8. Crowdfunding: a mechanism for attracting financing from the general public, when financing takes place on the basis of co-financing by the authorities, investors, and the public.

9. Grants and subsidies: Funding for a smart city can also be obtained through grants and subsidies from governments, foundations and other organizations. These funding sources can be used to support specific smart city projects, such as energy-efficient street lighting, smart transport systems or renewable energy projects.

10. Municipal bonds and loans: local authorities can raise financing for the development of smart cities by issuing municipal bonds and obtaining loans from banks and other financial institutions.

The instrument of municipal participation in the formation of a smart city is quite interesting. Municipal bonds are a type of bond issued by local governments, such as cities, counties, or local councils. These bonds are used to raise funds for various projects, such as the construction of roads, schools, parks, water systems, and other projects that may benefit the community. Municipal bonds typically have a lower level of risk compared to corporate bonds because they are issued by local governments with stable revenues and limited opportunities for default. Also, they can have more favorable terms of interest payment compared to corporate bonds, which makes them attractive to investors [3].

Such tools are quite actively used for the formation of a comfortable social infrastructure and meritorious benefits. For example, in 2022, the city of Berlin issued municipal bonds to finance the construction of social and environmental projects through so-called sustainable development bonds [4]. Similar bonds are quite actively used by the government of the state of North Rhine-Westphalia, which in 2020 issued its ninth sustainable development bond for a total amount of 3.5 billion euros (terms of 10 and 30 years) to finance social and environmental projects. Bonds were primarily issued for investors who support green investments and wish to receive more information about the state of ecology, environmental projects, etc. [5]

In general, we can note that the formation of a smart city is a complex process, which involves the simultaneous implementation of a large number of projects of rather high complexity and, accordingly, requires significant funding. This, in turn, requires the development of funding sources that can be used both separately for projects and in combination, depending on the needs of the city, its financial condition and the needs of a specific project.

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AUTHOR

Bohun Maksym, 16.01.1982 Ukraine

Current position: Postgraduate (International economic relations), department of international economic, Kyiv National Economic University named Vadym Hetman, Kyiv, Ukraine
Cherkasy State Business-College, Cherkasy, Ukraine

University studies: Bohdan Khmelnytsky National University of Cherkasy

Scientific interest: smart economics, finance management

Publications: 15 works

Experience: 18 years teaching and scientific activity



IMPLEMENTATION OF VIRTUALIZATION OF THE SERVER PART AT THE ENTERPRISE

Vladyslav Brusentsov, Serhii Burmistrov, Serhii Mykhailuta^{*1}

¹Cherkasy State Business-College, Ukraine

**Corresponding author's e-mail:arconiel456@gmail.com,
kafedraKIIT@gmail.com*

Abstract

In the this theses, we will discuss the technology of virtualization. Virtualization technology involves the process of moving all enterprise services from desktop computers to virtual servers, which can unsure uninterrupted operation of these same services, especially during hourly power outages when all services may continue to operate. Implementing this technology in the enterprise involved not only studying the technology itself but also learning software complexes for managing virtual servers, conducting analysis and research.

Introduction

With the growth of information technology, more and more servers and services are transitioning to server virtualization or to the cloud. Virtualization technology has long been used in various industries and simplifies the process of building cloud services by reducing the amount of necessary equipment for various tasks, which in turn eliminates the need for purchasing and servicing it.

Given this, the question arises of choosing virtualization technology for the company's services. There are two common types of virtualization: hardware and container. They have both common and different functionalities, which provides variability in choosing when developing the company's services, but at the same time raises the question of which technology will better meet all usage conditions.

Overview

Implementing server virtualization at an enterprise is the process of deploying virtualization technology to ensure optimal operation and efficient utilization of server resources within the enterprise. Virtualization enables the consolidation of multiple physical servers into a single virtual environment, which simplifies server management and maintenance.

The implementation of virtualization technology within an enterprise has numerous benefits, such as cost savings on server maintenance and reduced electricity consumption. Additionally, virtualization provides greater

reliability and data protection, as it enables the creation of backups and data recovery in case of disasters.

When choosing virtualization technology for an enterprise, several factors must be considered, such as the size of the enterprise, data volumes, performance requirements, and security demands. Different types of virtualization have their own advantages and drawbacks, so it is necessary to carefully consider each option and choose the optimal one for the specific enterprise.

Decision

To successfully implement virtualization of the server part at the enterprise, it is necessary to:

1. Conduct an analysis of the existing hardware and infrastructure to determine the optimal virtualization technology.
2. Select a suitable software product for virtualization implementation, taking into account the enterprise's needs.
3. Plan and prepare the infrastructure for virtualization deployment.
4. Test the solution before launch to verify its effectiveness and proper functioning.
5. Implement virtualization of the server part and transfer the necessary functionality to it.
6. Provide support and maintenance of virtualization to ensure uninterrupted system operation

Conclusion

This article discusses how virtualization is an effective solution for improving the efficiency of a company's server infrastructure. Implementing virtualization can reduce the amount of necessary equipment, which in turn reduces costs for purchasing and maintenance. Additionally, virtualization allows for more efficient distribution of workload on the server side, increases reliability, and provides faster access to necessary information. When choosing between hardware or container virtualization, it is important to carefully analyze usage conditions and consider the common and distinct functionalities of each type. Implementing virtualization is a key step in improving a company's server infrastructure and ensuring more efficient overall operation.

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ANALYSIS OF QUALITY ASSURANCE IMPACT ON SOFTWARE DEVELOPMENT

Ihor Demchenko, PhD Vladyslav Khotunov , Stanyslav Marchenko*

Cherkasy State Business-College, Ukraine

**Corresponding author's e-mail: youngdemi2002@gmail.com ,*

vkhotunov@gmail.com

Abstract

These days, business requires the creation of their own information systems. They can have different goals, but the main purpose is to save man-hours, automate some processes and, of course, improve calculation speed, where needed. Developed products became definitely bigger with a kind of more really complex business logic (e.g., banking) and integrations with other platforms and/or microservices.

Throughout the history of computing, many software and systems to be delivered into operation subsequently had high impact failures or were not able to meet the needs of stakeholders due to existing flaws. Most people definitely have experience with software that did not work as expected, or so they essentially thought. If the software doesn't work properly, it can cause many problems such as money, time or reputation. Quality Assurance is a way to reduce the risk of software failures during operation.

Keywords: quality assurance, context-based testing school, testing methodologies applicability

Introduction

Software problems will always exist in every software product: not because developers are irresponsible or careless, but because software

complexity is hard to determine – and humans have limited capacity to handle complexity. Design flaws can never be totally eliminated in any complicated system. Detecting the design defects in software is just as difficult, for the same complex reason. Since the software and digital systems are not continuous, testing boundary values are not sufficient to guarantee accuracy.

Software Testing (or quality assurance and quality control) is the process of evaluating and verifying that a software product or application works as expected. Or, it may include activities aimed at assessing the attributes or features of a program or system to determine if it meets the requirements. Quality assurance in deeper understanding also involves verification activities for some project documentation through the static testing techniques.

Quality assurance has become a weighty part of the software development life cycle. Modern and popular SDLCs, such as Scrum or V-Shaped models, involve testing as early as possible. The key purpose is to mitigate possible risks of intractable defects in the final stages of development. Quality assurance only makes sense in the case conducted against project needs, the system under test is suitable to final Users' needs and works as expected according to specification.

Summarizing described above: all of the mentioned meanings are called to achieve delivering high-quality software development and saving money by issues identification as early as possible.

From an official point of view, we have an ISO 29119 standard that reflects the software testing practices from most popular institutes (such as ISTQB or TMMI) and even some IEEE standards for testing documentation (f.e. IEEE 829). But the real business prefers to apply context-based testing approaches.

Quite important thing is to build project processes (not only testing) by taking into account possible risks and decreasing their influence on the final product. There is no actual (or standardised) and full set of risks that suits every project – every business has their own, but the following types can be common in one or another interpretation:

- Imprecise time estimates
- Mistaken identification of complexities, functionalities, or operations
- Insufficient regression time
- Incomplete validation
- Poor risk control

However, the problem is that standards of testing avoid taking into account context. They mostly describe widely used software testing methods and activities (defined by testing institutes) but avoid business problems. Standart based testing is applicable only for projects that use linear-sequential life cycle models (f.e. Waterfall).

As we know, agile software development models is a combination of iterative and incremental models with the main focus on adaptability, customer needs and rapid delivery of software that is ready to use in production. In other words, it is non-traditional SDLC models that have the main priority on the flexibility of the development process. ISO 29119 standard cannot guarantee flexibility for the quality assurance process through software development.

Nowadays development processes would like to involve the QA team in the early stages of negotiations with customers concerning the future project and real practice shows that they can be very useful because project managers focus on business and scope, developers focus on technical implementation and architecture structure, in turn, QA engineers analyse final users needs, common user flows (with the required set of features) and can even define high-level quality characteristics that should be met at the end of development.

Overview

This article discusses the advantages, disadvantages and conclusions on the following issues:

- Quality Assurance role in modern SDLC models
- Context-based testing approaches
- Testing standardization perspectives

Decision

The experience of big software companies (f.e. Apple, Google, Microsoft) shows that ISO standards that refer to software testing are not suitable for modern SDLC models.

Real businesses prefer to use context-based software testing school introduced by James Marcus Bach and Cem Kaner. Furthermore, the statistic shows that applying context-oriented testing activities is cost-effective in a long range perspective. Mentioned testing approaches are based on the following principles:

- The value of any practise depends on its context
- There are good practices in context, but there are no best practices
- People, working together, are the most important part of any project's context
- Projects unfold over time in ways that are often not predictable
- The product is a solution. If the problem isn't solved, the product doesn't work
- Good software testing is a challenging intellectual process
- Only through judgment and skill, exercised cooperatively throughout the entire project, are we able to do the right things at the right times to effectively test our products [3].

History knows real examples of software that was based on a great idea to solve a user's problem and no reasons to expect otherwise, but very serious

defects were identified in the latest stages of development (for example during acceptance testing). Sometimes the cost of a mistake can be comparable to the cost of developing a system or part of this system from scratch.

Quality assurance only makes sense in the case conducted against project needs, the system under test solves the final Users' problem and works as expected according to specification.

Conclusion

Software development, of the course, is fraught with risks. Some of them can be minor and easily surmountable, but other ones can have a huge and even destructive impact on the developed system and/or project. In an ideal world, risks must be handled by the whole project team and processes have to be established with appropriate risk analysis and control. But the statistic shows, applying testing activities (and the QA team formation) against context improves the effectiveness of the testing process.

Testing should take into account risks all the time and optimize processes in order to reduce the risk of their happening and decrease their impact on the project. From the cost of bug statistics, we know that the cheapest way to predict bugs is to fix mistakes in the documentation. The best bug is the one that never happens.

Investments into the Quality Assurance are usually returned as mitigation cost of bugs by identifying them in early stages. So, today managers and stakeholders prefer to integrate testing activities as early as possible and conduct it against the project (and/or business) concern.

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WEB APPLICATION TO HELP SMALL BUSINESSES KEEP RECORDS

Ivan Diakov, PhD Serhii Burmistrov

¹Cherkasy State Business-College, Ukraine

**Corresponding author's e-mail: razezone.so@gmail.com,
sergii.vl.burmistrov@ukr.net*

Abstract

The main goal of this project is to create a web application that would aid small businesses in maintaining their financial records. Web apps are becoming more and more crucial in today's business environment for optimizing operations and enhancing productivity. This program is created to be user-friendly and economical so that small business owners with minimal resources can utilize it. The project specifies the application's primary goals, which include giving record-keeping and financial reporting facilities. The work's conclusion highlights the application's potential advantages for small enterprises, including better financial management and decision-making.

Keywords: business, web apps, financial records.

Introduction

Small businesses frequently struggle with effective financial management, especially in the early stages. Yet, as a result of technological advancements, it is now possible to construct user-friendly and affordable web applications that can help small businesses with record-keeping and financial administration.

The objective of this project is to develop a web application that provides tools to small business owners so they may manage their finances more effectively. Small business owners will be able to monitor their sales, expenses, and other financial data and create financial reports to help them make decisions about the future course of their company.

Small business owners can better manage their finances and concentrate on expanding their companies by offering a practical and user-friendly solution. Financial management could change thanks to the creation of a web application for small enterprises, making it more convenient and affordable.

Overview

The main objectives of this work:

- Create a web application that small business owners with little technical experience may use easily.

- Develop a system that is reasonable and economical to assist small businesses in managing their finances and maintaining correct records.
- Give small business owners the resources they require to maintain a record of their earnings, expenses, and other financial transactions.
- Provide small business owners the ability to produce financial reports, including balance sheets and income statements, to aid them in making defensible choices about the direction their company will take.
- Make sure the application is scalable so that it can develop alongside the business as it grows and its requirements change.
- Create the application with security in mind, guarding against theft or unwanted access to the financial information of small business owners.

Conclusion

It is impossible to overstate the advantages of such a web application. Small business owners can concentrate on expanding their companies rather than becoming bogged down in administrative tasks thanks to simplified record keeping. By giving small business owners accurate financial information, the program can also aid them in avoiding costly mistakes. Furthermore, the application's global accessibility enables business owners to travel and work remotely without compromising their record-keeping obligations.

In general, developing a web application for small business record keeping is a wise investment in the development and success of these companies. This application has the potential to revolutionize the way small businesses function and thrive by offering a cost-effective and simple-to-use tool for managing financial records

EVALUATION OF UNIVERSITY POSITION IN NEW CONDITIONS

Djakons Romans

Latvia, ISMA

e-pass: romāns.djakons@isma.lv

Abstract

The relevance of this research is to use an assessment tool that identifies the weak links found outside the university. Their timely identification and prevention allow avoiding potential losses in the future. This is achieved through the analysis of business information used as part of a unified system. Such a system is set up for full-valued assessment. With help of the reasonable defined rates, it is possible to obtain performance conclusions about the state of the university.

Keywords: analysis, rates, system, coordination, requirements, decisions, procedure

Introduction

Considering that the totality of the established needs of educational programs contradicts their consumable needs, the problem of the study was expressed in the following wording: "It is impossible to effectively measure the change in the potential of an educational organization with a loss of trust on the part of all its participants".

Evolution of the system

The object of the full-valued assessment is the management tool used in the coordination of external and decisions made. Aim of the research is to standardise procedures for using compatible assessment techniques to find informed ways of improving the university. In accordance with the aim, the following tasks were formulated:

- 1) To identify the features of a full-valued assessment
- 2) To formulate the requirements for a full-valued assessment of the university.
- 3) To make a choice of an effective technology for a full-valued performance assessment
- 4) To develop an condition diagnosis procedure. .

As a result, it has been established that the full value of the assessment characterises the organisation's ability to justify both the magnitude of the additional benefit and the value of the damage avoided.

Conclusions

The use of new diagnostic tools makes it possible to unlock the growth potential of an organization in a new environment. The increase in growth is determined on the basis of algorithms that provide fixation of the change in the position of the university. This ensures that performance norms and efficiencies measures are synchronized.

REQUIREMENTS FOR ORGANISATION'S POSITION DETECTION

**Romans Dyakons, Vsevolods Karajevs,
Dina Kelsina, Rostislavs Kopitovs**

Latvia, ISMA,

*e-pass: romāns.djakons@isma.lv, karajevs@inbox.eu, d.kelsina@gmail.lv,
rostislavs.kopitovs@isma.lv*

Abstract

The conclusion about an organisation's capacity to operate is made within a system of reasonable standards and on the basis of value. From the point of view of the assessment, we are talking about a superposition model, in which each change is implemented at the level of a contribution to the enterprise value, assessing at the support stage. Assessment in the context of testing is considered as the attitude to the phenomena of difficulties identified in expert activity, which was organized to establish the significance of key attributes, which determine the strategic position of the organization.

Keywords: specifications. effectiveness, technology, choice, value, elements, contribution

Introduction

As a result, twelve requirements were formulated that will be used in the selection of valuation tools that allow assessing the position of the organization on the basis of value. In fact, the above requirements are high-level specifications. They have been given a high status due to the fact that on their basis the choice of the best technology will be made, which will be used as part of a full-valued assessment system. More as part of the adopted technology, ranges of key parameters will be established and validated, on the basis of which the effectiveness is measured and the organisation's

performance conclusion formed. During the research and study, it was found that there were five technologies that are being used during value-based management.

Choosing an effective technology for a full-valued performance assessment

The requirements, considered in the context of full value, provide the basis for the selection of the appropriate technology. Such grounds are put forward in the light of the survey of static and dynamic business valuation methods carried out. The formulation of their use is due to the analysis of the shortcomings of traditional evaluation mechanisms and the review of trends in the field of financial and organizational consulting. Based on the twelve requirements, the characteristic of the five most effective technologies is given. When selecting these technologies, two points were taken into account. Firstly, the significance of each requirement was determined, and secondly, the importance of a particular technology was taken into account. Secondly, five quantitative values were obtained, which reflect the degree of suitability of each technology considered in the context of assessing the viability of the organization. In terms of value, the choice of the best technology from the point of full-scale technology was carried out. As a result of this analysis, the "Pentagram of value" technology was selected, with a maximum score of 4.665 (with a norm of > 2.82) [1]. We are talking about the Copeland-Dolgoff model, in which each change is realised at the level of a contribution to the enterprise value. Such contributions are evaluated at the maintenance stage. By making a consistent transition from present value to reconstructed value, the four states of the enterprise are evaluated.

Results

As a result, the increase in value reaches up to 200% [2]. Such growth is possible if the contribution to the value of all elements involved in a full four-phase system evaluation is known, and the selection of the best alternative, validated by a system of quantitative assessments, is carried out. Once you know the contribution of each element, you can begin to measure the effectiveness of the overall activity. A researcher who dives into the theory of performance measurement must clearly adhere to the main condition. In the aggregate, the compliance of the norms of the whole process and the measures of the complete activity is necessary for working with a real object. The uniqueness of the approach lies in the fact that any contribution is evaluated at the maintenance stage. Moreover, it is necessary to first go through four stages, at which actions are carried out at the level of expert reports. As they are confirmed, a conclusion is made about the organization's performance.

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CONSTRUCTION OF THE MODEL FOR *AB INITIO* CALCULATIONS OF CHALCOPYRITES

**A. Gopejenko*¹, J. Grechenkov¹, D. Bocharov¹,
A.I. Popov¹, M. G. Brik², S. Piskunov¹**

¹*Latvijas Universitātes Cietvielu fizikas institūts*

²*Fizikas institūts, Tartu universitāte*

*Corresponding author's e-mail: agopejen@inbox.lv

Abstract

Chalcopyrites are ternary semiconductors, which possess a highly symmetrical crystal structure and a direct band gap. A model for the calculations of chalcopyrite materials has been developed based on the well-studied CuGaS₂ and CuGaSe₂ chalcopyrites within the framework of this study. This model has been applied for the *ab initio* calculations of perfect AgGaS₂ and AgGaSe₂ chalcopyrites to test whether it reproduces the basic parameters of the materials. Then the calculations Cr_{Ga}, Zn_{Ga}, and V_{Ga} have been performed to assess the influence of these defects on electron structure of the materials. The analysis of the calculations revealed that defect atoms resulted in the conductive state of the materials while perfect AgGaS₂ and AgGaSe₂ are insulators.

Keywords: density functional theory, ab initio calculations, chalcopyrite, photovoltaic materials

Introduction

Chalcopyrites (CP), are ternary semiconductors with the general chemical formula I-III-VI₂ (I=Cu, Ag, III=In, Ga, Al, VI=S, Se, Te, etc.) or II-IV-V₂ (II=Be, Mg, Zn, Cd, IV=C, Si, Ge, Sn, V=N, P, As, Sb, etc.). CP possess a highly symmetrical crystal structure and a direct band gap that are preferred in solar cells (Figure 1). CP crystallize in the I4₂d space group, No. 122, with

four formula units in one unit cell and have tetragonal crystal structure. Partial or complete substitution of cations or anions allows fine-tuning of the structural and physical properties of CP solid solutions due to the high flexibility of chemical composition.

AgGaS_2 and AgGaSe_2 possess important infrared nonlinear optical properties. The former is transparent both in the visible and infrared range from 0.7 to $12\mu\text{m}$, while the latter is opaque in the visible region and transparent in the infrared region from 0.7 to $20\mu\text{m}$ [1].

The first principle calculations have been performed for AgGaS_2 and AgGaSe_2 . At first perfect AgGaS_2 and AgGaSe_2 structures have been calculated followed by the modelling of Cr, Zn, and V atoms substituting Ga atoms in both materials. Structural and electronic properties have been calculated for both perfect AgGaS_2 and AgGaSe_2 as well as for both materials containing defects. The construction of density of state and band structure plots and band structure allowed investigation of the substitute atoms on the electronic properties for the materials under investigation.

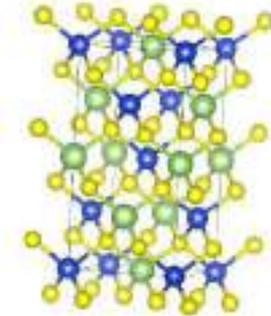


Figure 1. The model of chalcopyrite

Computational details

CRYSTAL17 computer code [2,3], which employs Gaussian-type functions centred on atomic nuclei as the basis sets (BS) for an expansion of the crystalline orbitals has been used to perform hybrid DFT calculations. The following BSs have been used in the calculations: Cu – Cu_pob_TZVP_rev2, Ga – Ga_pob_TZVP_rev2, S – S_pob_TZVP_rev2, Se – Se_pob_TZVP_rev2, Ag – Ag_POB_TZVP_2018, In – In_POB_TZVP_2018.

Heyd-Scuseria-Ernzerhof hybrid exchange–correlation functional (HSE06) [4], which uses a screened hybrid functional and includes the exact nonlocal Fock exchange has been used in the calculations.

The calculations were performed using the exchange-correlation hybrid HSE06 functional. The Brillouin zone has been sampled by $8 \times 8 \times 8$ Pack-Monkhorst net [5] resulting in 59 k-points in total for bulk calculations, 260 k-points in total for ideal $2 \times 2 \times 1$ supercell, and 868 k-points in total for $2 \times 2 \times 1$ supercell containing a single defect.

Results

The calculated lattice parameters for AgGaS_2 are $a = 5.74 \text{ \AA}$ and $c = 10.50 \text{ \AA}$. The direct energy band gap is estimated to be 2.62 eV. These results are in a good agreement with the experimental data. The calculated lattice parameters for AgGaSe_2 are $a = 5.97 \text{ \AA}$ and $c = 11.06 \text{ \AA}$. The direct energy band gap is equal to 2.22 eV. While the lattice parameters are in a good agreement with the experimental data the band gap value is slightly overestimated.

The supercell model of both AgGaS_2 and AgGaSe_2 has perfectly reproduced the results received in the calculations of the bulk materials. This allowed to proceed with the calculations of the Cr_{Ga} , V_{Ga} , and Zn_{Ga} defects in both AgGaS_2 and AgGaSe_2 .

DOS and band structure plots have been constructed and analysed for all the calculated structures. The analysis of the electronic structure has revealed that the induction of the defects transformed the electronic state of the materials from insulator to conductive.

Conclusions

Calculations of AgGaS_2 and AgGaSe_2 have been performed using the Crystal computer code. The calculated lattice parameters and band gaps are in a good agreement for both AgGaS_2 and AgGaSe_2 with the experimental data.

Adding defect atoms significantly affected the electronic properties of the materials making them conductive while perfect AgGaS_2 and AgGaSe_2 are insulators. Thus, even small concentration of the defect

Acknowledgements

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DEVELOPMENT THE MOBILE APPLICATION FOR PREVENTIVE EYE MUSCLE TRAINING AND STRENGTHENING DEVICE EYE ROLL

Viktors Gopejenko^{1,2}

¹*ISMA University of Applied Sciences, Latvia,*

²*Ventspils University of Applied Sciences,*

Corresponding author's e-mail: viktors.gopejenko@isma.lv

Abstract

In the framework of this research, the development of EyeRoll mobile application on the Android platform for an electronic device to train and strengthen the eye muscles is considered. Software development combines a methodology based on research in the field of optometry and vision science, user-friendly and easy-to-use functional design, and also provides feedback and evaluation of the progress in using the device.

Keywords: Android application, electrical eye training device, eye muscle training and strengthening, vision training, eye muscle relaxation

Introduction

Currently, there is an issue on the market of simulators for training and strengthening the eye muscles due to the following factors [1, 2]:

1) they are limited in use by the place and time (e.g., they are available only at the appointed time under the supervision of a specialist such as an

ophthalmologist or an oculist). They require professional knowledge for their effective use;

2) they continue to strain their vision using smart devices and/or computer programs

3) they have limited technical capabilities and proposed solutions, e.g., insufficient range of application and the range of activity of the oculomotor muscles;

4) the existing exercises are monotonous, therefore they do not provide sufficient compliance and motivation for regular training [3].

Vision training is one of the most effective additional procedures for normalizing and improving the functioning of the eye muscles. This was the reason behind the development of a device for preventive training and strengthening of the eye muscles to maintain a favorable tone of the eye motor function. The device consists of a housing, a light source (laser), two elements for coordination of the x and y axes (motors), a reflective surface and a microcontroller unit (MCU). The device is controlled by the software that provides the communication between the device and other external devices such as smartphones, tablets, computers and databases (Figure 1). The software has two modes: Relaxation – for the relaxation of the eye muscles and Training 1,2– for strengthening and development of the eye muscles.

The development of the software adapted to the user's requests based on the parameters of the user's behavior, such as the time spent working on the computer, the intensity of the activities, daily functions, etc. is considered in this work.

The main parameters of the software functionality:

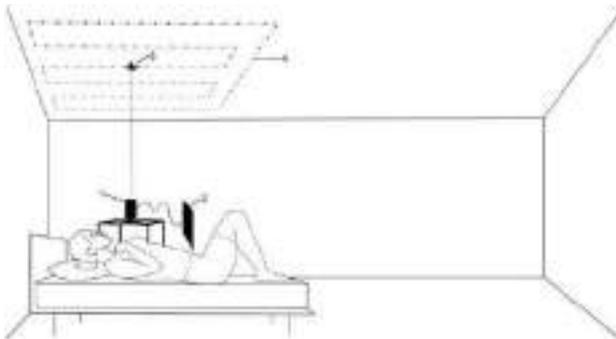
- the possibility of changing the parameters taking into account the training environment and individual tasks and goals of the user.

- the possibility of using the device independently without supervision of the vision specialist

- automatic feedback and a report generation based on the completed work according to the developed methodology;

- collection and analysis of the information and data to find individual solutions for the users based on the data collected by all users about the most effective and appropriate vision training and eye rehabilitation (AI) programs.

Users registered in the application have access to the analysis of the information and data of the vision training, expert opinions and recommendations. The application analyzes the overall progress of users and offers personalized plans and exercises for eye relaxation and training based on the data obtained from various sets of exercises.



**Figure 1. Using the device while lying down
(1-EYE ROLL, 2-smart device; 3-light pulse) [1]**

Decision

The EyeRoll application: algorithms and the logic of functioning.

1. Data collection.

a) User profile (age, use of glasses/lenses, hours at computer). Based on these data, a general score of the user (S_U) is derived. The score ranges from 0 to 10, where 10 means ideal conditions.

b) The program determines the desired number of exercises a day (denoted by N) depending on the number of hours spent in front of the screen,

c) If the relaxation mode is chosen, the user is asked to answer a set of 7 questions about the quality of her/his eyesight. Each question has 4 answers, ranging from 0 to 3. Thus, the overall score ranges from 0 (ideal) to 21 (very bad). Denote this number by S_E .

2. Daily use.

a) In addition to performing its regular functions, the application should remind the user about the need to make a pause and conduct an exercise. The frequency with which the notification appears depends on the required number of trainings per day. E.g., there should be at most $N/2$ notifications.

b) After each successful exercise (successful means that it was not aborted by the user, and the evaluation was done within a certain amount of time after the end of the exercise; otherwise, the exercise is considered as unsuccessful and the result is discarded). The user evaluates her/his state with one of 3 smiles: *Good*, *Neutral*, and *Bad*, which are encoded as 2, 1, and 0. At the end of the day, the mean note is computed as an **average** of all notes given during the day. Denote the respective mean note by $M(i)$, where i is the number of

the day counting from the first use. If in the j th day the user did not conduct any exercise, we set $M(j)=-1$.

c) Depending on the number of exercises per i th day, the efficacy of training $W(i)$ is computed as follows. Let n be the number of exercises per day. Then $W(i)=n/N$. If $W(i)>1$ (i.e., the user did more exercises than required), we set $W(i)=1$.

3. Evaluation of the results after a period of time.

It is assumed that the results are evaluated in 3 weeks. Otherwise, the suggested rules have to be adjusted.

a) In 3 weeks the user is asked to answer the same questions as in 1 c). The result is denoted by $\overline{S_E}$. If $S_E > \overline{S_E}$, then there is an improvement in the eyesight. by $\overline{S_E}$.

b) Based on the user evaluations the total evaluation is computed while taking into account the higher relative importance of the more recent evaluations. To do so, we use the following equation:

$$M = \frac{0.9 \sum_{i=1..7, M(i) \geq 0} M(i) + \sum_{i=8..14, M(i) \geq 0} M(i) + 1.1 \sum_{i=15..21, M(i) \geq 0} M(i)}{\text{total number of non-negative evaluations}}$$

This equation should be interpreted as follows: the average value of all non-zero evaluations is computed, the evaluations made during the first week are calculated with with the coefficient 0.9, while the evaluations made during the last week are calculated with the coefficient 1.1.

These coefficients are used to reflect the increased importance of the more recent evaluations. If necessary, the coefficients can be changed to 0.8, 1, and 1.2.

c) To estimate the work of the user during the considered period, we sum all $W(i)$:

$$W = \sum_{i=1..21} W(i)$$

The value $W > k$ means that the user made the number of exercises that is equivalent to exercising k days while making the complete set of exercises.

Making conclusion about the result of the application use

To make a conclusion about the outcome of the exercises we start by looking at M (see 3 b)).

a) If $M > 1.5$, the total outcome is positive. The user can be given a “present”, say, a new pattern.

b) If $1.5 > M > 0.8$, the outcome is neutral. If the user did more than 50% of exercises, we may attempt to stimulate his/her interest by rewarding a new pattern, giving a badge etc. If the average work is below 50%, we suggest the user to work more.

c) If $0.8 > M$, the outcome is considered to be negative. In this case, we check the amount of exercises performed as in the previous case.

d) If the neutral or negative outcome persists for more than 6 weeks and more than 50% of exercises are completed but there is no improvement in the quality of the eyesight (according to the evaluation of the questionnaire), then we suggest the user to visit a doctor.

Conclusions

The EyeRoll application was created using Java, an open-source mobile operating system, for Android smartphones. The program connects to the device that creates the red dot light patterns using the BluetoothAdapter object. The widget elements and native Android layout are used in the creation of the user interface.

Acknowledgements

Support provided by ERAF Project "Research and Application Methodology Development of a New Preventive Eye Muscle Training and Strengthening Device EYE ROLL realized at the ISMA University of Applied Sciences and University of Latvia is greatly acknowledged.

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SYSTEM OF INVESTING IN HOUSING CONSTRUCTION

Wladimir Gottmann

*Gottmann Estate Development GmbH
Geschäftsführer, w.gottmann@yahoo.de*

Abstract

The article defines the essence, main components and features of the investment system in housing construction. The current situation in the housing construction market in Europe is characterized. The directions of development of the European housing market are determined.

Keywords: forms of investment, investment mechanisms, sources of investments, subsidies, socialization of housing construction.

The relevance of studying the system, forms and dynamics of investment processes in the field of housing construction is very high in modern conditions, since the dynamic development of social and economic processes involves the development of new forms and methods of investment in order to create residential real estate. Investment is the most important element of any economic system, since it is a resource that allows you to create tangible and intangible benefits. At the same time, investment in construction ensures further expansion and reproduction of capital, creating a multiplier effect in the economy.

The purpose of investing in housing construction is to create housing as a durable commodity that meets the most important needs of the population. The investment system in housing construction is an open system that interacts with all participants in the investment process, as well as participants in the construction and sale of residential real estate. Organizational forms of investment – traditional (individual, loans, emission), alliances (corporations, associations), co-financing institutions, project financing. Investment mechanisms – construction financing fund, target bonds, co-financing institution, real estate operations fund. Sources of investment – budgetary and non-budgetary (internal: profit, depreciation; external: bank loan, housing certificate, equity participation, mortgage loan). The investment system in housing construction includes pre-project, design, financial and legal subsystems that have certain functions and the goal is the implementation of an investment project.

The general problem of system of investment in housing construction is the identification of sources of financing. The main sources of financing in housing construction are – private investments (investments of individuals

and legal entities: companies, non-profit organizations, associations, which may consist of own and borrowed funds); state (funds of different levels of the budget of the authorities, invested in order to provide the needy categories of citizens with housing, the acquisition of real estate for the needs of state authorities); mixed investments (investments consisting of funds from investors of different groups, such as public-private partnerships); foreign investment (capital invested by foreign agents in a construction project for the purpose of making a profit).

In economic science, housing is considered as a commodity that has several forms: an object for living, an object for acquiring ownership, an object for sale or rent. The modern housing market is a system of economic relations between the customer, contractors, the state, buyers, investors, suppliers and credit institutions in the field of housing construction, using the main factors of production in order to make a profit through its sale, rental and operation.

Describing the state of the modern housing construction market in Europe, one should note some stagnation and a slowdown in price growth in the construction sector. At the same time, experts note that the indicator of business activity in the construction sector still has a positive trend. The main problems of the housing construction market in Europe are currently considered: the lack of building materials and low water levels in water basins, which threaten supply and logistics, as well as the negative trends in the consumer market, reflecting a decrease in investment activity, both by the population and large companies. Together, these factors have a negative impact on the cost of housing construction.

The negative factor that caused the reduction in construction volumes is the war in Ukraine. Thus, as of June 2022, the volume of construction in the countries of the European Community decreased by 2.3%. The difference in production volumes between countries is very significant. The largest decline was observed in the construction sector in Austria and Germany: by – 6.3% and – 4.5%, respectively [1]. In these countries, the trend of labor and material shortages continues. There is also a significant decrease in the level of interest in the implementation of construction work, for example, in Germany. In the period 2021-2022 in Austria, a decrease in the level of permits for the construction of residential and non-residential facilities was noted. The most stable trends are demonstrated by the Netherlands – the country has a high growth in construction volumes in the sector of residential and commercial buildings. Similar trends are characteristic of the construction sector in Poland, which is characterized by consistently high growth rates in residential construction.

At the same time, European analysts note a number of problems related to the need to improve the system of investment in housing construction. Based

on the analysis of the experience of Austria, Finland, France, the Republic of Ireland, the Netherlands and Spain, scientists believe that the modern system of investment in housing construction in Europe should take into account the various national characteristics of the housing systems of the countries participating in the community, including:

- systems of subsidies, regulation and social security (direct subsidies, financial guarantees, tax incentives, inclusive zoning);
- cooperation of labor markets, land and finance, taking into account the peculiarities of state regulation;
- long-term consensus on private renting and its place in the housing system;
- socialization of the housing construction market, including social housing programs. In this regard, consideration should be given to increasing the role of “non-profit” housing providers (housing associations, cooperatives, state-owned companies) [2].

Also, analysts [1; 2] note the importance of countries and municipalities using transparent and efficient systems for assessing housing needs, as well as the appropriateness of the financial resources required for the construction of both new facilities and the improvement of existing housing stock. Thus, the need to study the theoretical and applied foundations of the investment system in housing construction is currently being updated.

Further research will be concentrated in the direction of studying the features of the forms of housing construction financing, taking into account the nature of the interaction between the subjects of the investment system (investor, customer, developer, contractor and buyer) in the framework of investment processes. At the same time, mechanisms for investing in the housing construction market require the development, taking into account modern scientific and applied approaches to financing investment projects in the housing construction segment.

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MODELING OF NAPHTHALIMIDE DIMETHYLANILINE COMPOUNDS. PROBLEMS OF TICT SIMULATIONS

Alytis Gruodis*

*Institute of Chemical Physics, Faculty of Physics, Vilnius University,
Saulėtekio Ave. 3, LT-10257 Vilnius, Lithuania*

**Corresponding author's e-mail: Alytis.Gruodis@ff.vu.lt*

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Abstract

Quantum chemical study of 4-(4-(Dimethylamino)phenyl)-N-(2-ethylhexyl)-1,8 naphthalimide (NA1), and 4-((4-(Dimethylamino)phenyl)ethynyl)-N-(2-ethylhexyl)-1,8-naphthalimide (NA2) compounds is presented and discussed. Problems of the ground state geometry optimizations and excited state geometry optimizations were evaluated through matching the simulated results with the experimental ones.

Keywords: quantum chemical study, naphthalimide compounds.

Introduction

Investigation of processes of intramolecular charge transfer (CT) is very important in organic optoelectronics.

Different macromolecular devices could be developed using carbazoles [1], fluorenes [2], naphthalimides [3] etc. Due to interaction with the surrounding media, the efficiency of the device may vary significantly. Essential changes of molecular structure and corresponding changes in charge redistribution predetermines the reactivity of molecule as well as sensitivity of sensor.

Naphthalimides belongs to class of pi-conjugated molecules which could be used for chemical sensors (for metal ions, anions, for reactive oxygen species) [3].

This work is devoted to the quantum chemical study of 4-(4-(Dimethylamino)phenyl)-N-(2-ethylhexyl)-1,8 naphthalimide (NA1), and 4-((4-(Dimethylamino) phenyl)ethynyl)-N-(2-ethylhexyl)-1,8-naphthalimide (NA2) compounds [4].

Review of research

Quantum chemical calculations of NA1, NA2 derivatives were performed using density functional theory (DFT) implemented in the *Gaussian16* [5] software package. Ground state geometry optimization and following lowest excited state geometry optimization were provided by means of range separated (RS) hybrid functionals: CAM-B3LYP and Wb97XD using 6-31G(d,p) basis set – see Fig.1. Solvent surrounding (Cyclohexane,

acetonitrile) was simulated using the Polarizable Continuum Model (PCM) method. Table 1 represents the parameters of molecular geometry of NA1 and NA2 in different solvents. For NA1 molecule, dihedral angle ϕ_2 (between naphthalimide fragment and benzene ring) changes from 53 deg (ground state) until 33 deg (lowest excited optimized state). For NA2 molecule, dihedral angle ϕ_2 (between naphthalimide fragment and benzene ring) is closed to zero (flat molecule). This discrepancy with the experimental facts can be explained by the suitability of the density functional method only for modeling the structure of the ground state but not excited state.

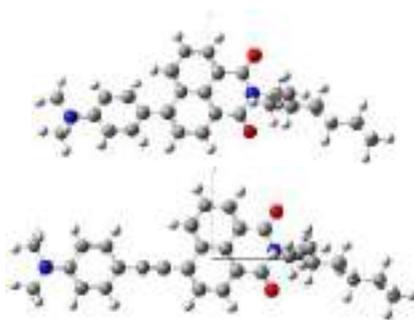


Figure 1. NA1(top) and NA2 compounds

Table 1

Different molecular geometry of NA1 and NA2 in different solvents. Dihedral angles ϕ_1 (between dimethylamine and benzene ring) and ϕ_2 (between naphthalimide fragment and benzene ring). Geometry optimization was provided by means of density functional CAM-B3LYP method and 6-31g(d,p) basis set in the ground S_0 state as well as the lowest excited S_1 state

Compound	Solvent	Optimisation in S_0		Optimisation in S_1	
		ϕ_1 , deg	ϕ_2 , deg	ϕ_1 , deg	ϕ_2 , deg
NA1	Vacuum	9	51		
	CyHex	7,3	53.1	0.2	33,9
	ACN	7,4	51.9	0.9	31,5
NA2	Vacuum	0	0		
	CyHex	1.3	0.9	0.7	0.5
	ACN	0.2	0.4	0.3	0.5

The semiempirical TD method (for singlets only) was used for the simulation of the electronic absorption spectrum. Distributions of electron density for the HOMO as well as the LUMO for NA1 and NA2 structures are presented in Fig. 2. Any pure CT charge redistribution behaviour was established. In general, charge redistribution between left substituents and central core unit is typical for both conformers.

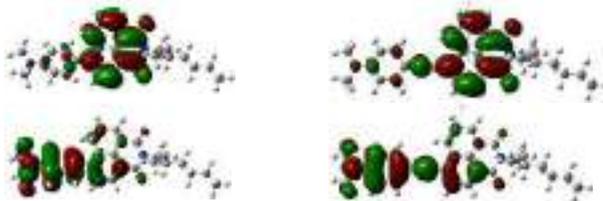
Conclusions

NA1 and NA2 molecules exhibit charge transfer behavior in partially in-plane/in-plane or twisted excited-state geometries that strongly depend on environmental parameters.

Acknowledgments

Computations were performed on resources at the High Performance Computing Center "HPC Sauletekis" in Faculty of Physics, Vilnius University, Lithuania.

Lumo



Homo

Figure 2. HOMO and lumo distributions of NA1(left) and NA2 compound

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Author

Alytis Gruodis



Senior Research Fellow at the Institute of Chemical Physics, on Vilnius University, Lithuania.

PhD in Natural Sciences from the Vilnius University in 1995.

Main research interests: molecular modeling using quantum chemistry approach.

AI-BASED SUPPORT SYSTEM *MISKANTAS-20* FOR THE ASSESSMENT OF KNOWLEDGE AND ACHIEVEMENTS

Alytis Gruodis*

¹Vilnius Business Collage, Kalvariju 129-401 Vilnius LT-08126, Lithuania

**Corresponding author's e-mail: Alytis.Gruodis@kolegija.lt*

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Abstract

Miskantas-20, a lecturer support system for assessing knowledge and achievements is being developed. The knowledge and achievement support system allows to automate the assessment of both closed and open-ended questions, not limited to the assessment of achievements in a particular subject area, and form feedback to both the person being tested and the tester.

Keywords: MISKANTAS-20, lecturer support system.

Introduction

How to check the student's knowledge and skills? This problem has been solved in classical ways for several thousand years. The roles of lecturer and student or teacher and student in a hierarchical educational system are an essential feature of every society [1]. In this way, checking and evaluation is the lecturer's prerogative and a very difficult job for the lecturer, since the open-type question, not the test type, requires individual familiarization and evaluation. How to make the lecturer's work easier?

Automated tests, which are possible in the *Moodle* [2] system, only partially solve this problem. Presenting several answers for which you need to choose one correct one, does not develop a critical and intellectual understanding of the subject, encourages memorization of the endless unnecessary information, and inhibits integrated thinking.

There are many benefits to having assessments on open-ended questions when the student must write an essay. In this way, both interdisciplinary knowledge and thinking intelligence would be reflected. The problem is that until first decade of 21st century such verification systems were not developed [3].

This work is devoted to *Miskantas-20*, a lecturer support system for assessing knowledge and achievements is being developed. The knowledge and achievement support system allows to automate the assessment of both closed and open-ended questions, not limited to the assessment of achievements in a particular subject area, and form feedback to both the person being tested and the tester.

Review of research

Miskantas-20 is a composite system where students and the lecturer use the MOODLE system of their organization for information collection, storage, and organization of communication. Fig. 1 represents the basic diagram of

data exchange between modules on remote computers. The system consists of several main parts: a) user's Moodle with local database, b) Miskantas' database MariaDB_M, which is used only for centralized data collection and returning the result to the user's Moodle with a local database, c) Kedras database MariaDB_K, which is used for automated evaluation.

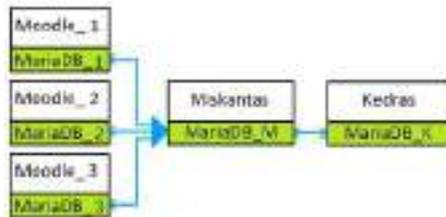


Figure 1. Basic diagram of data exchange between modules

Every academic user must organize the *Moddle* module on his institution's computer (or in the cloud). During manual manipulations by the lecturer, the data is transferred to the Miskantas' database MariaDB_M placed in the cloud.

Fig. 2 represents the schematic diagram of the module FLUORITE running in KEDRAS. FLUORITAS API scans the MariaDB_M database at defined time intervals. After finding records that correspond to unassessed sessions (parameter *AssessmentDone=0*), it runs data transfer and processing programs that transfer the corresponding records from Miskantas' MariaDB_M to Kedras' MariaDB_K for further analysis and return the results. Software modules as separate API's have been created to ensure system operation: FLUORITE, CHROMITE, CALCITE, COPY23, COPY32, ANALYSIS. Modules are written in Java language. JVM was implemented in OS Linux UBUNTU.

If at least one (or more) records are found that correspond to unassessed sessions (parameter *AssessmentDone=0*), four modules start in sequence: CALCITAS, COPY23, ANALYSIS, COPY32 – these are data transfer and processing programs that transfer from Miskantas'

MariaDB_M to Kedras' MariaDB_K and returns the relevant records for further analysis and returns the resulting results. After the work is completed, the CHROMITAS module is called again, which continues its activity – the Miskantas' MariaDB_M database, the session table is scanned at appropriate time intervals – whether there are any new unvalued sessions at the current time.

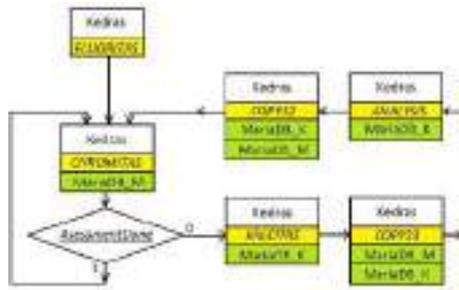


Figure 2. Schematic diagram of the module FLUORITAS in KEDRAS

The automatic evaluation is formed in the following way. First, the lecturer prepares an open question, writes an answer (which will not be visible to the students), and at the same time extracts keywords and key phrases from this answer. Students write an answer to an open-ended question, place it in the Moodle system and wait for the answer.

Second, all answers of the lecturer and the students are analysed at the same time. All answers are divided into sentences according to syntax signs, and sentences into words/items. A two-dimensional matrix, the number of rows of which corresponds to the number of sentences, and the number of columns to the maximum number of words in a certain sentence, is used for evaluation.

Third, the matrix is filled with weighting factors S_1 , S_2 , S_3 according to three criteria: a) the word/item in language dictionary (Lithuanian as well as English), weight factor S_1 ; b) sentence word as a keyword, weight factor S_2 ; c) sentence word as key phrase word, weight factor S_3 .

The biggest problem was the search for the right criterion – i.e., rational weights selection of coefficients S_1 , S_2 , S_3 for the evaluation of i) P_1 (density matrix method) and ii) P_2 (artificial intelligence method, neural network [4]).

For P_1 estimation, weight coefficients: $S_1=1$ (item in language dictionary), $S_2=5$, (item in keyword set), $S_3=10$, (item in key phrases set).

For P_2 evaluation (artificial intelligence method, unidirectional neural network: 3input/1output). A rational network training mode (10000 epochs) and data were selected for P_2 estimation (unidirectional neural network). Lecturer answer was used for training. Final note “10” was established according to the initial definition (the lecturer knows everything!). Each student answer was used for predicting/estimation. Due to comparison to lecturer score, final note of student answer will be in interval from “0” until ”10”.

Conclusions

During the implementation of the project, experimental development activities will be carried out to develop, test and evaluate the final prototype

and pilot version of the AI-based support system for the assessment of knowledge and achievements. Analysis of different texts (in English and Lithuanian) could be provided.

Overestimation is excluded. Real grades are too low. This is natural since the student must aspire to the level of a lecturer. However, for pedagogical reasons, grades should be correlated. In some cases, the correction should reach +2 points (in a ten-point system).

Problem of the sensitive grammatical content of the sentence is not perfect solved: how to recognize a factor, a conjunction, how to compare the synonyms. Finally, Miskantas-20 is useful for routine works as a novel advance system.

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Authors

Alytis Gruodis



Lecturer at Department of Information technologies, on Vilnius Business College, Lithuania

PhD in Natural Sciences from the Vilnius University in 1995.

Main research interests: e-learning, advanced programming using C++ and Java for modeling purposes.

MODERN BLOG APPLICATION USING REACT

Yehor Hermanenko, PhD Vladyslav Khotunov

¹*Cherkasy State Business-College, Ukraine*

**Corresponding author's e-mail , foreman270478@gmail.com,*

vkhotunov@gmail.com



Abstract

The advent of modern blog applications has revolutionized the way individuals and businesses share their ideas, information, and perspectives with a wider audience. In this context, we present a blog application that utilizes the React framework – a well-known JavaScript library renowned for its user interface building capabilities. Our blog application provides a platform to create, and publish blog posts. We delve into the technical aspects of the blog application, discussing its underlying architecture, data management strategies, and user interface design. Our aim is to provide a comprehensive understanding of the functionality and design of the blog application, as well as highlight its relevance and significance in the contemporary digital landscape.

Keywords: blogging, React framework, web technologies, social media sharing, development, design, feature-rich

Introduction

In recent years, the importance of blogging has increased significantly as it has become an effective way for individuals and businesses to communicate their ideas, thoughts, and products to the world. Due to the advancements in modern web technologies and frameworks, creating a blog application that is both visually appealing and functional has become much easier. This work aims to design and develop a modern blog application using the React framework and analyze the advantages and limitations of this approach.

Overview

The primary objective of this work is to design and implement a feature-rich and visually attractive blog application using React. React is a popular JavaScript library that offers developers an easy way to build user interfaces

with a component-based approach. React has gained recognition due to its simplicity, high performance, and reusability.

To accomplish the above goal, this project will be divided into multiple phases, starting with the research and analysis phase to identify the requirements and functionalities of a modern blog application. Once the project requirements are determined, the design phase will involve creating a wireframe and mockup of the blog application to give a clear idea of the application's look and feel.

In the next phase, the development phase, the primary focus will be on implementing the functionalities and features of the blog application using React and other web technologies such as HTML, CSS, and JavaScript. This phase will include developing components and modules that can be easily reused and customized to enhance the scalability of the application.

Moreover, this project will also explore various options for integrating third-party services and APIs to provide additional functionalities to the blog application. For instance, integrating social media sharing options, subscription management, or comment sections to increase engagement.

Decision

The decision to use React as the primary technology for building the blog application was based on its popularity and simplicity. React has a vast community of developers who contribute to its development and maintenance, making it a well-supported framework. Additionally, React's component-based approach offers the ability to create reusable components, making it easy to develop and scale the application.

Conclusion

In conclusion, this diploma work aims to design and develop a modern blog application using the React framework and analyze the benefits and limitations of this approach. By incorporating various design and development phases, this project intends to develop a feature-rich and visually attractive blog application that can be easily scalable and customizable. This project will also explore various options for integrating third-party services and APIs to provide additional functionalities to the blog application, enhancing the overall user experience.

OVERVIEW OF DATABASES AND INNOVATIVE DATA STORAGE TECHNOLOGIES

Aleksandr Igumenov^{1*}, Violeta Jadzgevičienė¹

¹*Vilnius Business Collage, Kalvarijų 129-401 Vilnius LT-08126, Lithuania*

**Corresponding author's e-mail: aleksandr.igumenov@kolegija.lt*

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Abstract

Databases are routinely used to manage and store information or data, both globally and locally. This is due to the need to collect and process large amounts of information. Currently, most projects use *SQL* or *NoSQL* solutions. The question is how long a situation like this will remain. Some solutions have technological limitations [1-9]. For example, *SQL* databases can grow if there is sufficient data storage on the physical device. Query services depend on the network card bandwidth, response time, and other parameters. This has led to an increased demand for solutions that can circumvent such technological limitations.

Keywords: database, blockchain, SQL, NoSQL, sharding

Introduction

The analysis of the published articles shows that scientists and researchers tend to improve the existing solutions by adding new technologies not directly related to *DB*. As an example, is the use of cloud services for database management. The current trend is towards the migration from *SQL* solutions to *NoSQL* solutions [3-6]. Since they support internal solutions designed to automate the partitioning of data into individual *DB* segments and their distribution across the network, they produce a single *DB* across different network segments. These are commonly referred to as *DB Sharding*. In other words, modern databases aim at combining distributed storage and *sharing* of large amounts of data. The main benefit is that the projects using such partitioned *DBs* do not differ from projects using *DBs* without partitioning. Such solutions are developed at the *DB* development stage and are subject to infrastructural technological constraints. But such *DBs* also cause several problems, such as complexity of implementation, balancing problems, complexity of merging of data into a single data array, and finally, partitioning is not supported by many database solutions (engines).

A new solution is database solutions based on *blockchain* technology.

Review of research

A review of the scientific literature leads to the following conclusions:

- The implementation of *blockchain* solutions has to take into consideration the foreseeable technological limitations of physical storage devices, as they significantly affect write/read speeds and data capacities.

- The development of high-tech solutions requires attention as far as the security of software solutions and the establishment of clear rules for data access at an administrative level are consent. This becomes especially important when the planned dataset will be used in the financial sector, which is governed by many standards, such as *PCI-DSS*, *GDPR*, *ISO/IEC27040*, and others.

- It is important that modern solutions make use of *Sharding* technology, which often solves the problem of extensibility. This is important not only for databases but also for *blockchains* [3, 5].

- The use of *blockchains* allows new solutions to extract not only the data but also the history of all data changes for a given identifier, which appears to be a much more rigorous behavioural model than relational databases. This feature being of paramount importance can be exploited in innovative products in the fintech field. However, the same property and cryptographic techniques used to implement blockchains make their performance significantly slower compared to relational databases.

- Research shows that blockchains are slower to process transactions due to their security mechanisms. For example, *Fabric* and *Quorum blockchains* have a peak throughput of 1500 *tps*, while some databases can reach 15000 *tps*. This is also the case for other indicators that affect speed, such as the number of nodes between which data is split, reproducibility, and others [10, 11]

- *Blockchain* solutions are often deployed based on *open-source* licenses and gain recognition for the attractive idea of decentralizing data. This makes it possible to exploit the idea of *open source* to develop new modern products [11]. Databases, on the other hand, make it possible to exploit the developed support infrastructure for the development of solutions, however they require an initial contribution since they a product distributed with a paid license.

Conclusions

In general, *blockchain* solutions are a new trend for products that need to store large amounts of data. In addition, they have a very high level of anonymous access control. Another advantage is that they do not overwrite the information, but always add net to it, which makes it possible to control who has added to it and when, and that each entry in the *blockchain* should be validated using specific mathematical and cryptographic algorithms. Also, the

blockchains are distributed over the network, which makes their access always available 24/365 (based on the blockchain mechanism).

Database solutions are evolving rapidly and nowadays allow everyone to choose the right solution for any need. They are faster compared to *blockchains* but are more centralized. Another important aspect is the reliability of data storage. Data recovery in the event of data loss depends heavily on the individual data recovery mechanisms rather than on the chosen database implementation mechanism.

Acknowledgments

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Authors

Aleksandr Igumenov



Lecturer at the department of Information technologies, on Vilnius Business College, Lithuania.

Receive the doctoral degree in informatics engineering from the Vilnius University in 2012.

Main research interests: blockchain technologies, global optimization, high-performance and parallel computing, IoT and internet technologies.

Violeta Jadzgevičienė



Head of Department of Information technologies, on Vilnius Business College, Lithuania.

Receive the doctoral degree in Educational Sciences from the Lithuanian University of Educational Sciences in 2015.

Main research interests: data bases, e-learning, virtual learning environments, educational systems for programming basics learning, project management, project management quality.

URBAN PLANNING IN THE SMART CITY ECOSYSTEM

Iryna Kalenyuk

*Professor, Doctor of Science (Economics)
Kyiv National Economic University named Vadym Hetman,
Kyiv, Ukraine 04050*

**Corresponding author's e-mail kalenuk@ukr.net*

Oleksandr Umanskyi

*PhD student (International economic relations),
Kyiv National Economic University named Vadym Hetman, Kyiv, Ukraine
Corresponding author's oleksandr.umanskyi@kneu.ua

Abstract. Modern globalization and urbanization actualize the issue of the development of cities as comfortable and environmentally friendly centers of life. The emergence and spread of smart cities was the answer to these challenges. The practice of creating smart cities is increasingly spreading in the countries of the world, their experience is diverse and interesting for research. An important component of a smart city is the policy of smart urban planning.

Keywords: digitalization, urbanization, IKT, sustainable development, green economy

Modern globalization is accompanied by the aggravation of urbanization problems, the growth of the urban population and, in general, the number of large cities and megacities. As an integral part of the development of society and economy, the process of urbanization can have both positive and negative consequences. On the one hand, cities provide more opportunities for employment, education, and access to cultural events. Cities can provide more efficient infrastructure, such as transportation systems, hospitals, and other services. On the other hand, the growth of urbanization can lead to problems such as air, water and soil pollution, overloading of transport infrastructure and provision of housing and other necessary services for the population. In the long term, increased urbanization may lead to resource scarcity and increased greenhouse gas emissions. All these circumstances actualize the issue of careful planning and management of cities in order to ensure their sustainable and efficient development.

The answer to these challenges was the emergence of smart cities, which were driven by innovations and new technologies that provide a comfortable

life for the population and help preserve the environment. Smart cities are fast becoming the new norm, and thus urban planning is evolving to accommodate these innovative developments. To create efficient and effective smart cities, urban planners must consider a number of factors, including transportation, energy consumption, waste management, and more.

One of the key aspects of smart city planning is the use of technology to create a more sustainable and livable urban environment. For example, smart transport systems can help reduce congestion and improve air quality, while smart energy networks can help reduce energy consumption and promote the use of renewable energy sources. Another important point when it comes to smart city planning is the use of data analytics for decision making. By analyzing data from sensors and other sources, city planners can gain insights into how people move around the city, which areas are prone to congestion, and other factors that can contribute to more efficient and effective urban infrastructure. In general, the goal of smart city planning is to create a more connected, sustainable and livable urban environment that meets the needs of residents, while also promoting economic growth and environmental sustainability. As technology develops, so will the field of urban planning, and the possibilities for creating truly smart, innovative cities are virtually limitless.

When assessing the success of the world's smart cities, many factors are taken into account, the main ones being: management, mobility, technology, security, people and environment. For example, the City-in-Motion-Index, developed by the IESE Business School of the University of Navarra, takes into account: Human capital; Social cohesion; Economy; Public management; Governance, which typically shows the effectiveness of state intervention; The environment; Mobility and transportation; Urban planning; International outreach; Technologies.

Urban planning, in turn, is closely related to sustainability. To improve the livability of any territory, it is important to take into account local master plans and the design of green areas and spaces for public use while also focusing on smart growth. New urban planning methods should focus on creating compact, well-connected cities with accessible public services. [1]

The quality of urban planning is measured using 8 groups of indicators: Bike Advance (Whether or not a city has a bike sharing system); Buildings (The number of completed buildings in a city; The count includes structures such as high-rises, towers and low-rise buildings, but excludes other miscellaneous structures and buildings of different statuses (under construction, proposed, etc.); Bicycle stations (Bicycle station locations in a city); Electric charging stations (Electric car charging points in a city); Number of people per household (Average number of people per household); Percentage of the urban population with adequate sanitation services

(Percentage of the urban population that uses at least basic sanitation services—that is, improved sanitation facilities that are not shared with other households); Artificial intelligence (AI) projects (Whether or not a city has AI projects); High-rises (Percentage of buildings classified as high-rises. A high-rise is a multi-floored building of at least 12 stories or 35 m in height (115 feet)).

Table 1 shows the ranking of the TOP-10 smart cities of SIMI 2022, both overall and by individual components – the headings Urban planning, Mobility and Transportation, etc. The composition of advanced cities according to the general index and according to individual ratings has certain differences. At the same time, the composition of the leading cities is obvious – London, New York, Tokyo, Paris, Singapore, etc. (Table 1):

It is important to note that not only capital cities can become the most successful smart cities, but also any other cities that choose a smart development strategy, implement the latest ICT, and create a people-centric space. Smart cities are most often associated with advanced technology, but smart cities are also characterized by prioritizing sustainability and protecting the environment. One of the key aspects of a smart city is the concept of "green infrastructure" or "green economy". This can include things like green roofs, urban gardens and parks that provide important benefits to both people and the environment. For example, green infrastructure helps reduce the urban heat island effect, improves air quality and provides important habitats for wildlife.

Smart cities can use renewable energy sources such as solar and wind power to reduce their dependence on fossil fuels, and they can implement smart grids to manage energy use more efficiently. In addition, smart cities can use data and analytics to optimize waste management and reduce water consumption. Overall, the connection between smart cities and the natural environment is critical. By prioritizing sustainability and protecting the environment, smart cities can create healthier and more livable spaces.

Table 1

Ten-city airports refers to CINE 2022 [3]

No	City/air Hub/air	Urban planning	Mainline airline Transport Hub/air	Roadway	Human capital	Social cohesion	Enterprise in	Convenient and	Technological	International air traffic
1	London New York	London New York	New York Beijing	New York Tokyo	London London	Taipei London	Keybank Ohio	Berlin London	Hong Kong Ulba	London Paris
2	Paris	Tokyo	Paris	Hanover	New York	Cubaica	Copenhagen	Berlin	Ala Doha	New York
3	Tokyo	Beijing	London	Los Angeles	Washington	Copenhagen	Copenhagen	Taipei	Singapore	Singapore
4	Berlin	Berlin	Shanghai	San Francisco	Paris	Washington	Washington	Dual	San Francisco	Bangkok
5	Washington DC	Hamburg	Madrid	Dubai	Los Angeles	Bam	Stockholm	Stock	New York	Tokyo
6	Singapore Amsterdam	Doha	Berlin	London	Berlin	Atlanta	Helsinki	Hanover Washington	Washington	Hong Kong
7	Osaka	Mumbai	Vietna	Seoul	Seoul	Mumbai	Cubaica	Washington	Los Angeles	London
8	Copenhagen	Washington	Shanghai	Paris	Cubaica	Emirates	Taiwan	Tokyo	Tokyo	Shanghai
9	Mumbai	Mumbai	Bangkok	Chicago	Tokyo	Helsinki	Singapore	New York	Amsterdam	Chicago

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Author



Iryna Kalenyuk, 13.09.1960 Ukraine

Current position: Doctor of Science (Economics), Professor, Director of Researching Institute of Economic Development, Kyiv National Economic University named Vadym Hetman, Kyiv, Ukraine

University studies: Taras Shevchenko National University of Kyiv

Scientific interest: economics of education, globalisation

Publications: more 250 works

Experience: 42 years teaching and scientific activity



Oleksandr Umanskyi, 12.05.1991 Ukraine

Current position: PhD student (International economic relations), department of international economic, Kyiv National Economic University named Vadym Hetman, Kyiv, Ukraine

University studies: Central European University

Scientific interest: smart economics, urban planing

Publications: 5 publications

Experience: 5 years of legal experience (of which 2 years of civil service)

CURRENT ADVERTISING DEVELOPMENT TRENDS IN UKRAINE

Arina Kalienichenko*, Viktoriia Riashchenko, Iryna Dernova

ISMA University of Applied Sciences, Latvia

**Corresponding author's e-mail: arishka140713@gmail.com*



Abstract

The research analyzes the trends of the modern development of the advertising market in Ukraine. The characteristic features of the advertising market development and the main types of advertising as an important economic category are revealed. The main advantages and disadvantages of individual types of advertising are investigated and summarized, and their popularity in Ukraine is highlighted. The peculiarities of advertising development and its form are considered in detail, as well as the most favorable types of advertising appeals and the reasons for such preferences among consumers are identified.

Keywords: advertising, advertising market, advertising activity, media, marketing.

Introduction

In the conditions of globalization of economic processes, the influence of global trends on the development of domestic markets is taking place. This applies to the advertising market, which is developing under the influence of both the global market and internal factors such as economic, political, and cultural factors.

Advertising transforms information into a tool that shapes consumer needs, interests, tastes, and habits. It has a powerful impact on changing the information space, distributing multimedia services, and publishing businesses. At the present stage of the development of the advertising market

in Ukraine, it is the external environment that has the greatest influence on the activities of advertising agencies, forcing them to restructure their business and adapt to new conditions, while forming new development programs. Like in many other countries, in Ukraine, more and more companies are directing their advertising budgets to digital channels, such as social networks, search engines, and mobile applications. However, It should be noted, that 2022 was an exceptionally difficult year for the entire Ukraine, particularly in economic terms. Many companies ceased to exist, many partially shut down, some operated as during the wartime, while there were also those that actively developed. The All-Ukrainian Advertising Coalition conducted a study and found that in 2022, the advertising media market fell by 63%. In general, direct TV advertising in 2022 decreased by almost 80% and amounted to 59,267,337.85 euros, while sponsorship lost 87% and did not exceed 5,851,711.84 euros. [1].

Let's consider the main types of advertising in the media that are most effective for promoting advertising messages in Ukraine. It is worth paying attention to the distribution of advertising by its types, as this will allow us to clearly understand which types of advertising are most popular. (Fig 1).

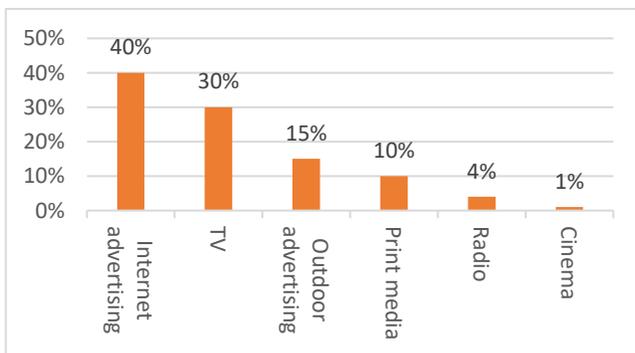


Fig. 1. Distribution of advertising by means of dissemination. [1, 2].

In Ukraine, 40% of total advertising spending is allocated to online advertising, with search engine advertising and social media advertising being the most popular forms. One of the most common and effective types of advertising is television advertising, which is presented to potential consumers through images and sound. Among outdoor advertising, advertising billboards and advertising on transport are the most prevalent. Outdoor advertising has a

number of advantages compared to other types of advertising: long-term contact with potential customers, voluminous and vivid images, a variety of advertising media, and a low probability of placing ads next to competitors. Disadvantages of this type of advertising include a low likelihood of finding the target audience and significant costs for measuring the effectiveness of placement. Additionally, outdoor advertising can be damaged by negative weather conditions, and legislative restrictions significantly limit the ability to create such ads.

Print advertising, including newspapers and magazines, is a special type of advertising that is widely distributed in all print media. One of the disadvantages is the lack of contact with customers who do not wish to view the advertising block. The prevalence of radio advertising is only 4%, although its advantages include wide coverage, frequency, live communication, and low advertising rates.

According to the Ukrainian Association of Media Business (UAMB), with the beginning of full-scale military operations on the territory of Ukraine, the press advertising market fell to 0. Starting in May, advertisers began to cautiously return, and by the summer, placement volumes reached 25-30% of the 2021 levels. [1]

In the modern stage of development of information technologies, advertising on the Internet is gaining significant popularity. Influencer marketing is becoming increasingly popular in Ukraine, especially on social media platforms such as Instagram and TikTok. Brands collaborate with influential people on social media to promote their products and services, engaging their followers and influence. Video advertising is also growing in Ukraine, where more brands are using video to promote their products and services. Video advertising on social media and streaming platforms has become more popular due to their high level of engagement and ability to effectively convey messages.

The most favorable types of advertising appeals among consumers may vary depending on several factors, including the target audience, the product or service being advertised, and the context of the advertisement. [3].

However, there are several types of advertising appeals that have proven to be effective:

1. Emotional appeals: advertising that evokes strong emotions such as happiness, sadness, or fear.

2. Humor: humorous advertising can be very effective in capturing consumers' attention and leaving a lasting impression.

3. Social proof: advertising that emphasizes the popularity or widespread use of a product can be particularly effective in persuading consumers to make

a purchase. This type of appeal is based on the idea that people are more likely to adopt behavior that is considered popular or widely accepted.

4. Celebrity endorsements can be effective in creating positive associations with a product or service.

5. Value proposition: advertisements that focus on the value or benefits of a product. This type of appeal highlights tangible benefits such as cost savings, convenience, or productivity.

Overall, the most favorable types of advertising appeals among consumers are those that are able to connect with them on an emotional or personal level, as well as provide a clear and compelling reason to take action. Effective advertising is capable of eliciting a sense of urgency or desire among consumers, as well as providing a solution to a problem or need.

Overview

This paper discusses the advantages, disadvantages, and conclusions on the following topics:

- Main types of advertising;
- Trends in the modern development of the advertising market in Ukraine;
- Specific types of advertising;
- Types of advertising appeals..

Decision

Therefore, having considered the types of advertising appeals, it can be noted that advertising should correspond to the culture and peculiarities of the mentality of the chosen target audience. Significant importance is also given to the price differences of various media. Advertising is evolving, the number of ads is increasing, and their quality is improving. Every step of technological progress inevitably affects the means and types of advertising. Special attention should be paid to advertising on the Internet. Advertising on the Internet is a process that is easy to control because there is the possibility of making corrections even during advertising events. One of the most significant features of such advertising is the ability to analyze the effect of the advertising campaign in real-time.

Conclusion

All in all, advertising activity in Ukraine is rapidly developing in parallel with the use of advanced innovative technologies. Advertising and marketing play an important role in the economy and business landscape of Ukraine. Promoting products and services: advertising and marketing are crucial for businesses to promote their products and services to potential customers. By using various channels such as television, radio, print media, digital media, and outdoor advertising, companies can reach a wide audience and increase

brand awareness. It is important to note that the Ukrainian nation has a unique mentality formed by instability and wars. Therefore, the first thing that advertising should provide to consumers is comfort and confidence that the product they choose will only bring them benefits.

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MODERN DIRECTIONS OF DEVELOPMENT OF THE CONSTRUCTION BUSINESS IN UKRAINE

Kaliuzhko Olena*
Dehtjare Jevgenija
Zdir Viktor

ISMA University of Applied Sciences, Latvia

**Corresponding author's e-mail: elenakaluzko@gmail.com*



Abstract

After February 24, the life of Ukrainians finally and irrevocably changed. The Ukrainian state and economy has changed its vector. After the victory of Ukraine, the cities will need a long and large-scale restoration. Most of the infrastructure is damaged or completely destroyed, so the areas affected by the fighting will turn into a large construction site. And the construction business will come to the forefront and become one of the priority areas for

the development of the Ukrainian economy. The aim of the work is to study the feasibility of introducing modern trends in the development of the construction business. At the heart of this study, the object is new technologies in the construction business. The subject of the work is modern technologies of the construction business. In this work, the following methods are used: the deductive method and the method of analysis.

Keywords: construction industry, modern technologies

Introduction

The construction industry of any country is a kind of indicator of the level of development of its economy, since it determines the state of many spheres of activity, for which it acts as a material base, creating the necessary material and technical prerequisites and providing construction, repair and reconstruction of industrial and nonindustrial facilities.

Construction technology is becoming increasingly safety-oriented. Wearable devices integrated into special work boots connect to Wi-Fi and warn of human fall hazards, robots transport heavy or hazardous materials instead of humans, or build scaffolding, laying bricks.

The construction industry is often criticised for being overly conservative, standardised and bureaucratic in its paperwork. However, the latest construction technology is not easy to implement because the main requirements for facilities are safety, i.e. each technology must be normative, standardised and self-sustainable: the final cost of its development must be adequate and the effectiveness in reducing costs in the future must be substantial, plus, prolonged in time. Any construction technology requires proper design and a whole range of work by the project team, quality control as well as staff training.

An important component of the construction complex are also subjects of the investment sphere, namely, investors of all forms of ownership, investment banks, insurance organizations specializing in construction risk insurance, intermediary and engineering organizations that provide services to participants of construction legal relations [1, p. 531].

The aim of the work is to study the feasibility of introducing modern trends in the development of the construction business. At the heart of this study, the object is new technologies in the construction business. The subject of the work is modern technologies of the construction business. In this work, the following methods are used: the deductive method and the method of analysis.

The studied issues in construction allow us to highlight the trends that are driving the transition to modern construction technologies, such as:

1. Cloud services and mobile technology

The operation of the BIM model involves the inclusion of cloud services for the exchange of data, real-time information. There can be a wide variety of segmented information and tools in the clouds, from tools for architects to project management systems that are available to anyone involved in the project at any time from a mobile device – the effects of collaboration are enhanced [3].

2. Artificial intelligence

Artificial Intelligence (AI) is the 'behaviour' of a machine, a technology that mimics human cognitive functions: problem and problem solving, image recognition, object recognition and learning. There is a special field of AI, machine learning, which is based on the collection of statistical data from which inferences and conclusions are drawn.

3. Virtual and augmented reality as building technology

Among the new technologies in architecture and construction, virtual reality (VR) stands out. It creates a 'real' world in a digital environment, using photos, renderings and 360° video. The technology's capabilities enable navigation in a realistic digital environment, where it is also possible to interact with objects in real time. Augmented reality is already individual digital elements superimposed on the real environment, which complete the final conceived model [3].

4. 3D modelling

This construction technology has long been in the service of the construction industry, but only in recent years has it gained real scale in widespread use.

The concrete 3D printing market in the construction industry [2] is predicted to grow to \$58 million by 2024.

This is stimulated by the increased demand for such printing in construction: the high productivity and ease of creating structures of varying complexity. Obtaining finished building blocks (walls, slabs) or other components directly at the construction site reduces not only production costs, but also logistics and personnel costs. Thanks to extrusion technology in 3d modelling it is now possible to create elements from different materials – concrete, geopolymer, cement, gypsum and clay [3].

Overview

The following issues are addressed in this paper:

- Popular modern technology in the construction business

Decision

Modern technology is not yet particularly developed in Ukraine, so I think a gradual introduction would be appropriate. As it will save time, costs and improve the quality of construction in general.

Conclusion

It is clear that large-scale digitalisation and adoption of modern technology in the construction industry will progress – a market demand where efficiency and reducing time as well as cost becomes a priority. Therefore, construction is becoming smart not only in computer-aided design, but also in the actual process of creating the object, using robots, 3d printing, sensors, smart materials and technologies. And of course, new technologies will have an impact on the profits of the construction business, as they aim to optimise and make all phases of a project efficient, from engineering surveying through to operation.

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GRAPHIC CHIP ARCHITECTURES: PAST, PRESENT AND FUTURE TRENDS

Vadim Kaliyzhnyi, PhD Vladyslav Khotunov, Stanyslav Marchenko

ISMA University of Applied Science, Latvia

Cherkasy State Business-College, Ukraine

**Corresponding author's e-mail: celebrutu@gmail.com,*

vkhotunov@gmail.com

Abstract

There have been significant developments in computer graphics over the past few decades, and advances in hardware and software have led to increasingly realistic and compelling visual experiences. Central to this

evolution is the development of graphical accelerators (GPUs), a special hardware designed to accelerate the complex calculations needed to render high-quality graphics. In this paper we will look at the history of graphic chip architecture from the early 1980s to the present day. We look at some key trends and innovations in this area, including the development of real-time ray tracing, the use of graphics processors for artificial intelligence and machine learning, and the growing emphasis on energy efficiency. We will also explore some of the challenges and opportunities that lie ahead in graphics chip architecture, including the potential impact of new technologies such as quantum computing and the growing demand for graphics processors in highly specialized applications, such as healthcare and augmented reality. In the final analysis, our aim is to provide a comprehensive overview of this critical area of computing and to give an idea of where it might lead in the coming years.

Introduction

The history of graphics hardware dates back to the early days of computer graphics in the 1960s and 70s, when researchers were first developing techniques for creating and displaying images on computer screens. In those days, computer graphics were limited to simple line drawings and wireframe models, and processing was done entirely by the computer's central processing unit (CPU). However, as computers became more powerful and the demand for more realistic graphics grew, researchers began exploring the idea of dedicated graphics hardware. The first commercial graphics processing unit (GPU) was the NEC μ PD7220, released in 1982. This chip was designed to handle simple 2D graphics, such as those used in computer-aided design (CAD) and desktop publishing applications. Over the next decade, as personal computers became more popular and graphics software became more sophisticated, the demand for more powerful graphics hardware grew. This led to the development of new graphics standards, such as VGA and SVGA, and the introduction of more powerful GPUs from companies like ATI, 3dfx, and NVIDIA.[1]

The current state of graphic chip architectures is characterized by a few key trends.

- One of the most significant is the increasing focus on real-time ray tracing, a technique for simulating the behavior of light in a virtual environment. Ray tracing is computationally intensive, and until recently it was too slow to be used in real-time applications like video games. However, with the introduction of hardware-accelerated ray tracing in NVIDIA's RTX

series of GPUs, it has become possible to achieve real-time ray tracing in certain applications.

- Another trend in the field is the growing importance of artificial intelligence (AI) and machine learning (ML) techniques. GPUs are particularly well-suited to the kinds of calculations required for AI and ML, and as a result they have become a popular choice for researchers and developers working in these fields.

- Finally, there is a growing focus on energy efficiency in graphics hardware. GPUs are notoriously power-hungry, and as the demand for more powerful graphics hardware has grown, so too has the demand for energy-efficient solutions. This has led to the development of new technologies like NVIDIA's Max-Q, which aims to deliver high-performance graphics in a more energy-efficient package.[1]

Overview

The following issues are analysed and discussed in this work:

- Finding answers to the problems of making production cheaper and how to do it.

- Examples from the experience of different companies that are involved in the development of a GPU and technologies that have been used to address the problem of excess energy consumption.

Decision

Reducing the cost of production of graphic chips while maintaining high performance and quality is a major goal for manufacturers in the industry. While it is certainly challenging, there are several ways in which it may be possible to achieve this.

- One approach is to invest in research and development to improve the efficiency of chip design and manufacturing processes. This may include the use of new materials, new production methods or new design techniques that allow more efficient use of resources. For example, the use of advanced lithography techniques, such as extreme ultraviolet lithography, can ensure more accurate and efficient chip production, which can help reduce costs.

- Another approach is to exploit economies of scale by producing chips in large quantities. This can help spread the fixed costs of chip production over a larger number of units, which can help reduce unit costs. In addition, by producing large quantities of the chip, manufacturers can make better deals with suppliers of raw materials and other resources.

- Imagination Technologies, for example, use various technologies and techniques to reduce the cost of making graphics chips. The key approach is to focus on improving the GPU design. This may include optimizing the GPU architecture to minimize the number of transistors needed, which may help

reduce the overall cost of production. For example, PowerVR Series8XE processors have an ultra-compact architecture designed to minimize energy consumption and maximize performance per square millimeter of silicon.[2]

- Another approach that Imagination Technologies uses to reduce the cost of manufacturing graphics chips is to leverage advanced manufacturing techniques. For example, the company has been working on developing graphics chips using a process known as "chiplet" technology. This involves breaking the GPU down into smaller, more manageable pieces, which can be produced using more cost-effective manufacturing techniques. The resulting chiplets can then be combined to create a high-performance GPU that is also cost-effective to produce.[3]

Let's take Apple Silicon as an example and touch on the CPU a bit

- First, Apple's custom-designed ARM processors are built using a smaller process that allows for increased transistor density and energy efficiency. This means that processors are able to achieve high performance, consuming less power than previous generations.

- Second, Apple's hardware development team optimized the integrated graphics processor (GPU) to work seamlessly with the ARM processor. They used a common memory architecture that allows efficient data transmission between the CPU and the GPU, reducing the need for data transmission via a slow and energy-intensive bus. In addition, they optimized the graphics processor to effectively work with the Apple Metal graphics API, which allows developers to take full advantage of the hardware acceleration provided by the graphics processor.

- Third, Apple's software development team worked to optimize the operating system and applications to work effectively on an ARM-based architecture. They used a binary translation technique that automatically translated code compiled for the Intel x86 architecture into code that could run on the ARM architecture without compromising performance.

- Finally, Apple's use of proprietary technologies, such as the Neural Engine, helped to optimize CPU performance even further, consuming less power. The neural engine is a specialized processor that accelerates machine learning tasks, allowing the processor to perform these tasks more efficiently and with less power consumption than if they were performed by a processor or graphics processor.

Overall, Apple's ability to switch to ARM processors and maintain high-performance integrated graphics with low power consumption was a result of a combination of efficient hardware design, software optimization, and use of proprietary technology. By optimizing every aspect of the hardware and software stack, Apple was able to achieve a significant increase in

performance while consuming less power, making their latest devices more efficient and longer-lasting.[3]

Conclusion

Manufacturers are trying to make their technology better, take the same jump performance NVIDIA RTX 30 series compared to the 20 series and similar 40 series with the 30 series. Manufacturers with each generation make more reasonable steps to increase the power of video cards, but which are not energy efficient. I believe that in the next 10 years, the world will see video graphics that are more productive than today, with less power consumption and less compact design.

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POTENTIAL GROWTH EVALUATION OF BPO ORGANIZATION

Vsevolods Karajevs, Rostislavs Kopitovs

Latvia, ISMA,

e-pass: karajevs@inbox.eu, rostislavs.kopitovs@isma.lv

Abstract

The relevance of this study lies in the timely detection of subtle signals that cause loss of stability in the future. Confirmation of their authenticity, carried out on the basis of specially developed tools, allows the organization to avoid downtime in activities. Adaptation of controls to the constant influence of the external environment as part of a unified diagnostic system makes it possible to suppress the prerequisites for the introduction of ineffective proposals.

Keywords: specifications, effectiveness, technology, choice, value, elements, contribution

Introduction

The analysis of the consequences is commensurate with the amount of savings obtained by preventing unreasonable losses, which is the basis for the formation of motivation fund for long-term development. When confirming that the organization is in an inoperable state, actions are developed to restore the lost stability. The weakened reaction of the impact on the challenges of

the external environment, due to the habits of being guided by standard decision-making schemes, contradicts the search for effective proposals aimed at improving the process. Traditional methods of accepting changes reduce the effectiveness of the activity. Standard reports on the state of the organization do not meet the requirements for improving overall performance. The selective nature of the assessment conducted by various departments of the enterprise on the basis of various business information causes uncertainty in the selection of proposals for process improvement. In this regard, the problem of this study is expressed by the following wording: "It is impossible to ensure effective change in the organization in the absence of unique means of assessing the working state".

Main Part

Based on the identified problem, *the object* of this study is a control tool developed at the level of standard. Compliance with provisions of the standard, aimed at identifying genuine buckling signals, is used to reconcile external improvements and internal improvements.

This coordination is based on *the hypothesis*, which boils down to the fact that at a certain life cycle of an organization, unique means of assessing the working state of an enterprise are needed.

The subject of a full-scale assessment is focused on the decision-making methodology, on the basis of which conclusions are drawn about the states of the process, includes elements of training of personnel involved in the implementation of the new version of the system

The purpose of the study is focused on development of procedure that ensures the search for reasonable ways to improve the organization in terms of preventing unauthorized hacking of the management system.

In accordance with the goal, the following *tasks* were set:

- formulate the rules for the use of unique means of effective evaluation of the enterprise;
- develop a procedure for a full-scale assessment of the enterprise's performance, carried out throughout the entire life cycle of its existence;
- test the procedure on the basis of an existing enterprise.
- determine the effectiveness of the developed procedure in the context of current changes.

Taking into account the tasks put forward, a set of recommendations has been developed on the use of effective management mechanisms in each specific case. Changes carried out at the level of management tools improve the quality of reliable diagnoses, and accumulate experience in getting the enterprise out of an unstable state.

Results

As a result, the increase in value reaches up to 200% [2]. Such growth is possible if the contribution The practical value of the study lies in the fact that

the full scale of the assessment is achieved through three important transitions: from the rules to the points of application, from the points to the principles of reproduction of anomalies, from the principles to the provisions of standard. Based on the standard, step-by-step detailing of the state of the organization is carried out. As a result, not only objective conclusions about the state of the organization are formed, but also specific recommendations are developed to restore the loss of value, taking into account the localization of places that lead to loss of efficiency.

The scientific novelty of the study lies in the development of a comprehensive document containing instructions to the expert on the impact aimed at improving performance by eliminating the shortcomings of original version in the real management system. The presence of the standard makes it possible to obtain a reasonable conclusion about the performance of the organization through a combination of cost indicators configured to comply with conditionally specified standards and dimensionless indicators of process reproducibility belonging to the group of objectively specified standards. This combination allows you to unleash the growth potential of the organization in a new environment due to the synchronization of performance standards and efficiency measures. As a result, the organization is protected from making ineffective changes that cause loss of efficiency.

BPO FUNCTIONS OF PERFORMANCE TECHNOLOGY

Dina Kelsina

Latvia, ISMA,

e-pass: d.kelsina@gmail.lv

Abstract

The present research is devoted to the decrease in time of the organization presence in an unstable condition. Such reduction is connected with the timely restoration of the depreciated resources of the enterprise. Their detection is carried out by using the tools to measure the actual value of the enterprise. During measurement, the mechanisms which cause inconsistency of the purpose, including tools of performance efficiency variation, are revealed.

Keywords: evaluation, value, imperfection, depreciation, recovery, potential, growth.

Introduction

The prolonged presence of the organization in the conditions of stable functioning forms invariable, generally accepted, norms of the key parameters of evaluation. At the same time, issued diagnoses in situations of instability form conclusions about the normal state. Unreliable decisions not only cause a loss of vigilance, but also contradict the rules for establishing norms that satisfy the established and consumed needs throughout the organization's life cycle.

The resulting inconsistency requires special support for a system of variable standards. Such a system is developed taking into account reasonable algorithms for setting the ranges of diagnostic parameters established for a particular stage of activity of a particular enterprise. Unique diagnostic models are used as initial algorithms, including setting financial leverage and growth potential, controlling the ratio of tangible and intangible assets, confirming the discount rate and capitalized profit. Generalization of the above is expressed in the present formulation of the problem: "It is impossible to ensure the measurement of performance in the absence of newly developed diagnostic tools of interrelated parameters"..

Problem statements

Management of the enterprise, interested in ensuring its viability, is forced to go beyond the traditionally used means BPO type It is about creating a separate set of tools, based on which the decision about the state of the enterprise, functioning at all stages of the organization, as well as under the influence of cruising circumstances. The separation of the object required the preservation of resources to enable the function of managing their changes, according to the established rules of their operation. Such a function is aimed at localizing the places of disturbances in the sustainable functioning of the organization. If this does not happen, then we are talking about the imperfection of the diagnostic tools used. The results of the study show that the causes of imperfection is the use of typical assessment tools, which implement BPO diagnostic function.

The initial goal was to develop a procedure that ensures the identification of imperfections in the diagnostic tools. Their elimination makes it possible to give a full assessment

According to the formulated research goal, four objectives were set: In accordance with the goal, the following main objectives were formulated:

- to carry out a current analysis of the diagnostic tools used, not adapted to the new conditions. Such tools belong to the class of so-called "worn-out resources of the organization";
- to choose the best scenario for improvement of diagnostics system,
- to realize the medium-term scenario of development of the enterprise, adjusted to the measurement of the actual value;

– to work out instructions of perspective development of the organization in the conditions of confirmation of its growth potential

To solve the problems it is necessary to coordinate the requirements of diagnostics focused on the achievement of the strategic goal and solutions aimed at the implementation of the growth potential of the organization in a new environment.

Results and Conclusions

The perfection of the diagnostic toolkit allows to find the levers of growth of the enterprise. Management has key factors at its disposal, on the basis of which long-term development scenarios are developed. Their acceptance is confirmed by the results of the comparison of the actual value with the potential value. At the same time the conditions of tuning of comparison tools to the new parameters of assessment are fulfilled.

Adjustment of BPO diagnostic functions to the needs of a particular enterprise. It is about the timely restoration of worn-out resources of the organization. In the course of recovery there is an effective adaptation of the organization to the new circumstances of large-scale nature.

PROSPECTS FOR THE DEVELOPMENT OF LATVIA AS PART OF THE BALTIC-BLACK SEA UNION

Kaspars Kikste,

*Postgraduate student ISMA University of Applied Sciences, (Riga, Latvia)
kaspars.kikste@gmail.com*

Abstract

The creation and development of the Baltic-Black Sea Union is due to many prerequisites. Such an alliance can become a powerful military-political and economic association, forming an axis from the north from the Baltic Sea to the south – the Black Sea. In such an alliance, development prospects open up for each country, taking into account the leading trends of the modern century. Latvia can get additional sources of growth as part of this union by developing its ICT sector, transit potential, etc.

Key words: alliance, Baltic Sea – Black Sea union, information and communication technologies – ICT, export, military products.

Jel codes: F52; H56

The formation of the Baltic-Black Sea Union is due to historical, geographical, economic and political prerequisites. And the direct invasion of the Russian Federation into Ukraine confirmed the need to form a single shield of protection in the new system of world order. This is especially true for small countries that are not able to defend themselves or form an effective defense system on their own. Historical background testifies to the significant potential of the formation of the Baltic-Black Sea Union, which would combine the potential of several countries.

All participating countries can work within the framework of a customs union (such as the one created between the Baltic countries), this contributes to an increase in trade volumes and an increase in the efficiency of economic activity. Estonia is one of the most developed countries in the region and specializes in agricultural products, engineering, shipping and transportation. Latvia exports: electrical machinery and equipment, machinery and mechanisms, lumber, pharmaceutical products, iron and steel products, round timber, knitwear and textiles, non-ferrous metals and their products, etc. Lithuania has a fairly high rate of development and a fairly developed industrial base, creates conditions for the all-round dissemination of ICT (information and communication technologies), including in the financial sector. Poland is the second largest country in this group of countries, and at the same time the most developed. Poland has large reserves of minerals, a powerful industrial base, and highly developed agriculture. Ukraine has the largest territory in this union; at the end of 2022, the economic base has been largely destroyed not only in the eastern regions, but throughout the country. Nevertheless, one can speak of Ukraine as a country with a great potential for economic development and cooperation within the framework of the BBS.

BBS can become a very powerful economic creation, since it will unite both resource-rich countries and fairly developed countries that have formed their specialization in the new conditions of the digital economy. Of particular importance in the context of economic prerequisites is the transport factor – the formation of a through transport corridor between the Black and Baltic Seas. Moreover, this corridor can be provided by almost all types of modern transport: road, rail, pipeline, river. The implementation of this project will certainly increase traffic flows and reduce the time of transportation of various goods and passengers from the eastern regions to Europe. In general, the task of ensuring military security has not only a military aspect, but also involves a whole range of interrelated tools. The strengthening of the military sector, the military economy cannot take place independently of the state and growth of the entire national economy.

s practice shows, modern warfare implies not so much a huge military potential of its own, but rather opportunities for cooperation and the availability of advanced technologies that can be used for military purposes, such as drones, artillery technology, etc. The electronics and electrical engineering industry in Latvia is strategically export-oriented, where about 90% of manufactured products are sent (a large share of exports and a large number of export markets testify to the competitiveness of the industry at the international level). The main export markets of the industry are the EU countries. The ICT sector provides up to 4% of the country's GDP, is rapidly developing and growing both in terms of the number of companies and the number of employees. The main sub-sectors of the ICT sector are the development of software, mobile applications, home pages and payment card systems, the provision of localization services, hosting and data centers, and e-commerce. Analytics indicate that such potential can be used to produce the latest types of weapons or parts of them. UAVs and electronic warfare equipment are defined as key in this matter.

A strong aspect of the Latvian economy can be considered the presence of a transit potential. For a long time, Latvia has used all the advantages of its position as a bridge between East and West in the movement of various goods (bulk, building materials, forest products, etc.), energy resources (oil, gas), finance, labor. However, recently there has been a policy to change this position. Emphasis is placed on the fact that Latvia should not become a bridge between East and West, but a part of developed Europe. The banking system was updated and cleansed, which resulted in an outflow of funds from non-residents from the post-Soviet countries.

In our opinion, the loss of transit potential is more politically motivated than a real economic conditionality. From time immemorial, countries have always had competitive advantages associated with a favorable geographical position and access to the sea. Another question is that the formation of such a transit corridor should be clearly taking into account the national interests of Latvia, ensuring its economic, energy and military security.

High-tech products are produced in Latvia – electrical engineering, computer components, wireless communication devices, construction equipment, electric motors, unmanned aerial vehicles – drones, 3D printers, etc. More than 5480 people are employed in the industry (2018), Electronic and electrical industry is one of the largest employers of technically and scientifically trained people in Latvia (Latvijas preču..., 2021).

The most important Latvian exports in 2021 were timber, wood products and charcoal; electrical appliances and electrical equipment; mechanisms and mechanical devices. Wood, wood products and charcoal were mainly exported

to the UK (21.7%), Estonia (13.5%) and Sweden (9.3%), electrical appliances and electrical equipment – to Lithuania (23.3%), Estonia (10.2%) and RF (9.5%), mechanisms and mechanical devices – to Lithuania (19%), RF (18.7%) and Estonia (13.6%) (Latvijas preču..., 2021).

The electronics and electrical engineering industry in Latvia is strategically export-oriented, where about 90% of manufactured products are sent (a large share of exports and a large number of export markets testify to the competitiveness of the industry at the international level). The main export markets of the industry are the EU countries. The ICT sector provides up to 4% of the country's GDP, is rapidly developing and growing both in terms of the number of companies and the number of employees. The main sub-sectors of the ICT sector are the development of software, mobile applications, home pages and payment card systems, the provision of localization services, hosting and data centers, and e-commerce.

In 2018, more than 6,800 companies were active in the sector. 111 companies in the sector are equipment manufacturers. The number of people employed in the industry exceeded 36,000 people. The turnover of the sector in 2018 reached 3.8 billion euros. The main export partners in the field of ICT services are Sweden, Ireland, the USA and Italy. The largest companies: Tieto Latvia – (a branch of a Finnish company that has reached a turnover of 44.4 million euros and employs 770 employees in Latvia to develop solutions for processing payment cards, BI applications, DMS, and other IT solutions); Accenture Latvia branch; DPA; Exigen Services; Tilde; Idea Port Riga; CTCO; Evolution Latvia; X Infotech; Mikrotokls и др.

In 2019, the total turnover of Latvian companies in the ICT sector reached 2.02 billion euros, the total profit of the sector – 271.81 million euros. In total, 31 thousand employees worked in companies operating in the field of telecommunications, computer programming and information services, Lursoft reports. Lursoft data shows that 7129 companies are registered in the ICT sector, most of which or 64.13% are related to computer programming, 28.05% are related to information services, and the remaining 7.82% work in the telecommunications sector. More than half, that is, 64.30% of companies operating in the ICT sector, are registered in Riga, another 18.77% – in the Riga region, while in other regions the distribution is similar (Lursoft..., 2020). It should be noted that Latvian ICT companies are not only successful in attracting foreign investment, but are also one of the largest export sectors in the country. According to LIKTA, exports of ICT products amounted to €1.1 billion in 2019, with another €779 million generated by exports of ICT services. ICT enterprises rank third among the exporting industries in Latvia.

The ICT sector has not only a great export potential, but also a significant potential in the context of the development of the military economy in order to strengthen national security. Modern types of weapons require the mandatory availability of equipment with electronics: guidance systems, unmanned aerial vehicles (UAVs), etc. In our opinion, Latvia has all the prerequisites for the production of such products. Of course, such production can be established not only through the efforts of national firms, but also as a joint production with the subjects of other BBS countries. Increasing efforts to actively develop such tools and create conditions for their production can become an important impetus for the country's economic growth.

All BBS countries have a tendency to increase spending on basic equipment and scientific research that is aimed at this equipment, that is, developments in the field of weapons. Countries are actively developing new technologies in the field of weapons, for example, artificial intelligence, autonomous control systems, Big Data, biotechnology, quantum technologies, helping the armed forces become more efficient, sustainable, offering opportunities to use commercial civilian innovations to meet military goals, as well as for goods dual purpose (The Secretary..., 2021).

Accordingly, the development of artificial intelligence technologies, chips and technologies, analytics, machine learning and intelligence technologies is required. This requires the formation of a triune concern within the framework of relations between the state, private business and science, within the framework of cooperation for the introduction of breakthrough technologies, with the assistance and cooperation with international organizations, including the European Union and the UN.

In modern conditions, the armies of all countries of the world must be ready for military operations, taking into account the realities of the new world order. The armies of large countries have sufficient (or at least large) military potential, however, as practice shows, a war of a new level (primarily of high quality) determines the need to develop new technological equipment that can provide an advantage (or at least parity). In addition, military conflicts lead to a drop in economic activity, a rupture of economic and political ties. In this situation, joint cooperation is promising for many countries, which can not only contribute to common projects, revitalize the economy, but also becomes an important tool for strengthening collective security.

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SUSTAINABLE DEVELOPMENT GOALS IN HIGHER EDUCATION INSTITUTIONS: THE CASE OF KLAIPĒDOS VALSTYBINĒ KOLEGIJA

Remigijus Kinderis*

Klaipėdos valstybinė kolegija / Higher Education Institution, Lithuania

**Corresponding author's e-mail: r.kinderis@kvk.lt*

Abstract

This paper presents a literature review to verify how the relation between higher education and the sustainable development goals has been established and how the higher education institution (Klaipėdos valstybinė kolegija) integrated sustainable development goals into its daily activities.

Keywords: sustainable development, sustainable development goals

Introduction

Higher Education Institutions (HEIs) are on a unique position to be at the forefront of the Sustainable Development Goals (SDGs) promotion and serve as a benchmark for other sectors of the economy. HEIs can also contribute to the discussions on the SDGs in society at large. Since the United Nations (UN) approved the Agenda 2030 for Sustainable Development in 2015, HEIs have increasingly demonstrated their commitment by supporting several initiatives. Although a great deal of progress has been made, there is still a lack of integrative approaches to truly implement Sustainable Development Goals (SDGs) in higher education [1], [2].

This paper presents a practical case that illustrates how to design and articulate SDGs within an institutional setting adopting a holistic approach. It is based on empirical inquiry into global and holistic sustainable transformation and a real experience to move towards a verifiable and

pragmatic contribution to sustainability from the position of Klaipėdos valstybinė kolegija.

Overview

The United Nations' Transforming Our World: The 2030 Agenda for Sustainable Development is one of the most ambitious and important global agreements in recent history. The agenda, with the 17 Sustainable Development Goals (SDGs) at its core, is a guide to tackling the world's most pressing challenges – including ending poverty and bringing economic prosperity, social inclusion, environmental sustainability and peace and good governance to all countries and all people by 2030. The SDGs cover a wide range of complex social, economic, and environmental challenges and addressing them will require transformations in how societies and economies function and how we interact with our planet.

Universities, with their broad remit around the creation and dissemination of knowledge and their unique position within society, have a critical role to play in the achievement of the SDGs. Arguably none of the SDGs will be achieved without this sector.

Engaging with the SDGs will also greatly benefit universities by helping them demonstrate university impact, capture demand for SDG-related education, build new partnerships, access new funding streams, and define a university that is responsible and globally aware [2].

The cases for university engagement in the SDGs are two types/ways:

1) Why the SDGs need universities: Provide knowledge, innovations and solutions to the SDGs; Create current and future SDG implementers; Demonstrate how to support, adopt and implement SDGs in governance, operations and culture; Develop cross-sectoral leadership to guide the SDG response.

2) Why universities need the SDGs: Create increased demand for SDG related education; Provide a comprehensive and globally accepted definition of a responsible university; Offer a framework for demonstrating impact; Create new funding streams; Support collaboration with new external and internal partners.

While learning and teaching, research, organizational governance and operations, and external leadership are often approached separately, in reality they are closely interlinked. The SDGs present great opportunities for creating, strengthening and communicating links between these areas [1], [2], [3].

What encouraged Klaipėdos valstybinė kolegija HEI (KVK) integrate the SDGs into its activities?

Three years ago, the representatives of the higher school management visited an international week organized by Vives University of Applied Sciences in Belgium. At this event, a lot of attention was paid to the practical implementation of the SDGs goals. The representatives of KVK had the opportunity to participate in various meetings and events, during which colleagues encouraged and inspired the representatives of KVK to take initiative in KVK.

Overview of the step-by-step SDGs integration process in Klaipėdos valstybinė kolegija.

Stage 1. Recognition: Identifying and acknowledging what a university is already doing to contribute to the SDGs can provide a powerful narrative about impact and a strong impetus for further action.

Step 1. Mapping helped to find out what KVK is already doing to support and contribute to the SDGs across all areas or within specific areas of the university and was a great starting point for discovering possibilities for deeper engagement.

KVK mapped the activities that were already contributing towards sustainable development (based on reports) and what were planning to do (based on strategies and plans) in order to answer to the question “What is KVK situation?”.

Mapping specific efforts of the community (students, teaching staff, researchers and technical and administrative staff) regarding the SDGs allowed to establish the KVK starting point and draw up a route towards a verifiable and pragmatic contribution to the SDGs and the 2030 Agenda.

Stage 2. Opportunistic alignment: Different areas across the HEI recognise the usefulness and importance of the SDGs framework and find opportunities to use it to frame or drive discrete activities and programs, without an overall strategy.

Stage 2. Step 2. Building capacity and ownership of the SDGs required from us understanding the current knowledge of and commitment to the SDGs across research, learning, teaching, operations, governance and culture.

Reaching this understanding was included a stock-taking of the information gathered in Step 1. This indicated where existing knowledge gaps lie and how we might advocate for the importance of the SDGs to the work and life of the university.

Stage 2. Step 3. Identify priorities, opportunities and gaps. Step 3 allowed us to build on the commitment to the SDGs established in Step 2 and begin to progress and integrate the SDGs at KVK. This Step was a central to setting whole-of-university intentions and commitments to the SDGs.

Key to the completion of this step was setting a realistic and incremental foundation for any actions that the university takes to integrate its commitment to the SDGs. Step 3 involves bringing together key stakeholders – students, staff, community members – to arrive at a common determination of priorities for action on the

SDGs and to identify opportunities for working cohesively and collectively on achieving the SDGs.

Stage 2. Step 3. Identify priorities, opportunities and gaps. Not all the SDGs affect HEI activity in the same manner, nor can the HEI make the same contribution to them all. It is true, it must be said, that the internal link between the goals is a close one, that one goal must lead to another and that these connections must help to perceive the complexity of the problems and the transdisciplinary nature and independence of their solutions. However, KVK considered that it was necessary to draw up a roadmap and to select the “key” SDGs for the KVK. KVK selected 7 of the 17 SDGs: 3, 4, 9, 10, 11, 12, and 17.

Stage 3. Organising principle: The ongoing and far reaching impact will come if the SDGs become part of ‘business-as-usual’ for the university, by recognising and integrating the SDG framework into all relevant university governance structures and frameworks.

Stage 3. Step 4. Integrate, implement and embed the SDGs. Depending on our institutional context, this step involved including the SDGs in various vehicles for governance, establishing coordination mechanisms for our actions on the SDGs and implementing policies, strategies and/or action plans. To complete this step, KVK made a decisions that are clear and widely supported about how the SDGs will be mainstreamed in all key HEI strategies and policies.

In this step was analyzed and selected the benchmark SDGs, targets and indicators for the KVK. We reflected on the following questions: “To which SDGs/targets can the KVK contribute, and how can the 2030 Agenda contribute to a more sustainable KVK?”. As a result, 40 evaluation criteria and values were selected for the achievement of the SDGs, which were integrated into the college's strategic and annual activity plans.

Stage 3. Step 5. Monitor, evaluate and communicate. The way in which HEI evaluate and celebrate their contributions to the SDGs is key to informing and shaping future engagement and action. A cohesive and well-grounded monitoring, evaluation and communications plan will enable universities to create and share compelling stories to draw both the necessary support for their future engagement with the SDGs and to widen the shared understanding of the SDGs.

The tools that KVK use to measure and evaluate already are in place within the KVK strategic planning system. For example, you might be feeding into annual reports.

Conclusion

The integration of sustainable development goals into the daily activities of a higher education institution is not a simple process, it requires consistency and time.

The integration of sustainable development goals into the activities of the higher education institution involves certain stages and steps, during which the whole community is involved as well.

The implementation of sustainable development goals must become a part of the strategic activity planning system of the higher education institution and a priority of the community, only in this case the higher education institution will experience success.

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DEVELOPMENT DISPARITY OF THREE BALTIC STATES: LATVIA, LITHUANIA AND ESTONIA

Yuri Kochetkov*, Elena Sventitskaya

Baltic International Academy, Latvia

**Corresponding author's e-mail: Jurijs.Kocetkovs@rtu.lv*



Abstract

Three Baltic States – Latvia, Lithuania and Estonia regained their independence not long ago and practically simultaneously. As time passed, it became clear which of them were developing more successfully and which were lagging behind other countries of the EU. Therefore, this research analyses changes in the aforementioned three main indicators of socio-economic status of the Baltic States – the employment rate, the unemployment rate and the GDP per capita during a decade – from 2012 to 2021. Estonia is the leader of the three Baltic States. Latvia is lagging behind not only Estonia but also Lithuania practically with regards to all indicators. Average values of the indicators, estimated according to the statistical data. The case study results fully correlate with the results of comparing the statistical data. The most favourable conditions for conducting business are provided in Estonia. To overcome the crisis, the State has to play its regulatory role by using the budget policy of “cheap” money in Latvia. It is necessary also to improve the tax system.

Keywords: Latvia, Lithuania, Estonia, employment, unemployment, GDP per capita, role of State

Introduction

Three Baltic States – Latvia, Lithuania and Estonia, located on the Baltic Sea shores, regained their independence not long ago and practically simultaneously. They have rather similar geographic and climatic conditions. When regaining their independence in the early 1990s, these countries had practically equal starting positions for an independent development. As time

passed, it became clear which of them were developing more successfully and which were lagging behind other countries of the European Union.

To compare countries according to their development degree, different indicators of wellbeing of their population are used. The best indicator is the total volume of the annual aggregate production of goods and services in the national economy. This is the gross domestic product (GDP) of the country expressed in monetary terms at its market prices [1]. GDP characterises the state and success of the national economy operation quite precisely. However, GDP is not a direct indicator of the nation's wellbeing. It is generally assumed that with the GDP growth also the level and quality of life is increasing.

Analysis of situation

The most widespread indicator characterising wellbeing of the country's population is the production output (GDP) per capita. Economic development of countries takes place in a cyclic way – booms of economic activity are characterised by increasing the employment rate and decreasing the unemployment rate [2]. When, following a boom, another fall in economic development starts, the employment rate grows and wellbeing of the population deteriorates. Unemployment is an integral feature of the market economy. Therefore, this research analyses changes in the aforementioned three main indicators of socio-economic status of the Baltic States – the employment rate, the unemployment rate and the GDP per capita during a decade – from 2012 to 2021. The *research objective* is to determine the degree of development disparity of the Baltic States and its main reasons. The *object of research* is main socio-economic indicators of the countries. *Methods of research* are analysis of statistical and estimated data.

Governments of all countries must aim at higher employment of the population, adopt laws reducing the unemployment rate and increasing the GDP volumes per capita. This contributes to increasing the level and quality of life of the population. Not all governments of the Baltic States succeed in coping with the existing problems in the national economy development and supporting entrepreneurship [3] [4]. Surveys conducted among entrepreneurs in Latvia, for instance, have allowed to establish that frequent changes of tax regulations result in additional difficulties for business development and decrease competitiveness of enterprises on the world markets. Based on the available statistical data, a table has been compiled presenting changes of three main socio-economic indicators in the Baltic States during recent years (Table 1) [5], [6], [7].

Table 1

Socio-Economic Indicators of Latvia, Lithuania and Estonia

Indicator	State	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Employment, %	Latvia	63.0	65.0	66.3	68.1	68.7	70.1	71.8	72.3	71.6	69.9
	Lithuania	62.0	63.7	65.7	67.2	69.4	70.4	72.4	73.0	71.6	72.5
	Estonia	66.8	68.2	69.2	71.5	71.7	73.8	74.5	75.0	73.5	74.0
Unemployment, %	Latvia	15.1	11.9	10.8	9.9	9.6	8.7	7.4	6.3	8.1	7.6
	Lithuania	13.4	11.8	10.7	9.1	7.9	7.1	6.2	6.3	8.5	7.1
	Estonia	10.0	8.6	7.4	6.2	6.8	5.8	5.4	4.4	6.8	6.2
GDP, per capita, €	Latvia	1034	1105	1158	1235	1277	1344	1450	1557	1572	1665
	Lithuania	6.0	0.7	2.4	7.8	5.4	1.1	6.8	4.6	7.4	2.2
	Estonia	1088	1169	1237	1284	1334	1433	1569	1704	1749	1878
		4.7	7.0	1.9	7.9	8.4	8.6	3.0	3.0	5.4	1.8
		1301	1379	1481	1553	1617	1746	1871	2027	2076	2228
		5.5	2.1	9.0	2.9	4.6	4.6	1.0	5.0	8.8	9.6

The comparison of indicators by years during the period from 2012 to 2021 demonstrates that Estonia holds the first position in all three of them, surpassing Latvia and Lithuania. With regards to the employment level, Latvia and Lithuania are very close: until 2015, Latvia was slightly (up to 1.3 %) surpassing Lithuania, but then, from 2016, Lithuania started surpassing Latvia. When comparing the unemployment rates in Latvia and Lithuania, it can be stated that this indicator has been a little lower in Lithuania than in Latvia, except for 2020, when the unemployment rate in Latvia was by 0.4 % less than in Lithuania. With regards to such important indicator as the GDP per capita, Estonia has also surpassed Latvia and Lithuania. In its turn, Lithuania was surpassing Latvia in GDP per capita during all of the examined years.

Estonia is the leader of the three Baltic States. Latvia is lagging behind not only Estonia but also Lithuania practically with regards to all indicators. Average values of the indicators, estimated according to the statistical data (Table 2), also indicate to this.

Latvia is lagging behind its nearest neighbours also according to many other indicators: financing of healthcare, education, science, etc. For instance, in 2017, Latvia (with the population of 1 950 116) was ranked the 75th according to the number of scientific publications – 2188 [8]. The same year, Estonia, having much less population (1317384 persons), was ranked the 68th – 3118 scientific publications.

Table 2

**Average Values of Indicators of the three Baltic States during the
Period from 2012 to 2021**

Indicator	State	Average
Employment, %	Latvia	68.7
	Lithuania	68.8
	Estonia	71.8
Unemployment, %	Latvia	9.54
	Lithuania	8.81
	Estonia	6.76
GDP, per capita, €	Latvia	13401.4
	Lithuania	14450.2
	Estonia	17284.2

To compare the three Baltic States according to the conditions for doing business, a case study of data has been performed for three similar enterprises in these countries. The case study results fully correlate with the results of comparing the statistical data. The most favourable conditions for conducting business are provided in Estonia. Therefore, less people leave Estonia, comparing to its neighbours, in order to earn their living in the more developed countries of the European Union, and the country's population does not decrease. According to the case study results and surveys of entrepreneurs, the conditions for conducting business in Latvia are much worse. This February, the European Commission pointed to the poor operation of the financial sector in Latvia: especially due to the monetary policy, hard access to receiving loans for both entrepreneurs and private individuals.

Conclusion

With account of Latvia's lagging from its neighbours and other countries of the European Union according to a number of indicators, as well as difficulties in many spheres of socio-economic life of the population, it can be stated that the country is in the state of a general crisis. To overcome the crisis, the State has to play its regulatory role by using the budget policy of "cheap" money. Reduction of the bank rate, levied by the Central Bank, would contribute to stimulating the business activity and investments in production. This would increase the employment level of the population, would ensure reduction of unemployment, growth of the level and quality of life. It is necessary to improve the tax system, stop frequent (practically annual) changes of taxes, reduce the tax burden for small businesses as one of the tools for increasing the employment rate and struggling with unemployment.

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DEVELOPMENT THE STORE BY NEXT.JS TECHNOLOGY

Vadym Kopachev, Nataliia Falchenko

ISMA University of Applied Science, Latvia

**Corresponding author's e-mail: kvsochka@gmail.com,
kafedraKIIT@gmail.com*

Abstract

The use of information technology allows you to optimize those tasks and processes that take up part of your personal time. One way or another, web applications have significantly changed our lives, as they have penetrated into all spheres of life: from buying goods to receiving government services online.

With Next.js, you can easily create high-performing, search engine-optimized sites that not only search engine bots will love, but users as well.

Keywords: shop, informational technologies, web application

Introduction

Shop – a website that has special software so that its visitors can comfortably make purchases. Email clients, social networks, search engines, online stores, online business software are all web applications. The external interface of the web application is developed using several programming languages: HTML, CSS, Javascript, which are supported in any browser. Although you can use any other programming language or framework to write the backend, be it Python, PHP, Ruby, Java.

Overview

There are many types of online stores. Consider the following types.

By platform type:

- On your own CMS. Advantages: unique design, ease of administration and the ability to expand functionality. But it is worth considering that a mandatory fee will need to be paid for the license.

- On open source CMS (free). Advantages: budget savings. Disadvantages: limited functionality, lack of operational technical support, the need for improvements and downloading additional modules.

By product range:

- Specialized shops. They only sell certain products.
- Virtual supermarkets. You can find literally everything here.

By type of sale:

- Wholesale.
- Retail.
- Wholesale and retail.

The design is created by analyzing the target audience. The whole concept of the design of the online store will depend on this.

Decision

Next.js has a number of advantages, namely:

- Next.js apps load significantly faster than React apps due to built-in server-side rendering;

- Supports static site export functions;
- Quick entry;
- Automatic code splitting for pages;

- Easily create internal APIs with built-in API routes and create API endpoints;

- Built-in support for page routing, CSS, JSX and TypeScript;

- Quickly add plugins to customize Next.js to suit your page needs.

The only real downside to Next.js is that it's a standalone framework, meaning it has a specific method and set of tools that it wants you to use to build your applications.

However, the features of Next.js are quite suitable for most projects.

Conclusion

In the 21st century, people spend most of their free time on the Internet. There we read the news, watch our friends, study, communicate, order whatever we like. During the writing of the thesis, it was revealed that in Ukraine 95% of purchases are directed to the online market. With the help of this, people save their time on shopping trips and, of course, it is possible to order goods from any available country. The existing competitors providing such solutions were also analyzed, their advantages and disadvantages were identified, which will make the future project simple, affordable and at the same time technologically advanced. During the work on the project, a fully working system for working with an online store was developed.

FINE SIGNAL DETECTION TECHNOLOGY

Rostislavs Kopitovs

e-pass: rostislavs.kopitovs@isma.lv

Abstract

The relevance of the research lies in the timely removal of the control system from an unstable state. As a result, the emergent property is restored by replacing non-effective elements. This is achieved by detecting the links of loss of efficiency. Such links are technical solutions, taking into account private interests, contrary to the requirements of the system design. As a result, the organization is subject to the so-called "commoditization" effect, in which the potential users of the organization cease to appreciate the development of the product.

Keywords: methodology, norms, deviations, faults, causes, priorities, improvements

Introduction

Focusing on the elimination of inconsistencies allowed to identify the problem of research, reduced to the following formulation: "It is impossible

to ensure the performance of the organization in the absence of the means of reasonable selection of innovative proposals. As such means is the built-in block of the management system, with the help of which the control of inconsistency of requirements takes place. Thus, the management of system change in the technology of flexible goals, taking into account the distributed responsibility of individual participants of the organization is carried out. In other words, the object of the study is related to the efforts that are due to the need to be responsible for the control of activities within the full life cycle of the organization.

Methodology

The subject of the study is the application of high-level specifications that perform the synchronization of market offers and industry requirements, prevents the spread of the commoditization effect.

The purpose of this study is to develop a procedure to ensure timely response to the violation of the requirements as part of the approved program of phased introduction of changes in the system.

In accordance with the objective, the following key *objectives* were formulated:

- conduct an ongoing analysis of improved versions of the system that implements the synchronization of requirements and innovative proposals;
- to select the best scenario, taking into account the identification of key factors and symptoms;
- substantiate the realization of the medium-term scenario of the enterprise development;
- to work out instructions of perspective development of the organization in conditions of acknowledgement of potential of its growth.

On the basis of the objectives, recommendations for the use of productive means, which carry out the distribution of powers among all participants of the organization, highlighting the attributes that make it possible to comply with the requirements of the effectiveness of the system have been developed. Thereby the possibility of timely exit from the unstable state of the organization by imposing a new program of improvements to the current version of the system is provided

Conclusion

Practical value of the research consists in the fact that the results of testing the developed procedure showed that the present approach allows to exclude stops of activity, contributes to the reduction of losses and the formation of the development fund. The proprietors of the enterprise have at their disposal an effective means which, after adaptation to the specific needs of the user,

makes it possible to measure the value of the enterprise at any point in the life cycle of the organization

Scientific novelty of the research lies in the presence of a comprehensive approach, which allows evaluating the workability of the organization as a whole, as well as identifying weaknesses in its manufacture on individual stages. The developed tool allows to overcome the fifty percent threshold of reproducibility of the organization capacity. The high level of potential is revealed during the determination of the optimal ratio of tangible and intangible assets.

CREATION OF INTERACTIVE HISTORICAL RECONSTRUCTIONS WITH UNREAL ENGINE 5, USING PHOTOGRAMMETRY, NANITE AND LUMEN

Oleksii Koval, PhD Vladyslav Khotunov

¹Cherkasy State Business-College, Ukraine

**Corresponding author's e-mail: firmenwind@gmail.com,
vkhotunov@gmail.com*



Abstract

During the last years technologies are growing with incredible speed. That growth provides people with new opportunities and allows us to make the world a better place to live in. Things that were impossible before become simple one click actions today. The world starts seeming smaller and smaller because of the internet, but in fact it becomes more and more accessible thanks to it. About 30 years ago it was needed to manually search for needed information in sources that are limited territorial, nowadays everyone with access to the internet can find anything in a few minutes or less. 10 years ago to get a drawing it was needed to have art skills or to find a painter, nowadays AI can create any picture in seconds. 20 years ago digital graphics had very limited opportunities, nowadays it's possible to capture the real world around

us and render its digitised version in real time. With the latest 3D graphics technologies it's possible to make the world even more accessible for everyone than it is now. Using photogrammetry real architectural and natural landmarks can be digitised and turned into photorealistic 3D models. Using Unreal Engine 5 these 3D models can be rendered in real time providing a unique experience similar to real presence at the place with the same level of freedom that any video or photo can't give. In this thesis it is explained how digital tourism can be developed with usage of the latest technologies.

Keywords: 3D graphics, Unreal Engine, Photogrammetry

Introduction

Unfortunately not all people and not always can visit another country to take a look at different cultures and historical landmarks. Reasons can be different, like pandemic, war, or simply lifestyle or level of life. Recreating cultural places digitally not only can make them more accessible for people all over the world for tourism, but also allow historians to explore them more freely, and what is more, make virtual backups that will partially save them from being accidentally destroyed by people or natural disasters.

Process of capturing real objects into 3D models is called photogrammetry. It uses numerous photos of an object from all possible angles to create a digital copy of this object. [1] Digital photogrammetry was first proposed by Ian Dowman in 1984 as a way to map the topography of terrain using satellite imagery. But today with the growth of technologies it's possible to capture almost any object.



Figure 1. Photogrammetrised 3D model

When a captured model is ready, it can be rendered for a video or put into a game engine. In the second case there's a problem with overdense topology that most engines can't handle with desired performance. But the Nanite virtualized geometry system that was introduced in Unreal Engine 5 solves this problem. [2] Nanite uses a new internal mesh format and rendering technology to render pixel scale detail and high object counts. It intelligently does work on only the detail that can be perceived and no more. This allows to handle billions of polygons in a real time environment, without overloading the system.

But even the most detailed model won't look real without proper lighting. And Unreal Engine 5 has a solution for this task as well – it's Lumen. This is a new fully dynamic global illumination and reflections system that was introduced in Unreal Engine 5 same as Nanite.

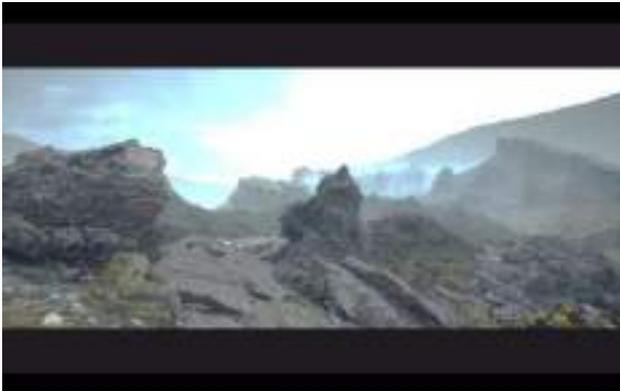


Figure 2. UE5 environment

Thanks to these 3 technologies it's possible to create interactive real time locations that are almost indistinguishable from reality.

Overview

This work shows how modern technologies can be used to make cultural development more accessible for people all over the world, and to take care of important historical and natural objects.

Decision

The idea behind the project is to implement a service that allows people to visit various historical, cultural and natural landmarks virtually without need to leave home. It should be possible for a person to walk around the presented

object like it would be possible in real life. This should provide a believable experience of presence and visiting a landmark. Part of the income could also be spent on keeping the real objects and locations that were recreated, and on some restorational works for them.

Conclusion

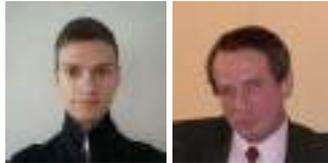
Modern graphics technologies made a huge step forward during past years and can be used outside of common cases like games and movies visual effects. They can also be used to allow people to explore the world like it wasn't possible before. Visit a foreign country as a common person with a PC, or explore an ancient artefact or ruins as a scientist, or make a digital copy of important objects to save them from unexpected damage. Modern technologies provide almost unlimited opportunities and it only depends on people how they will use them.

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CONSTRUCTIONS OF MULTIPLICATIVE INVERSES WITH FUNCTION VALUES THROUGH THE MEAN PROPORTIONAL IN A RIGHT TRIANGLE. METRO ALGORITHM

Alexander Kovantsov, Vladislav Ivanov
Riga Technical University



Abstract

Within the last hundred years, geometry has been widely used in various technology sectors such as aviation engineering, architecture and computer science. For that reason, it is essential to study and develop methods that would help increase the precision of mathematical operations' results. Given algorithm allows to accurately determine the value of $\frac{1}{f^c(x)}$, $C \in \mathbb{N}$ obtained by elementary geometric constructions, i.e., to measure the length of the constructed line segment, knowing the value of function $f(x)$ at a point x on the interval $f(x) \in (0; 1) \cup (1; +\infty)$.

Keywords: arithmetic operations with inverse functions, geometry, unit segment.

Introduction

Since ancient times, geometry has played a significant role in the life of humanity [1]. Geometric approaches are currently widely applied in aviation engineering, architecture, computer science and other technology sectors; therefore, it is essential to study methods that would help to calculate the results of mathematical operations more accurately. As part of the work, an algorithm was developed in two forms, simplified and extended, which can be used for the precise determination of inversed function values. The triangular constructions obtained during the construction process remind radial Metropolitan System [2], at the center of which the closed line (ring) is located, which, in turn, is crossed by the other lines (branches); thus, the algorithm was named "Metro".

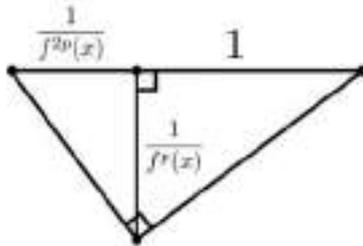


Figure 2. Single construction

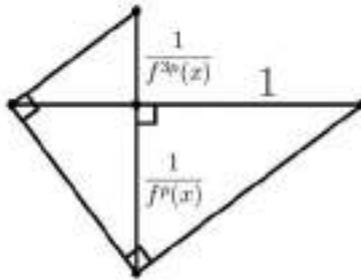


Figure 3. Double construction

The legs of right triangles constructed on one of the four ring's main segments were called **branches**.

As part of the extended algorithm, several notations were introduced:

n – number indicating how many times the power of C could be divided by 2 with no remainder; the number of single constructions on branches.

m – number indicating how many times the power of C could be divided by 3 with no remainder; the number of double constructions on branches.

K – number of constructions on the ring.

N – total number of triangles on the ring and branches.

Given values were combined into a formula (1), whereby the number of required triangles on the ring could have been calculated:

$$K = \frac{C}{2^n \cdot 3^m}$$

Thus, the total number of triangles N on the ring and branches is:

$$N = K + n + 2m$$

Conclusions

1. Recursively constructing $\frac{1}{f^p(x)}$, $p \in \mathbb{N}$ long line segments, any inverse value of the function can be represented geometrically with a segment of length $\frac{1}{f^C(x)}$, $C \in \mathbb{N}$.
2. The number of triangles constructed on the ring and branches will always be less than or equal to the number of constructed triangles on the ring:

$$C \geq K + n + 2m$$

3. An algorithm in simplified form is applied when $C \in \mathbb{N}$ is not divisible by 2 or 3 with no remainder.
4. By using an extended algorithm, it is possible to reduce the number of triangular constructions and therefore save time in performing operations.
5. Any inverse value of the function could be determined by applying methods of elementary geometry acquired within the school program [3].

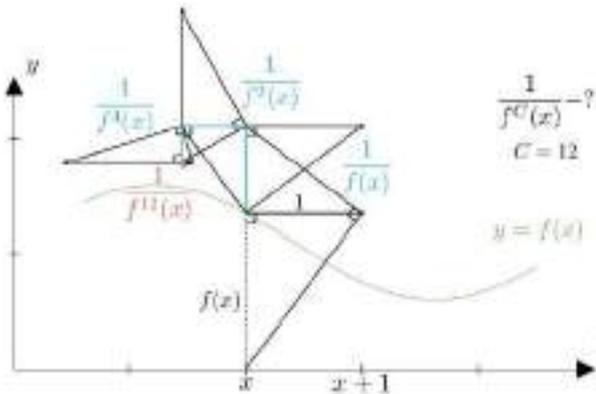


Figure 4. Visualized algorithm (C=12)

Such an approach is universal and can be applied to any $C \in \mathbb{N}$. However, the time spent on construction could be too long, especially if a large number of triangles has to be constructed.

It was concluded that in cases where the power of C is divisible by 2 or 3 with no remainder, the number of operations and the time spent on

construction could be reduced using extended construction algorithm (“Moving around the ring and branches”), which significantly reduces the number of constructions and shortens transitions from p to $2p$ and p to $3p$. To implement it, either **single** or **double constructions** on the ring have to be constructed.

The legs of right triangles constructed on one of the four ring’s main segments were called **branches**.

As part of the extended algorithm, several notations were introduced:

n – number indicating how many times the power of C could be divided by 2 with no remainder; the number of single constructions on branches.

m – number indicating how many times the power of C could be divided by 3 with no remainder; the number of double constructions on branches.

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Conclusions

1. Recursively constructing $\frac{1}{f^p(x)}$, $p \in \mathbb{N}$ long line segments, any inverse value of the function can be represented geometrically with a segment of length $\frac{1}{f^c(x)}$, $C \in \mathbb{N}$.

2. The number of triangles constructed on the ring and branches will always be less than or equal to the number of constructed triangles on the ring:

$$C \geq K + n + 2m$$

3. An algorithm in simplified form is applied when $C \in \mathbb{N}$ is not divisible by 2 or 3 with no remainder.

4. By using an extended algorithm, it is possible to reduce the number of triangular constructions and therefore save time in performing operations.

5. Any inverse value of the function could be determined by applying methods of elementary geometry acquired within the school program [3].

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ESTIMATION OF THE POSSIBILITY FOR RESERVOIR OXIDATION ZONES EXTRACTION BY MACHINE LEARNING METHODS

**Yan Kuchin^{1,2}, Ravil I. Mukhamediev^{1,2}, Nadiya Yunicheva^{1,3},
Jan Rabcan⁴ and Elena Mukhamedieva**

*¹Institute of Information and Computational Technologies MES RK,
Kazakhstan, Almaty*

²Satbayev University (KazNRTU), Kazakhstan, Almaty

*³Almaty University of Power Engineering and Telecommunications
(AUPET), Kazakhstan, Almaty*

³University of Zilina, Slovakia, Zilina



Abstract

Failure to take into account reservoir oxidation zones (ROZ) when planning uranium mining by in-situ leaching is one of the main reasons for non-confirmation of reserves and often leads to huge material losses when entire mining blocks are empty. The article considers the possibility of extracting the ROZ using machine learning methods. To do this, the wells were divided into three classes depending on the characteristics of the ROZ.

The RandomForestClassifier showed an average accuracy of 0.55 for identifying the ROZ, however, the values varied greatly depending on the class of wells.

Keywords: uranium mining, machine learning, classification, boosting

Introduction

At present, the uranium concentration during its extraction by the method of in-situ at reservoir-infiltration deposits of Kazakhstan is determined by dividing the concentration of radium obtained as a result of gamma-ray logging interpretation by the radioactive equilibrium coefficient (K_{rr}). Since in the zones of reservoir oxidation (ROZ) $K_{rr}=\infty$, i.e. in the presence of pronounced gamma-ray anomalies, uranium is completely absent, they must be considered when interpreting gamma-ray logging. ROZ can be determined during core analysis at the exploration stage, and then geological sections can be built and pulled along the geological sections, as shown in Figure 1.

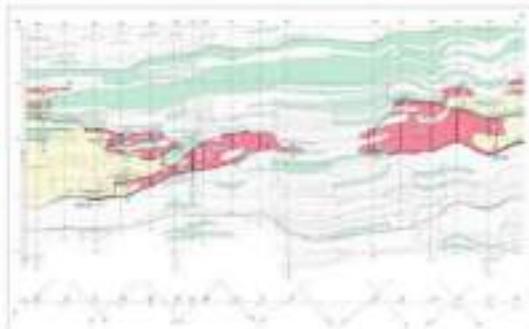


Figure 1. Geological section, ROZ zones (highlighted in yellow) on the right and left

However, core sampling and laboratory research is a long and expensive process. In addition, the construction of sections and extrapolation of the identified ROZ is not always done in a timely and correct manner, and requires high qualifications and significant manual labor. As a result, often the initial interpretation is carried out without taking into account the ROZ, and then it is necessary to recalculate it already taking into account the ROZ.

Another way to identify the ROZ is to perform fission neutron logging (FNL), since it allows one to directly determine the uranium concentration, bypassing the stage of converting the radium content into the uranium content

through Krr. In such cases, ROZ are identified where ore intervals according to gamma-ray logging do not correspond to ore intervals according to fission neutron logging. [1] However, this method is very expensive and complex, and therefore not widely used.

Failure to take into account the ROZ is one of the main reasons for the non-confirmation of reserves and often leads to significant material losses when entire production blocks turn out to be empty. At the same time, at the moment, there is no fast and reliable way to identify the ROZ for the correct gamma-log interpretation. In this regard, one of the promising directions for solving this problem can be machine learning, when the prediction of the location of the ROZ will be carried out by analyzing the entire set of available geological and geophysical information, by identifying patterns that are not noticed by people. The authors could not find any articles on this topic, at the same time, a number of methods based on the use of machine learning algorithms are proposed for solving the problems of logging data interpretation [2-21].

Methods

The methodological scheme of the study consists of the following steps:

- Apparent Resistivity, Spontaneous Polarization), lithology (since the ROZ can only be in permeable rocks), depth and coordinates of the wellhead, as well as data from the nearest adjacent well were used
- Development of methods and procedures for preprocessing raw data
- Application of boosting machine learning methods
- A special data set was created with the division of wells into three classes: 42 wells without ROZ (LOW_ZPO), 84 wells with a ROZ share of 5-50% of the ore-bearing horizon (MEDIUM_ZPO) and 42 wells with a ROZ share of more than 50% of the ore-bearing horizon (HI_ZPO))
- As input parameters, gamma-ray logging, electric logging.

Results

Training and validation were carried out on different datasets (LOW_ZPO, MEDIUM_ZPO, HI_ZPO) in order to assess the accuracy of the identification of ROZ for each class of wells, as well as to determine the optimal composition of the Train Set.

The results of the RandomForestClassifier are shown in Table 1.

To evaluate the performance of the model, a simple visualizer was developed, shown in Figure 2. Blue dots are the actual values of rock classes, red dots are predicted, along the X axis 1-permeable rocks, 2-impermeable rocks, 8- reservoir oxidation zone, along the Y-axis – depth within the ore-bearing horizon, in decimeters.

Table 1

RandomForestClassifier results

RF Classifier	Train_set	Validation_set		
		HL_ZPO	LOW_ZPO	MED_ZPO
HL_ZPO	f1_weight	0.645	0.606	0.687
	f1_macro	0.567	0.378	0.614
LOW_ZPO	f1_weight	0.230	0.908	0.352
	f1_macro	0.267	0.611	0.369
MED_ZPO	f1_weight	0.555	0.827	0.746
	f1_macro	0.459	0.441	0.667
H_L_M_ZPO	f1_weight	0.234	0.864	0.731
	f1_macro	0.282	0.454	0.684

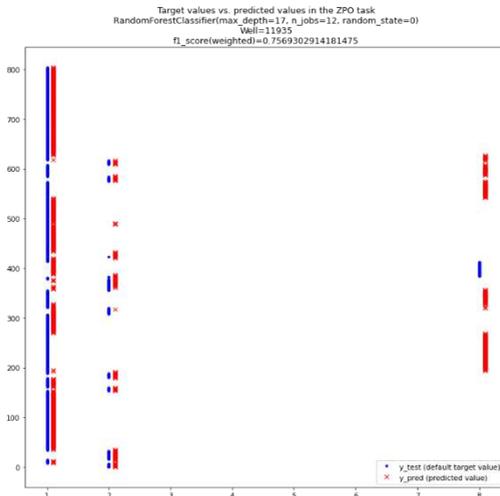


Figure 2. An example of visualization of the actual and predicted ROZ for one of the wells

Conclusion

As a result of the experiments, it can be concluded that it is possible to use machine learning methods to identify the ROZ. Nevertheless, taking into account the importance and responsibility of the ROZ allocation in the calculation of reserves, in order to assess the possibility of industrial application of the algorithm for the allocation of ROZ by machine learning

methods, it is necessary to conduct additional experiments, and also answer the following questions:

- What is the minimum required accuracy when identifying ROZ
- Can the required accuracy be achieved
- Does this require additional data
- Is the required accuracy achievable if only data from one well is used, without taking into account neighboring wells
- Transfer Learning. Is it possible to transfer the model developed on the data of one field to other fields.

Acknowledgment

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GLOBAL HUMAN CAPITAL TRANSFORMATIONS UNDER THE IN FLUENCE OF DIGITALIZATION AND CREATIVIZATION

Nataliya Kuznetsova*

PhD in Economics, Associate Professor,

Head of Economic, Entrepreneurship and Marketing Department

Cherkasy State Business College, Ukraine

**Corresponding author's e-mail: nataliya.kuznetsova14@gmail.com*



Abstract

Today, the global world is changing dynamically. The economic development of countries is accompanied by large-scale social transformations based on technological revolutions. Every technological revolution was reinforced by global trends that laid the foundations for the formation of a new technological order. Intellectualization, digitalization, and creativity are important modern trends accompanying the development of the

world economy today. Their complex action not only has a large-scale impact on the economy, but also causes deep global transformations of human capital, which requires systematic disclosure and study. The article considers the key transformations of human capital under the influence of the specified global trends.

Keywords: human capital, global transformations, creativization, digitization

Introduction

Large-scale digitization of the global space creates radically new conditions for business and people. Open space for business and interpersonal communications is formed. Movement of capital accelerates. The structure of Added Value changes in the direction of an increase in the share of intangible assets. International migration is intensified. There are global transformations of labour markets and radical changes in labour activity. At the same time, the role of intelligence, knowledge and creativity in the formation of a global product is growing significantly, which gives impetus to the development of creative entrepreneurship, the formation of creative industries and economies. Social factors influencing the formation of new qualitative characteristics underwent a significant transformation, which in turn led to a change in views on the role of human capital, turning it into the main driving force of socio-economic development. Accordingly, global social transformations laid the foundations for the formation of a new paradigm of human capital development (Fig. 1). The processes of intellectualization and creativity of the economy, which caused global economic changes and influenced the transformation of all spheres of human activity, had a significant impact on the transformation of the qualitative components of human capital.

Overview

Penetration of creativization into all spheres of social life has led to a shift in priority to the creative component in the formation of key components of human capital. According to the traditional concept, they include knowledge, professional skills and abilities, health, motivation, which are accumulated through investments and according to alternative concepts, expanding the range of qualitative characteristics of a person as a capital owner, which strengthen the fundamental basis of his/her qualitative development as a productive force. Brought together they provide the ability to receive income.

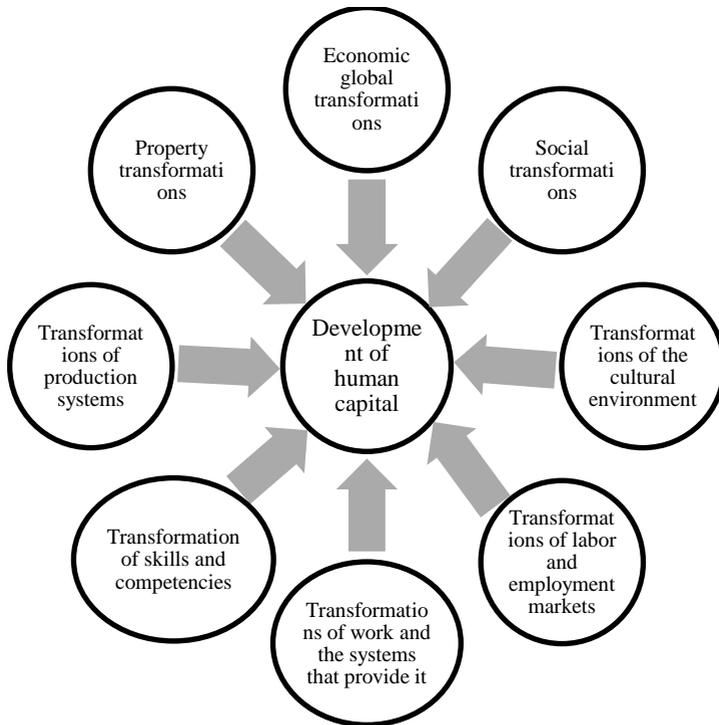


Figure 1. Formation of a new paradigm of human capital development under the influence of social transformations

Under the influence of creativity, the components of human capital acquire certain peculiarities, specific features and characteristics. In a globalized world, the role of combined knowledge, technical and creative skills and their fusion is increasingly growing in the creative sectors of economy, where they spread through an extensive network of communication links. It provides enterprises in other industries with opportunities to increase their efficiency due to the availability of open access to new knowledge, creative innovations and the speed of their mastery. Digitization promotes the speed of knowledge exchange, due to the introduction of modern educational technologies and digital tools into the educational process, and causes the need for the development of creative education for the formation of digital abilities and skills, which are already in demand on labour market today. Demand for design and technical skills will continue to grow as design and digital

technologies underpin the development of many creative industries, from fashion to advertising, architecture to publishing, as well as other non-creative sectors of the economy. The growth of digital content, design, Internet applications will require a combination of creative skills with digital and other technical capabilities, the so-called “createch” skills. In addition, the accelerated dynamics of the development of digital technologies leads to an increase in demand for digital and cognitive skills in the labour market to interact with AI. Existing research demonstrates the existence of a high level of correlation of certain skills with AI in various occupations, which are most closely related to AI due to job requirements. In particular, in the USA, the United Kingdom, Canada, Australia, and New Zealand, such skills most often include machine learning, scripting languages, principles of software development, Data Science, Big Data [1]. The rate at which AI is penetrating the economy is a key indicator of technology’s growing maturity, and demonstrates how the workforce and firms have been able to embrace AI as a technology. For example, studies confirm that in the US, the rate of diffusion of AI-related skills (that is, the increase in their connections with other skills in various occupations) was twice that of the average skill in the labour market and on average 10% better paid. This means that working in the digital space will increasingly require “fusion skills” that combine creative, commercial and business skills. Accordingly, investment in the development of creative education, which would accumulate interdisciplinary knowledge and contribute to the formation of technical and creative skills, is an important task to improve the quality of human capital in the concept of its development in conditions of creativity. Insufficient amounts of investment by manufacturing and creative enterprises in training and developing their employees, supporting lifelong learning, is the reason for the lack of skills in the workplace. This especially applies to the creative sector of the economy, which is characterized by flexibility and innovation in conditions of creativity and technology.

As for the components of *health and motivation*, it can be noted that they depend on the nature and features of creative work. It is characterized by high intensity, instability and complexity, where internal motives prevail over external ones, status and labour motivation over material ones, which can have a negative effect on the mental health and well-being of creative talents. Digitization of creative work, on the one hand, will contribute to the growth of its productivity and quality, the emergence of new creative content and innovations. On the other hand, it will lead to an even greater increase in its level of tension, limitations in live communication, and an increase in the level of conflict in everyday life of creative workers. Therefore, in this context, it is

important to ensure the quality of human capital, the level of its return in the form of Added Value and income, the factor of proper financial support for the working capacity of creative workers. It requires improving the practice of investing in the field of education and professional training, in the development of the health care system and the recreational complex both at personal, micro and macro levels. As for the component of spatial mobility, it should be noted that it is vital for people in creative jobs, as it requires constant “refuelling” by socio-cultural changes taking place in society: proactive communication, new impressions and expressions that feed creativity. This is what determines the migratory mood, motives and behaviour of creative talents. It is important to note that, on the one hand, the migration of creative people is a necessary factor in their professional development and realization, which leads to an increase in the value of human capital. On the other hand, it affects the spatial redistribution of human capital, “creatively” exhausts those countries from which talents emigrate and nourishes those where the creative flows are directed. Also in this context, the current trend of digital (virtual) labour migration is also characteristic of the creative economy sector, in particular for IT and design specialists, whose incomes are generated digitally and through digital employment (freelancing). However, for specialists in the other sectors of creative economy (photography, cinema, architecture, fashion, decorative and applied arts), spatial labour migration is more acceptable, since their creative work products require open “living” space. Therefore, consideration of the mentioned trends in the sectors of creative industries is necessary in the formation of modern migration policy and needs to be regulated by governments, especially at the level of countries that are donors of creative talents.

Digitalization increases a new type of threats associated with the rapid development of computer technologies, i.e. cybercrime. It is also a source of scaling existing threats regarding the violation of intellectual property rights and the spread of plagiarism, which is characteristic of the sector of creative economy, since products of creative activity are overwhelmingly individual (personal) property of employees of creative professions. This determines the need to take into account the security and protection component in the global paradigm of human capital development [2].

Conclusion

Therefore, the effects of global trends in the development of the world economy on the formation of key components of human capital and the appropriate amount of investment in knowledge, professional skills and abilities, health, motivation, spatial mobility and human safety and protection will determine the possibilities of a high level of productive return of human

capital, which is socially significant and possible for its planning and development as an object of management at different economic levels.

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RESTAURANT BUSINESS OF UKRAINE DURING THE WAR

Anzhelika Lahodzia, Tatyana Odinkova, Iryna Dernova *

ISMA University of Applied Sciences, Latvia

**Corresponding author's e-mail: lagodzaanzelika@gmail.com*



Abstract

The modern industry of the restaurant business is experiencing real challenges and surprises with its stability and cohesion. The full-scale war has made the market situation in the restaurant service market extremely difficult, resulting in restaurateurs not being able to strategically plan for the long-term development of their business and focusing only on the short-term perspective.

Keywords: restaurant business, full-scale war, catering establishments

Introduction

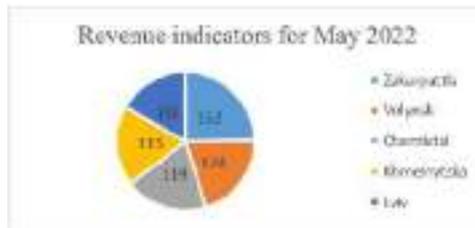
In modern times, business faces many challenges, if earlier the only problem for entrepreneurs was competitors and government requirements, then in recent years extraordinary situations such as the COVID-19 pandemic and war have been added. During the quarantine measures, the owners adapted to this situation and switched to food delivery in order to preserve the establishment and profit.

But after the full-scale invasion of the Russian Federation into Ukraine on February 24, 2022, the life of Ukrainians became unpredictable. At the beginning of the war, visiting food establishments became not only impossible, but took a back seat in the minds of Ukrainians. This was influenced by many factors, such as: constant shelling, evacuation of the population, a sharp drop in purchasing power or the absence of work at all [1].

To date, compared to February 2022, the restaurant business market has fallen by approximately 25%. In some regions, the market fell by more than 50% (Kharkiv, Mykolaiv, Zaporizhzhya, Luhansk regions), in Kyiv, Odesa, Dnipropetrovsk regions – by as much as 30%. At the same time, positive dynamics are also observed in the western region: in Lviv and the region, the number of restaurants and cafes increased by approximately 30%, in Zakarpattia, Chernivtsi, and Ivano-Frankivsk regions by approximately 20% [2].

The public catering market is developing most intensively in Lviv – more than 500 new establishments in the region since the beginning of the war. This is also reflected in the fact that restaurant investors began to consider the cities of Western Ukraine as more profitable for starting a new business.

The study for May 2022 shows the best revenue indicators of institutions in the Transcarpathian region (Fig. 1). During the week of May 16-22, it reached a total of 152% against the week of February 14-20. The lowest indicators are in the east and south of Ukraine, which are at the epicenter of hostilities.



Drawing 2. Revenue indicators of restaurants for May 2022

The following factors have a negative effect on the efficiency of the restaurant business:

- damage and destruction of property, buildings, stock;
- theft of property in the temporarily occupied territories of the country;
- interruptions in the supply of raw materials, materials, and goods from abroad;
- growth of the exchange rate and devaluation of the hryvnia;
- forced resettlement of citizens;
- reduction of incomes of Ukrainians and, as a result, reduction of purchasing power.

Restaurants and restaurant chains that have decided to become volunteers deserve special attention: they cook for soldiers from the Armed Forces of Ukraine, territorial defense, displaced persons and all those in need.

Among such establishments: Kyiv Food Market chain, Lyudi Coopera, Goodwine, Dmytro Borisov Family of Restaurants, Holding of Emotions !FEST, restaurant company First Line Group, restaurant chain Mafia, Headquarters Sozanovsky", restaurant chain "Tarantino Family" and many others. Many restaurants have been converted into military field kitchens.

But at the expense of expansion abroad, there are not many such examples so far. About a third (28%) of representatives of Ukrainian small and medium-sized businesses have already expanded their activities to foreign consumers [3].

First of all, the war hit the key business link – the supply of products. Restaurateurs have acknowledged serious disruptions in logistics and shortages of certain products. At the beginning of the war, it was difficult to find spices, tomato paste, alcohol and imported goods (avocado and salmon). Some suppliers and factories have stopped working altogether. Among the other problems faced by the restaurant business during the war are: panic, the outflow of personnel, termination of contracts for the supply of goods, communication support at all points.

At the beginning of the war, simple and homemade food was relevant in establishments, since there were no problems with products for such dishes at that time, and homemade food was and still is cheaper in cost. Italian and Asian cuisines were in trend for a long time, but due to the exchange rate, imported products became more expensive, so the owners of establishments could not order expensive products in that difficult time for people.

According to the accounting system for restaurants Poster, Ukrainian restaurateurs in April 2022 made a choice in favor of small and more flexible formats: coffee shops, cafes, bakeries and fast food. Bars had the worst opening dynamics in April. If the number of new coffee shops and cafes during this period was only half as much as in the past, the number of new

bars fell 4 times, in particular due to the ban on the sale of alcohol in many regions [4].

So far, the restaurant industry has shown rare resilience in the face of war, although its financial reserves are rapidly melting: volunteer activities and, most importantly, the departure of potential guests from Ukraine and a decrease in purchasing power do not contribute to the preservation of former incomes. Two-thirds of restaurateurs saw their income drop by 30-70%. Most restaurateurs believe that it takes no more than two years for the industry to recover after the war.

Overview

This work deals with the state of the restaurant business during a full-scale war and conclusions on the following issues:

- How the war affected visits to food establishments
- How many institutions survived a full-scale war
- In which territory of Ukraine has the development of the restaurant business increased?

Decision

Today, restaurants need to seize the moment and not waste time, to be flexible and adapted to military conditions. After all, war requires decisive actions and decisions. Therefore, restaurant business owners need to review concepts at least once a week, try to attract a new audience, optimize the menu, review the ingredients of dishes, remove expensive items or those that need special products.

Conclusion

Thus, constant shelling, population outflow, falling wages, lack of work – these are all the things that today prevent Ukrainians from returning to their former life and habits, in particular, visiting food establishments, as before. If during the quarantine people could not and did not want to visit establishments due to the risk of catching the coronavirus, then with the start of a full-scale war in Ukraine, visiting restaurants completely disappeared from the agenda of hundreds of thousands of Ukrainians. After the victory of Ukraine, the restaurant business will begin to flourish not only in the western and central regions of the country, but also in the eastern, northern and southern territories. Only with faith in victory and tireless work will every Ukrainian be able to bring the great day of Ukraine closer.

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USING BLOCKCHAIN TECHNOLOGIES TO DIGITALLY ISSUE AND VERIFY DOCUMENTS

Daniil Lysenko, PhD Vladyslav Khotunov, Nataliia Falchenko

**Corresponding author's e-mail: drovk199995@gmail.com,
vkhotunov@gmail.com*

Abstract

Web 3.0 has been a hyped and hot topic since the late 2021. Currently, many people are wondering about the capabilities of Web3, trying to make use of it before anyone else gets the chance. There has also been a lot of skepticism around it. Web3 has been called not feasible, a buzzword and a pyramid scheme. It has also been criticized for its carbon footprint. In this work, I strive to explore the idea of decentralized Web 3.0 applications, assess the technology and its use cases and make a conclusion. To do this, I will compile all of the information and opinions on the topic I can find and then will make my own Web3 application based around the NFT technology. I strive to explore a concept that can be beneficial to society—verifying documents in an easy, publicly accessible way.

Keywords: web3, web application, informational technologies, document verification

Introduction

Web3, which actually is mostly referred to when Web 3.0 is mentioned nowadays, is the actual topic of this course work. The name Web3 was picked

to differentiate this concept from the semantic web. It's an idea of the Web being based on blockchain.

Web 1.0 used to be mostly decentralized, every website being its own separate thing. Nowadays, a big chunk of the Web is centralized. It is most apparent when every other Amazon or Google outage, half of the Web goes down with them. It is also a big concern that the Internet is largely dominated and monopolized by the "Big Tech".

Web3 is meant to counter that, since blockchain is decentralized, and building apps around it could solve most of the current problems and bring a scent of the Web 1.0 freedom back again. How feasible it actually is remains an open question.

By allowing "trust" to be exchanged across connecting networks, blockchain allows the Internet to create a distributed state of the network. The concept of a web of trusts between nodes in the Blockchain is based on this "trust." Blockchain is also connected to other decentralized Internet projects. Those initiatives share several unique characteristics, such as the importance of P2P, data storage, and encryption in each. Because blockchain shares these characteristics, it may be the most prominent alternative for Internet decentralization. Because of the components depicted in Figure 1, Blockchain is able to achieve these qualities [1].

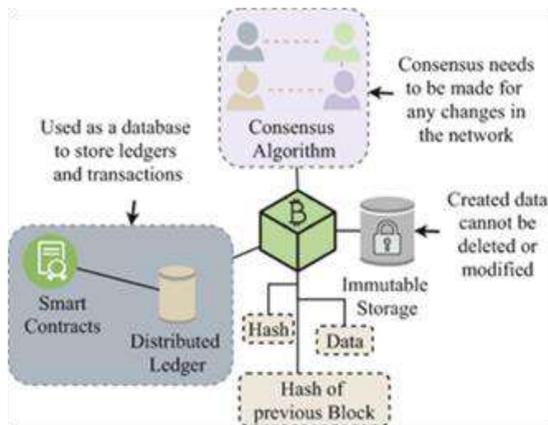


Figure 1. Blockchain components

There are a few advantages and disadvantages of Web 3. Advantages include decentralization, better privacy and transparency. Disadvantages

include the consolidation of blockchain, not transparent business practices, the abundance of cybercrime and environmental risks. Bitcoin by itself uses more energy than Ukraine annually [2].

The other piece of technology this work utilizes is NFTs. NFTs share the same advantages and disadvantages as Web 3 with a few additions. They can be used to verify the ownership history of file attachments, but they are also notorious for attracting scam artists, art thieves and questionable business schemes.

Overview

This work discusses and offers solutions to the following points:

- Discovering a potential use for NFTs
- Verifying documents in easy-to-develop way

Decision

The idea behind the project is to implement a web application, that allows institutions to create documents, bind them to NFTs and issue them to people via blockchain.

This will provide an easy and scalable way to combat forgery and complicated bureaucratic processes.

Conclusion

While Web3 remains a misunderstood concept in modern times and has a reputation of a solution without a problem, it still has the potential to become something better.

The technology's use is invaluable while using it for cryptographic purposes.

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SOIL SALINITY MEASUREMENT BASED ON DATA SAR SENTINEL-1

Merembayev Timur¹, Symagulov Adilkhan^{1,2,*}, Kuchin Yan¹,
Jan Rabcan³, Bayangali Abdygalym²

¹IICT MSHE RK, Kazakhstan, Almaty

²Satbayev University (KazNRTU), Kazakhstan, Almaty

³University of Zilina, Slovakia, Zilina

*Corresponding author's e-mail: asmogulove00@gmail.com



Abstract

Soil salinity is a significant negative factor that reduces the productivity of agriculture. In this paper, we consider the method of salinity assessment based on the performed field studies and SAR Sentinel-1 data. The collected data set concerns the communal territory of South Kazakhstan. We applied preprocessing of radar data and obtained $R^2=0,192$ estimate with LightGBM regressor.

Keywords: soil salinity, remote sensing data, machine learning

Introduction

Climatic changes and human activities lead to the degradation of the soil cover in large areas of the territory. Previously cultivated soils become unsuitable for crop production.

In this regard, it is necessary to record the changes taking place in order to develop countermeasures. However, the process of land salinization is highly variable and does not lend itself to strict forecasting methods. One way to assess salinity is to apply machine learning methods [1] based on remotely sensed land surface data [2,3]. In this paper, following [4], we consider the possibility of applying one of the machine learning algorithms to assess the salinity of the southern regions of Kazakhstan, based on data from the synthetic aperture radar (SAR) Sentinel-1.

Method

The methodological scheme of the study includes the following basic steps (Figure 1).

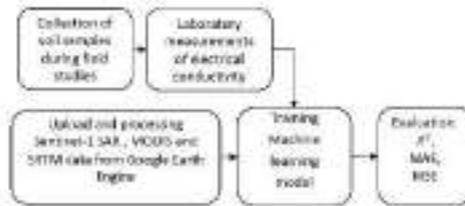


Figure 1. The main stages of research

The field studies were conducted between May and July 2022. A total of 207 soil samples were collected. The coordinates of the collection points were measured (Garmin 65 instrument, positioning accuracy about 5 m). The conductivity of soil solutions was measured in the laboratory (instrument (Hanna GroLine HI9814)). These data made up the target values of the data set. SAR Sentinel-1 data were then downloaded and processed so that a vector of values of size 19 was obtained for each body point. These data made up the input value matrix. Using the generated set, computational experiments were performed using the LightGBM regressor [5]. Evaluation of the regressor was performed using the coefficient of determination (R^2) [6].

The performance of the model was evaluated using Random permutations cross-validation (ShuffleSplit) after 200 runs of the model. The model showed an average value of $R^2=0.192$. The value scatter diagram is shown in Figure 2.

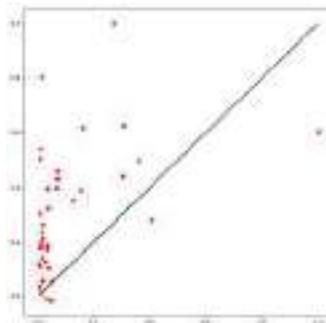


Figure 2. Scatter diagram of laboratory and predicted salinity values

Results

As an example of a project for testing automation the Siebel CRM testing automation system will be considered. Using a set of open-source software an automated testing system was created that are not inferior to the characteristics of the complete, large, and paid solutions. Technically, the created tests are http queries sent to the server, and test scenarios can be described using any programming language. This makes the solution more flexible and easily scalable. Rejecting the finished programs for automated testing, which requires significant hardware and software resources it was possible to significantly reduce the cost of testing automation and to achieve faster and more reliable tests.

Conclusion

This study demonstrates the potential of applying Sentinel-1 SAR data to assess soil salinity. Further research is needed, as the regressor results are not sufficient for widespread application. The applicability of other regressor models, optical range data, and additional input data preprocessing techniques should be analyzed as possible ways to improve the results in future studies.

Acknowledgments

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Authors



Timur Merembayev, 1985, Almaty, Kazakhstan

Current position: software-engineer at Institute of Information and Computational Technologies.

Scientific interest: Machine Learning, GIS, Geoscience, Data Management etc.



Adilkhan Symagulov, 1994, Almaty, Kazakhstan.

Current position, grades: Engineer and junior researcher in scientific projects

Scientific interest: **Machine Learning, Deep Learning, Data Science, etc.**



Yan I Kuchin, 1980, Almaty, Kazakhstan.

Current position, grades: programmer-engineer at Institute of Information and Computational Technologies.

Scientific interest: **geophysics, machine learning, data processing, natural language processing etc.**



Jan Rabcan, 1989, Zilina, Slovakia

Current position, grades: as. professor, PhD

Scientific interest: data mining, artificial neural network, machine learning etc.



Bayangali Abdygalym, 1997, Almaty, Kazakhstan.

Current position: Master of Technical Sciences, **Kazakh National Research Technical University, Kazakhstan**

Scientific interest: machine learning, software engineering, NLP.

THE ROLE OF AJARA TOURIST ROUTES IN THE CULTURAL TOURISM

Ermile Meskhia

Batumi Art State Yniversity

Georgia, Batumi, Gorgiladze street 19

www.batumi.edu.ge; info@batu.edu.ge

Received 4 фзкуд 2023, www.isma.lv

Management (Tourism business), camera-ready, platform only

Abstract

With the financial support of the local government the Department of Tourism of Ajara Autonomous Republic planned and implemented a number of activities with the purpose of forming new tourist routes, taking into consideration the interests of various age and taste groups. At the stage of planning new tourist groups previous years' experience of studying the tourists was taken into account, as well as existing resources and opportunities. An electronic map of the tourist routes was created.

Key words: cultural tourism, route, strategy, Georgia, Ajara

Introduction

Despite of the challenges resulting from Covid-19 Pandemic, tourism industry moved to a new phase in Georgia.

As it is illustrated with International tourism experience, cultural tourism remains as one of the most demanding tourist directions.

Georgia from this viewpoint has all necessary conditions for developing the aforementioned traditional fields of tourism, which is verified with an increased demand on the cultural tours among the streams of tourists.

Body text

Ajara represents one of the distinguished regions for recreation and business meetings due to its unique nature, existence and tourist resources.

In 2022, Batumi Batumi won the title of Europe's fastest-growing tourist destination at the "World Travel Awards".

Batumi was named as winner the winner at the World Tourism Festival held this year at the Island Madeira, in Portugal being awarded with the title recognized as "Oscar" in the field of tourism.

With the financial support of the local government the Department of Tourism of Ajara Autonomous Republic planned and implemented a number

of activities with the purpose of forming new tourist routes, taking into consideration the interests of various age and taste groups.

In general, existing methodological literature upon planning touristic routes is not characterized by a diversity. Formation of the routes is basically based on the professional experience of field experts and the recommendations existing in certain academic literature.

From this viewpoint, a guidebook of the Cultural Routes “Management of Cultural Routes from theory to practice” issued by the Council of Europe is to be considered as an exception [1].

Which was financed with joint program of the European Council/Council of Europe upon Cultural Routes. A guidebook is an important book for the managers and designers of the routes, students and researchers interested in the cultural tourism and related issues [2].

In Georgia, the fundamentals for planning, designing and implementing tourist routes is represented by the Legal Documents regulating the field of tourism, “Georgian Tourism Strategy – 25”, “Strategic Plan of the Department of Tourism and Resorts of Ajara”, documents issued with the support of the Directorate of Research and Planning at the National Tourism Administration of Georgia, other recommendations and reference books [3].

Previous experience of the studies undertaken by the tourists, existing resources and opportunities are to be also taken into account at the stage of planning tourist routes.

“Tourism Department of Ajara Autonomous Republic” is actively working in the direction of planning, developing and popularizing new tourist routes in mountainous Ajara [4].

Machakhela, Keda and Khulo Routes are particularly popular among the visitors. It is noteworthy that informational signboards, tourist objects are placed on the tourist routes, besides this individual tourist maps were developed. An electronic map of the tourist routes was formed [4].

With the organization of the Department informational tours were organized for the representatives of tourist agencies and guides. Short-term educational trainings and courses were delivered for the personnel involved in the tourist routes.

It is noteworthy that each route is developed in accordance with the principle so that to necessarily include family guesthouses and food objects functioning on the route, which enables the tourist using the route to visit the sightseeing places and have an opportunity for on-site service.

Under organization of the Department of Tourism and Resorts of Ajara an informational base in foreign language is provided for each tourist route, being available for the citizens of any country via social networks.

Conclusions

International Conference of the Informational Systems to be held in Riga, Latvia will enable us to introduce the activities implemented in terms of planning and organizing tourist routes to foreign colleagues.

On the other hand, this will serve as a unique opportunity for popularizing tourist potential of Georgia, in particular Ajara abroad and being shared with best practices from foreign partners.

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Authors

Name Surname, Date of birth, Place of birth

Ermile Meskhia, 09.01.1959, Abasha

Current position, grades: Dean of Batumi Art State University

University studies: Doctor of Historical Sciences

Scientific interest: Culture research

Publications (number or main): 46

Experience: professor, Doctor of Historical Sciences, Author of 3 monographs and over 45 scientific works. Three of them refer to Bologna Process and the problems about higher art education in Georgia. The coordinator of international grant project of TEMPUS (Trans-European-Mobility-program for University Studies) in Batumi Shota Rustaveli State University (since 2010) and 2019-2022 – manager and Researcher of Project Erasmus + Role of Universities in the Regional Development/RURD



FACTORS AFFECTING THE FINANCIAL SUSTAINABILITY OF FERTILIZER PRODUCERS IN UKRAINE

Miniailo Olena^{1*}
Grinčuks Maksims²
Kuznetsova Nataliya³

^{1,2} ISMA University of Applied Sciences, Latvia,

³ Cherkasy State Business College

*Corresponding author's e-mail: 380975700068lena@gmail.com

Abstract

The paper considers the peculiarities of the development of the fertilizer market in Ukraine, defines the characteristics of the activity and financial stability of enterprises on it. In the course of the study external and internal factors affecting the financial stability of Ukrainian fertilizer producers were determined.

Keywords: fertilizer market, financial stability of enterprises, influencing factors, external and internal influencing factors.

Introduction

A key segment of the global chemical industry is the production of basic chemicals, fertilizers and nitrogen compounds, plastics and synthetic rubber in primary forms. The largest mineral fertilizer producers are concentrated in this segment, whose products are oriented both to supply the domestic market and for export. In recent years, chemical companies producing mineral fertilizers in Ukraine are reducing production volumes, so the issue of meeting the demand of the domestic market for these products is becoming more and more acute.

Overview

In Ukraine, the production of mineral fertilizers has always been a sector, the products of which were in demand. Previously, domestic agrarians started to buy fertilizers for the next sowing campaign at least six months in advance. Nitrogen (68.0%), complex (28.0%), potassium (3.7%) and phosphate (0.3%) fertilizers were in high demand among agricultural producers. The situation and habits of Ukrainian farmers were changed by 2022 – the beginning of a full-scale war in the country. Because of the massive shelling and occupation of the southern regions, many fields were left uncultivated and mineral fertilizers became unnecessary. Their sale was further complicated by the fact that all logistical routes were lost, and even those in need and able to purchase

fertilizers were not physically able to deliver them. Due to the outbreak of war, the mineral fertilizer market in Ukraine fell by 40-55%, from 4.75 million tons to 2-2.9 million during 2021-2022. This is primarily due to the reduction of cultivated areas by 14-16% as a result of military operations [3]. But despite the weak demand and the loss of a large number of production facilities, the chemical industry has not stopped even if the war is over, and if peace comes, the Ukrainian chemical industry can show significant growth – more than 15% per year, and its contribution to the country's GDP can increase to 8-10% [4].

In addition to the factor of war, the activities of fertilizer enterprises in modern conditions are accompanied by the influence of many factors of the external environment, which affect including the processes so financial support. Therefore, manufacturing enterprises need to be able to adapt to external factors and respond to their changes in a timely manner.

The external factors affecting the production activities of enterprises in the fertilizer market are economic and social (the level of technology and equipment development; solvent demand of the population; economic policy, its stability and validity; legal framework of economic activity). To date, apart from the martial law inside the country, the work of domestic enterprises is negatively affected by the coronavirus pandemic. The main specificity of these factors is that enterprises have no possibility to adjust them.

Factors contributing to the deterioration of the financial condition of production enterprises are also: non-compliance with the "golden rule of financing" of production activities, growth of borrowed capital in all forms, increase in accounts payable, increase in the cost of bank loans, availability of collateral capital, etc.

Also, the main internal factors that need to be considered at the level of individual enterprises are: the composition and structure of the products and services provided; revenues, production costs; the potential opportunity of the enterprise to take a certain share of the market; the optimal composition and structure of assets; composition, structure and state of financial resources; the right choice of strategy and tactics of financial resources management; industry affiliation of the enterprise.

It should be noted that all of the above factors are closely interrelated, but their impact on the financial stability of the enterprise can be both negative and positive.

The main perspectives of improving the financial stability for Ukrainian mineral fertilizer producers in the conditions of war is the entrance to the international market and increase in foreign sales of fertilizers. Until 2021, 60% of global fertilizer exports were carried out by five players – Canada, Russia, EU, China and Belarus. Qatar, Saudi Arabia and Iran remain very

strong players on the nitrogen fertiliser market. The fall of Russia, Belarus, and, most likely, Iran under the sanctions roll opens up good opportunities for Ukraine in the global markets [4].

Conclusion

Thus, financial stability in the current business environment plays a key role in the functioning of any enterprise and is one of the main indicators that indicates the current financial condition of the company and ensures its successful and stable operation. The development of the fertilizer market in Ukraine and the country's position on the global fertilizer and food markets in the near future will depend on how competently the grain agreement will be adjusted. Strategically, the country's position will depend on the timing of the end of the war and the ability of the Ukrainian government to effectively protect the interests of its own producers through various protective instruments within the WTO.

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DETERMINATION OF SOIL SALINITY USING A UAV

Mukhamediev Ravil^{1,2}, **Merembayev Timur**¹, **Symagulov Adilkhan**^{1,2},
Kuchin Yan¹, **Jan Rabcan**³

¹*IICT MSHE RK, Kazakhstan, Almaty*

²*Satbayev University (KazNRTU), Kazakhstan, Almaty*

³*University of Zilina, Slovakia, Zilina*

**Abstract**

In this paper, we consider a method of estimating soil salinity based on field surveys performed and data obtained during a UAV overflight of the field with a mounted multispectral camera. We applied Random forest regressor. The regressor was evaluated using Random permutations cross-validation: Mean Absolute Error: 0.577, Mean Squared Error: 0.695, Mean_R-squared scores: 0.575. The high results allow us to recommend the method for practical application.

Keywords: soil salinity, remote sensing data, machine learning

Introduction

The productivity of arable land can be significantly reduced by the effects of soil salinity. In order to take the necessary measures, e.g. soil leaching or conversion to salt-tolerant crops, mapping of cultivated fields is necessary. The traditional way is the application of remote sensing data, which are based on field survey data [1-3]. Due to the labor intensity of expeditions and laboratory measurements, the amount of ground data is usually very limited. Consequently, there is a need for a system that would link ground surface monitoring data with the actual values of soil or vegetation conditions. Such a system belongs to the class of artificial intelligence systems that can be built on the basis of one or more machine learning models [4]. Unmanned aerial vehicle (UAV) technology is successfully developed in several applications [5] and can help in such a system by collecting high-resolution operational data. In this study, we tested the possibilities of rapid land salinity detection using a UAV equipped with a multispectral camera.

Method

The general scheme of mapping using UAVs and machine learning models includes several steps (Figure 1)

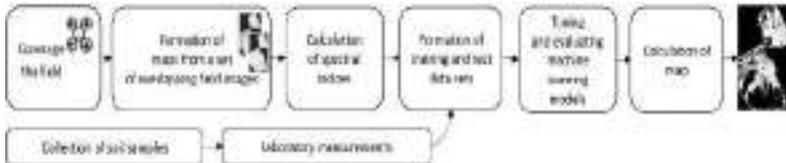


Figure 1. Main steps of soil salinity mapping using UAV

The field study was conducted on May 23, 2022. A total of 78 soil samples were collected as well. The coordinates of the collection points were measured (Garmin 65 instrument, positioning accuracy about 5 m). The conductivity of soil solutions was measured under laboratory conditions (Hanna GroLine HI9814 instrument). A field flyover was also conducted on May 23, 2022, using a specially designed UAV with a MicaSense RedEdge-MX multispectral camera installed. In Figure 2, the camera is marked with an orange oval.



Figure 2. UAV used in the research

The ground data constituted the target values of the data set. In turn, the multispectral UAV images (resolution about 7 cm per pixel) were processed and transformed into a set of layers corresponding to salinity indices: 'SI1', 'SI2', 'SI3', 'SI8', 'WI1', 'NDSI', 'SSRI', 'S1', 'S2', 'S3', 'NDSIre', 'SI3re', 'SSRIre', some of which, were formed by the authors of the study. These data made up the matrix of input values. Using the generated set, computational experiments were performed using Random forest regressor [6]. The regressor was evaluated using the coefficient of determination (R^2), Mean Absolute Error, and Mean Squared Error [7].

Results

The performance of the model was evaluated using Random permutations cross-validation (ShuffleSplit) after 200 runs of the model. The model showed an average value of $R^2=0.575$. The value scatter diagram is shown in Figure 3.

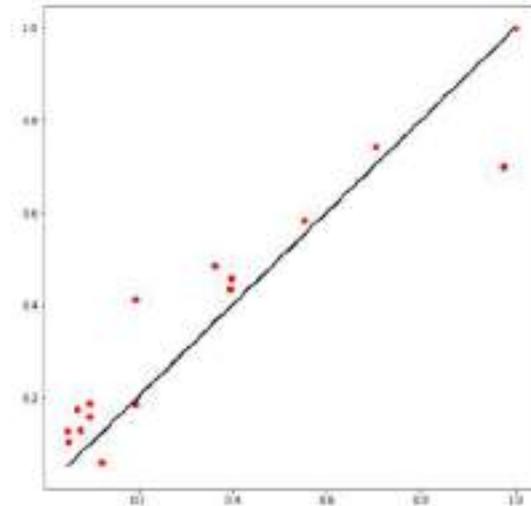


Figure 3. Scatter diagram of laboratory and predicted salinity values

Conclusion

The performed research allows us to recommend a combination of UAV + multispectral camera + machine learning for rapid mapping of the salinity of small agricultural fields. The advantage of the method is its efficiency and high resolution. In the course of further development, the authors plan to investigate other regressor models and increase the volume of field studies.

Acknowledgments

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Authors



Ravil I Muhamedyev, 1959, Irkutsk, Russia.

Current position, grades: professor at Satbayev University.

Scientific interest: machine learning, data processing, decision support systems etc.



Timur Merembayev, 1985, Almaty, Kazakhstan

Current position: software-engineer at Institute of Information and Computational Technologies.

Scientific interest: Machine Learning, GIS, Geoscience, Data Management etc.



Adilkhan Symagulov, 1994, Almaty, Kazakhstan.

Current position, grades: Engineer and junior researcher in scientific projects

Scientific interest: Machine Learning, Deep Learning, Data Science, etc.



Yan I Kuchin, 1980, Almaty, Kazakhstan.

Current position, grades: programmer-engineer at Institute of Information and Computational Technologies.

Scientific interest: geophysics, machine learning, data processing, natural language processing etc.

Jan Rabcan, 1989, Zilina, Slovakia



Current position, grades: as. professor, PhD

Scientific interest: data mining, artificial neural network, machine learning etc.

EXPLAINABLE MACHINE LEARNING MODELS FOR IMPROVING THE QUALITY OF HEALTH CARE ORGANIZATIONS

**Mukhamediev Ravil^{1,2}, Yelis Marina^{1,2,*}, Yunicheva Nadiya^{2,3},
Symagulov Adilkhan^{1,2}, Kuchin Yan², Jan Rabcan⁴**

¹*Satbayev University (KazNRTU), Kazakhstan, Almaty*

²*IICT MSHE RK, Kazakhstan, Almaty*

³*Almaty University of Power Engineering and Telecommunications
(AUPET), Kazakhstan, Almaty*

⁴*University of Zilina, Slovakia, Zilina*

**Corresponding author's e-mail: k.marina92@gmail.com*



Abstract

In this paper, explainable machine learning is explored as a means for implementing a decision support system for healthcare organizations.

Keywords: Explainable Machine Learning, healthcare, multi criteria decision support system

Introduction

Artificial Intelligence systems show results in a wide variety of practice areas.

Currently, one of the unsolved problems of artificial intelligence is the problem of explaining the operation of complex learning systems. In health care, banking, and critical infrastructure areas, the application of machine learning is limited for this reason, among others [1]. At the same time, there are active developments in the field of explanation systems [2]. The significant results achieved [3,4] allow us to consider machine learning models in conjunction with explanation systems as a separate class of Explainable Machine Learning (EML) systems. Explanation models are divided into four groups [3] (Figure 1). It is possible to use such systems to develop systems for making recommendations on the management of organizations based on a range of indicators in comparison with other organizations of similar type.

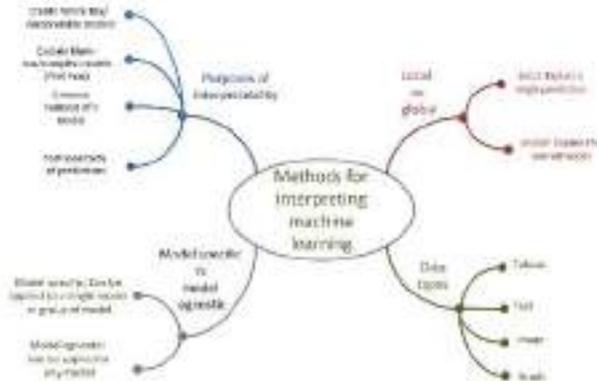


Figure 1. Methods for interpreting machine learning

The scheme of work and some results of the development of the explanation system obtained in the field of school education are described in the paper [5].

Method

Machine learning models are tuned by selecting parameters that minimize prediction errors for all examples on which they are trained. Suppose we have a regression model with a cost function of the form:

$$J(\theta) = \min \frac{1}{2m} \sum_{i=1}^m (h_{\theta}(x^{(i)}) - y^{(i)})^2 \quad (1)$$

where m is the set of training examples or objects; $x^{(i)}$ – the value of parameters or properties for the i -th object; $y^{(i)}$ – the actual value of the explained or target variable for the i -th example; h_{θ} – the hypothesis function, which can be, for example, linear.

$$h_{\theta} = \theta_0 + \theta_1 x_1 + \theta_2 x_2 + \dots + \theta_n x_n, \quad (2)$$

and n is the number of properties (features) or input variables.

To minimize the cost, the parameters θ are selected, and the parameters themselves describe in this case the influence of the properties. In more complex cases, such a scheme is considered only on a local section [6], or some game-like model [7] is used, essentially enumerating combinations of properties.

Multi Criteria Decision Support System – MCDSS are built just on the weighting of properties or their combinations, applying different techniques for obtaining knowledge from experts [8]. In the case of EML, the module of obtaining and transforming expert knowledge is replaced or supplemented by a model built on objective data, the volume of which may be large, and unavailable for review by an individual expert. As a result of the work of this

module, an estimate of the influence of parameters of various kinds is formed (Figure 2).

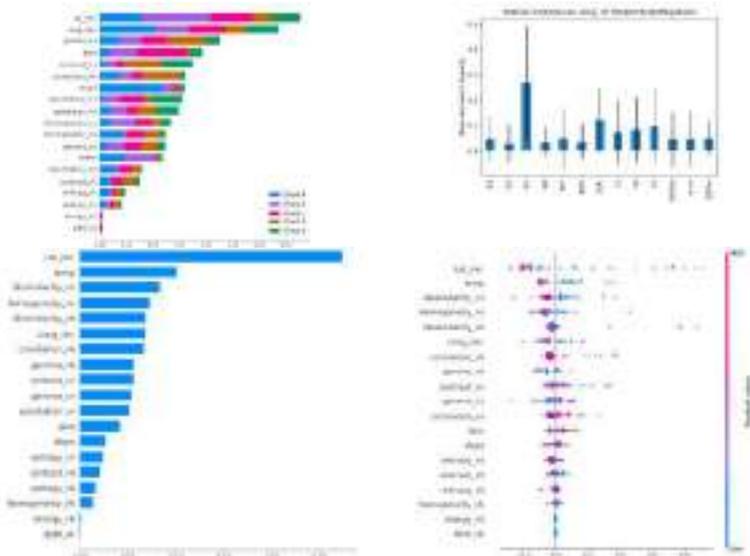


Figure 2. EML model visualization

Knowing the influence of the properties, we can adjust them to get better results in a regression or classification model describing our object of study.

To apply this approach, we need to solve the following problems:

- Form a set of data describing the objects under study
- Define one or more target indicators (target values)
- Develop a classification or regression model
- Evaluate the influence of the attributes
- Construct a system to explain the influence of the properties or, in other words, a system for forming recommendations.

The benefit of such a decision support system is the reliance on an objective information model of the system

Results

At present, to implement the described decision support model, a system of indicators of health care organizations has been developed, a data set describing more than 200 health care organizations in Kazakhstan has been collected, several target indicators of the system have been identified, a

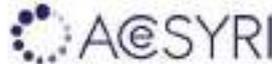
regression model linking research objects (health care organizations) into a single information system has been developed and experiments to assess the influence of properties have been conducted.

Conclusion

The paper justifies the use of EML as part of the MCDSS, as a way to build a block of knowledge, based on objective information of large volume.

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Authors



Ravil I Mukhamedyev, 1959, Irkutsk, Russia.

Current position, grades: professor at Satbayev University.

Scientific interest: machine learning, data processing, decision support systems etc.



Marina Yelis, 1992, Almaty, Kazakhstan.

Current position, grades: PhD student at Satbayev University.

Scientific interest: machine learning, data processing, computer vision, etc.



Nadiya Yunicheva, 1968, Almaty, Kazakhstan.

Current position, grades: Leading researcher, Institute of Information and Computing technologies.

Scientific interest: methods of the interval analysis, data analysis of geophysical and climatic research.



Adilkhan Symagulov, 1994, Almaty, Kazakhstan.

Current position, grades: Engineer and junior researcher in scientific projects

Scientific interest: Machine Learning, Deep Learning, Data Science, etc.



Yan I Kuchin, 1980, Almaty, Kazakhstan.

Current position, grades: programmer-engineer at Institute of Information and Computational Technologies.

Scientific interest: geophysics, machine learning, data processing, natural language processing etc.



Jan Rabcan, 1980, Zilina, Slovakia

Current position, grades: as. professor, PhD

Scientific interest: data mining, artificial neural network, machine learning etc.

TOPIC MODELING OF INFORMATION PUBLICATIONS**Andirov Mussa****Al-Farabi Kazakh National University, Almaty, Kazakhstan***Corresponding author's e-mail: andirov2610@gmail.com***Abstract**

With the introduction of information and publications for social media every day, a large number of text content is created in the comments, reviews and short text reports. As a result, users have a lot of relevant information in the same content or more information on the topic discussed. The algorithm of machine learning and learning of the spoken language is used to analyze the number of text pieces in social networks, accessible to the internet, including the method of topic modeling, which has become popular in recent years. In this article, the proposal of topic modeling and its public application, methods and means is considered. Topic modeling helps to classify documents into different topics and to select some words that represent the extracted topics. In this work, we created a topic modeling pipeline to evaluate different topic modeling algorithms, including their performance on short and long texts, preprocessed and non-preprocessed datasets, and with different embedding models. Finally, we summarized the results and more suggestions for algorithm selection depending on the task.

Keywords: topic modeling, LDA, NMF, BERTopic, Top2Vec, preliminary report, information publications

Introduction

We live in a world where data flows accumulate continuously. Thus, searching for the necessary information from the collected information can be something very tiring and time consuming. In natural language processing (NLP), the term topic modeling includes statistical and deep learning methods for searching for hidden semantic structures in a set of documents. Topic modeling is designed as a means of organizing, searching and understanding a large amount of textual information. This is an uncontrolled problem of machine learning. Uncontrollable means that the algorithm studies patterns when there are no tags or labels. Most of the information we create and Exchange as human beings is textual. Documents, conversations, phone calls, messages, emails, notes, social media posts. In this article, we will discuss

popular approaches to topic modeling based on deep learning, starting with conventional algorithms. We will try to share these models and compare their advantages and disadvantages in practical use. Topic modeling methods are designed for word processing, as topics are difficult to define manually, which is inefficient or scalable due to the large amount of data. So, our topic model evaluation solution is a complete set of different topic matching, diversity and cluster metrics, as well as many visualizations that make it easier for people to better understand and evaluate the results of topic models. The indications used consist of:

- Normalized Pointwise Mutual Information (NPMI) is an indicator of the sequence of topic words in $[-1,1]$, where 1 is the ideal union
- Topic Diversity (TD) – measuring diversity by the percentage of unique topic words, i.e. $[0,1]$, where 1 represents different topic words.
- Inverted Rank-bias overlay-also an indicator of diversity in the form of a percentage of the rank of unique topic words, in which higher rank words are less punishable. Again in the $[0,1]$ range, where 1 represents different subject words.
- Rand Index-a measure of the similarity of two clusters given by the topic model and specific features, again $[0,1]$, where 1 represents a perfect match.

Materials and methods

2.1 Classification of topic modelling

The topic model can be seen as a technique for presenting large amounts of data generated by the development of computer and web technologies at low dimensions and presenting hidden concepts, prominent functions or hidden data variables depending on the context of the application. effectively defined [1]. The reduction in size was originally considered algebraically, where the original Matrix was decomposed into a factor Matrix. So, in this review, our topic simulation classification strategy is described as follow:

- Probability model
- Non-probabilistic topic model (algebraic model)

Impossible approaches are algebraic approaches to matrix factorization and appeared in the early 1990s along with the concept of implicit semantic analysis and non-negative matrix factorization. Both LSA and NMF work. in the " word bag " approach, when the body becomes a term document Matrix and the order of the terms is completely ignored, only the terms are taken into account in the documents. The probabilistic model emerged to improve an algebraic model such as implicit semantic analysis by adding probabilistic meaning using generative model approaches [2]. The next level in the classification tree is based on an observable and non-observable approach to subject modeling, with the PLSA and Dirichlet implicit distribution such as the probabilistic topic model falling into this hierarchy. Initially, both pLSA

and LDA were completely uncontrolled approaches, but later many researchers work on the Dirichlet hidden distribution model (LDA) with a controlled approach to model learning, Plsa being studied in a semi-controlled manner in very limited areas of application [1-2]. The perfect models did not make a significant contribution to controlled modes and are considered to be out of the article. The last level in the classification hierarchy considers word sequences when modeling the subject. Full topic modelling approaches based on BOW until 2006.

2.2 Dataset

The data sets used here can be divided into two different categories: short and long text sets. Their division into these categories is justified, since a set of short-text data has characteristics different from an extended set of text. For example, long-text data sets, such as 20 Newsgroups, often contain documents containing more than 100 words, and are more readable and complex because they are often news articles. The entire data set, their categories, the number of documents and the number of specific features indicated by the sources are shown in Table 1. You can get acquainted with their relevant sources on the links. For example, the 20 Newsgroups dataset is a version separated by dates, Yahoo Answers is a set of 60 thousand documents taken from a complete dataset, CRISIS NLP resources are only marked versions. For our experiments, we initially studied how raw and pre-processed versions of the same data set affect the results. Even for embedding-based topic modelling algorithms such as Top2Vec and BERTopic, we found that a small amount of preprocessing results in good topic words [3]. Therefore, in order to make a fair comparison of the data sets of different algorithms, we used similar preprocessing methods in each run. In addition, to facilitate comparisons based on human data and better visualize the results, we selected a small number of topics in the data set, which is determined by the number of unique features in the corresponding data set.

Table 1

Available datasets and their characteristics

Name	Type of Text	#Docs	Topic Count
20 Newsgroups (By Date)	Long	18846	20
Yahoo Answers (60K)	Long	60000	10
CRISIS #01	Short	20514	4
CRISIS #07	Short	10941	2

2.3 Topic modeling algorithms

In this section, we will consider in more detail the four algorithms used. Here we give examples of how algorithms work, what parameters we use, and how to visualize algorithms.

Dirichlet latent distribution (LDA)

LDA is a probabilistic model that is considered the most popular TM algorithm in real-world applications for extracting topics from a collection of documents, as it provides accurate results and can be taught online. The corpus is organized as a random mixture of hidden themes in the LDA model, and the theme represents the distribution of words [4]. In addition, LDA is a generative uncontrolled statistical algorithm for extracting topic information (headings) from a collection of documents within the framework of the Bayesian statistical paradigm [4]. The LDA model assumes that each document consists of different topics, where each topic is a probability distribution by word. An important advantage of using the LDA model is that topics can be extracted from a given collection without prior knowledge. The scheme of the LDA topic model is shown in Figure 1.

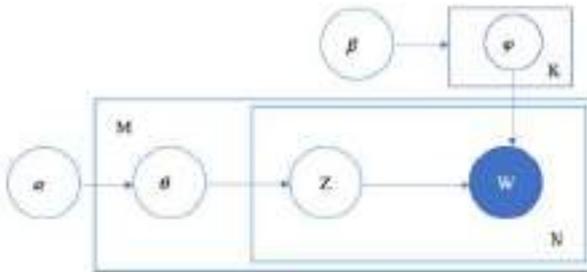


Figure 1. The initial structure of the LDA topic model

Non-negative matrix factorization (NMF)

NMF is an uncontrolled matrix factorization (linear-algebraic) method that can simultaneously perform both dimension reduction and clustering. It can be applied to many topic modeling tasks; however, only a few works have been reported to define topics for short texts [5]. Introduced the NMF model, the purpose of which is to obtain headings for short text data by using a factorizing asymmetric matrix of correlation of terms, a term document Matrix, and a matrix view of the text body as a word package. The NMF method was defined as the decomposition of a non-negative D matrix into non-negative factors U and V , $V \geq 0$ and $U \geq 0$, as shown in Figure 2. The NMF model can obtain relevant

BERTopic

We will briefly describe how BERTopic creates themes and topic representations in the form of topic words. The algorithm can be divided into three stages. In Stage 1, embeddings are created for each document in the data using a pre-prepared embedding model. By default, any model from the Sentence BERT framework is supported, but in general, any prefabricated language model can be used, which is one of the strengths of BERTopic, which is precisely reduced to semantic similarity by transferring calculated attachments to it [6-7]. Then, in Step 2, these attachments are grouped into Umap and then smaller-sized views into headers using the hierarchical clustering algorithm in the HDBSCAN soft clustering approach. This clustering method allows you to classify documents as noise, which can improve the formation of short topics. However, in practice, when we use a small number of headers, most of the 10 files are classified as noise, up to 60% of the total data set. Here, each document is assigned to a single topic (cluster), so if someone wants to attribute each document to a "real" cluster without making any noise, our experiments have shown that the simplest and most elegant solution is to use K-Means instead of HDBSCAN, which, of course, requires us to specify the number of the desired topics, as well as Other options, such as changing the parameters of the HDBSCAN algorithm and attributing documents to a noise-free cluster, were accompanied by additional problems and performance reductions if the probability was greater than a given threshold value. Finally, in Stage 3, using the class-based TF-IDF approach, topic words are allocated to each cluster by creating a distribution of topic words and selecting the best N words (here: ten words in the topic). Figure 4 shows the 20 Newsgroups topic similarity matrix for BERTopic. Only five headers are shown here as a set of 20 to avoid too large a number. The numbers in the Matrix show the cosine similarity of different subjects. Low values indicate that these two topics are not important, while high values suggest the opposite. For example, the fifth and twelfth topics can be considered similar topics in politics.

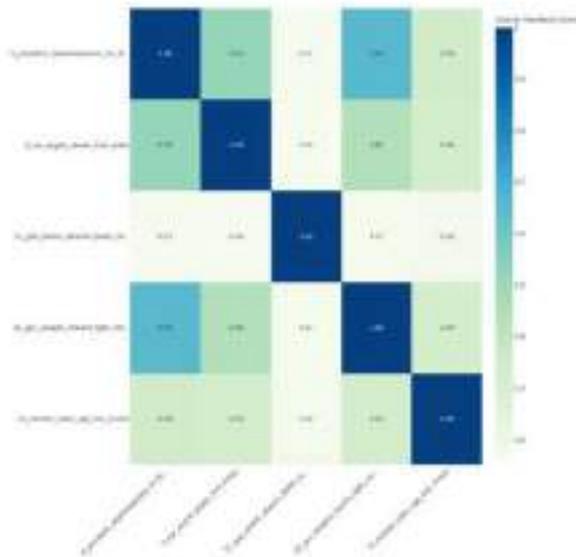


Figure 4. Visualization of the topic similarity matrix for BERTopic

Top2Vec

There are several similarities between Top2Vec and BERTopic. Both use pre-prepared embedding templates to create document and word embeddings. The embedding sizes are then reduced using UMAP and clustered using HDBSCAN. Unlike BERTopic, Top2Vec takes a slightly different approach to creating title words, giving all documents a specific title. Consequently, there are no noisy documents that do not belong to the topic in the top2vec output [8]. In addition, Top2Vec solves the issue of emissions documents without taking them into account when calculating topic vectors, but subsequently assigns them to the nearest topic vectors. Documents with emissions can be viewed with the naked eye thanks to the UMAP-2D visualization method. It also concludes that Top2Vec consistently finds more representative information headers and corps than probabilistic generative models such as the LDA and PLSA for different header sizes and keyword count. We fully agree with this statement, since we have observed a similar pattern in our experiments [8]. The result of the UMAP-2D visualization can be seen in Figure 5 for TOP2VEC with the CRISIS #01 data set. Documents with emissions are marked with white circles, and each colour represents a

different defined subject (not a specific sign). Since it directly uses document embedding, this visualization method is only available for embedding-based algorithms (Top2Vec, BERTopic). Using the UMAP algorithm reduces the dimensions of the document to 2 and displays the resulting vectors in a 2D coordinate system.

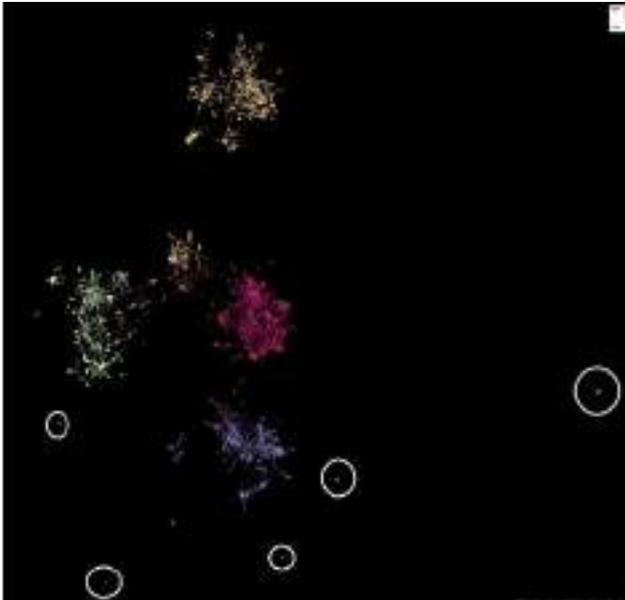


Figure 5. UMAP 2D scatter chart visualization for Top2Vec

Comparison

In this section, we calculate and compare the results of our algorithms, including the performance results of short and long data sets, the performance results of pre-processed and unprocessed data sets, and the effects of different embedding patterns [9].

3.1 Performance for short data sets

First, we compare the performance of different algorithms in a short data set. As mentioned earlier, the short data set in our task includes four Crisis data sets and one news set. Table 2 presents the results of our algorithms for all five evaluation indicators. Estimates are averaged over all five data sets. In addition, the number in parentheses indicates the rating of each algorithm.

Table 2

Performance for short data sets

Algorithm	TD Unique	TD Inv. RBO	TC NPMI	Cluster Rand
NMF	0.718(3)	0.715(4)	-0.014(3)	0.614(3)
LDA	0.700(4)	0.810(3)	0.010(2)	0.625(2)
BERTopic	0.826(2)	0.901(2)	0.050(1)	0.474(4)
Top2Vec	0.897(1)	0.956(1)	-0.279(4)	0.739(1)

As can be seen from Table 2, The top2vec algorithm surpasses other algorithms in TD and Cluster Rand, while BERTopic achieves the best results in TC.

3.2 Performance for long data sets

Comparing long data sets is very similar to short data sets. For example, we have 20 Newsgroups datasets and a Yahoo Answers datasets; the result is the average score for these two datasets [10]. The number in parentheses indicates the rating of each algorithm. The result is shown in Table 3.

Table 3

Performance for long data sets

Algorithm	TD Unique	TD Inv. RBO	TC NPMI	Cluster Rand
NMF	0.565(3)	0.805(4)	0.035(3)	0.846(2)
LDA	0.565(3)	0.878(2)	0.038(2)	0.792(3)
BERTopic	0.637(2)	0.828(3)	0.081(1)	0.425(4)
Top2Vec	0.819(1)	0.902(1)	0.113(4)	0.906(1)

The situation with a long data set is much more complicated than with a short data set. In total, four algorithms ranked first in at least one evaluation indicator. Top2Vec ranks first twice: TD (Unique) and Cluster Rand; it also ranks TD (Inv. RBO) with a slight gap from the first place. As for the two indicators in TC, BERTopic ranks first, surpassing other algorithms.

Conclusion

Topic modeling is increasingly used in our daily lives, and the need to extract topics from unstructured data is also increasing every day. In our work, we have developed a topic modeling pipeline, which includes a selection of data sets, algorithms and evaluation indicators. In addition, we have introduced four imaging methods that will help people intuitively assess the performance of the model. In our experiments, we found that no algorithm is superior to the others in

all evaluation indicators; thus, there is no super-superior algorithm. However, you can choose the best algorithm according to the task.

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Authors



Andirov Mussa, Almaty, Kazakhstan.

Current position, grades: Master's student of the Kazakh National University named after Alfarabi

Scientific interest: Artificial intelligence, machine learning, natural language processing

**THE 21TH INTERNATIONAL CONFERENCE INFORMATION
TECHNOLOGIES AND MANAGEMENT 2023****Kostiantyn Nosatskiy, PhD Vladyslav Khotunov***Cherkasy State Business-College, Ukraine***Corresponding author's e-mail: kostyaa.nosatskiy@gmail.com***Abstract**

Today, the problem of ecology is quite acute, because with the growth of industry and the improvement of a comfortable standard of living, our humanity has begun to forget that the air that is around us, we breathe into your lungs, as well as what water a person pollutes over time gets into our body and can cause significant damage, therefore the issue of ecology is at the top of the agenda in the world.

Keywords: ecology, solar energy, alternative sources of electricity

Introduction

The ecology of our planet is definitely the business of everyone who lives on our planet, but unfortunately, people have begun to forget about it by spoiling it with their unconscious actions, but it is worth noting that humanity has still taken certain steps to improve the ecology of the world. For example, back in 1859, after the tragic cases of the cholera epidemic in London, the then authorities decided to build a sewage system that was able to improve the epidemiological situation in the country. Such a project can hardly be called "modern technologies", but it can be considered as a starting point for the improvement of ecology, and this movement towards improvement continues even now.

There are a large number of projects that are unknown to the majority of the population, but at the same time they significantly change life on our planet for the better, one of the many such categories is alternative sources.

Alternative types of sources are wind, solar and hydropower plants. If we take as an example the thermal power plant that pollutes up to 80% of the air

in Ukraine [1] in order for people to receive heat, then with the development of alternative sources, these percentages can be reduced to a minimum, which means that the level of morbidity will decrease.

And it is also difficult not to mention nuclear power plants, which produce a significant part of the world's electricity, humanity experienced all the dangers of nuclear power plants during the explosion of the fourth power unit of the Chernobyl nuclear power plant on the territory of Ukraine in 1986 and the accident at Japan's Fukushima – 1 in 2011. The consequences of these events were terrible and led to the contamination of a large number of areas, urgent evacuation of people and serious diseases, but at the same time, solar and wind farms, even if they wanted to, cannot cause such damage. And also looking at the events in Ukraine when the Russian troops seized the Zaporizhzhya nuclear power plant and made it their nuclear shield and means of nuclear terrorism, more and more humanity began to understand that it is necessary to switch to alternative sources[2]. A large number of these have already been built, the largest solar stations include the following [3]:

- Tengger Desert Solar Park (China) 1,547 MW.
- Bhadla Solar Park (India) 1,515 MW.

In Ukraine, the top three are headed by:

- Nikopol HPP (Nikopol) – 246 MW
- Perove SPP (Crimea) – 105.56 MW,
- Okhotnikovo SPP (Crimea) – 82.65 MW,

We should not forget about wind power plants because they invest the lion's share of electricity in the world, for example, 743 GW [4] are produced in the world now only thanks to wind turbines, and such plants are located all over the world, the largest are:

The Gansu wind farm complex (China)

Alta Wind Energy Center (USA)

Wind energy center in Muppandal (India)

Of course, these sources of electricity also have disadvantages, such as the need for a large area to place the equipment and the problem that windmills and solar panels cannot turn with the wind and the Sun, respectively, but this is all solved programmatically with the help of modern technologies, a certain piece of code and sensors installed at such stations. And the benefit they bring to the planet is difficult to estimate, because they hardly pollute our ecology.

Conclusions

As a conclusion, we can say that our future lies in modern technologies that will develop in the future and help make our home clean and comfortable for life.

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USING MACHINE LEARNING IN WEB APPLICATION DEVELOPMENT

Oleksandr Omelchenko, PhD Serhii Mykhailiuta

ISMA University of Applied Science, Latvia

¹Cherkasy State Business-College, Ukraine

**Corresponding author's e-mail: greyomelchenko@gmail.com,
mykhaylyutasl@gmail.com*

Abstract

From online shopping to social media, web applications have converted the way we interact with technology. In recent years, web applications have emerged as an essential part of modern technology, and machine learning has emerged as a powerful device in this field. With the growing demand for personalised and intelligent web applications, the integration of machine learning algorithms has come to be essential to improve the overall performance and efficiency of web applications. Machine learning algorithms are capable of analysing huge amounts of statistics, identifying styles, and making predictions, all of which are vital components of web software

development. This work targets to explore the use of machine learning in web application development.

Keywords: software development, web applications, machine learning, modern technology

Introduction

The rise of machine learning has revolutionised many industries, which include web application development. Web applications have become more sophisticated, with users expecting personalised and dynamic experiences. This has led to a growing demand for applications that can leverage machine learning to make data-driven decisions, automate tasks, and offer personalised experiences. According to a report by Grand View Research, the worldwide market for machine learning in web application development is predicted to reach \$20.83 billion by 2028, growing at an average annual growth rate of 39.6%. The report additionally highlights the growing demand for customised and dynamic web apps as a key motive force for the growth of machine learning in web application development.

Machine learning algorithms can be integrated into internet applications to analyse statistics, recognize patterns, and make predictions. This will help web applications provide more accurate recommendations, personalised content, and predictive analysis. In addition, machine learning can also automate complex tasks, freeing up time for developers to focus on other aspects of the application. However, the integration of machine learning in web development additionally poses new challenges and requires specialised expertise. Data privacy issues, ethical issues, and the need for specialised skills are some of the challenges that need to be addressed to completely understand the potential of machine learning in web application development.

Overview

The main objectives of this work:

- To provide an introduction to machine learning and its various applications in the field of web development.
- To explore the use of machine learning in web application development, its advantages, challenges, and impact on the development process, user experience, and overall performance of the application.
- To emphasise the potential of machine learning to transform the way we develop and interact with web applications, and also the need for web developers to have a solid understanding of machine learning techniques and concepts.
- To use the experience gained to complete a practical task.

The practical task of this work is to create a recommendation system for a movie search website using machine learning.

Conclusion

Overall, the functionality benefits of the use of machine learning in web software development are extensive. By using the power of artificial intelligence, developers can create more personalised, efficient, and effective web applications that provide users with an advanced experience. As the sphere of machine learning continues to evolve, it is likely that we will see even greater innovative applications of this technology inside the sphere of web development.

ENHANCED KNOWLEDGE RETENTION BY SPACED LEARNING STRATEGY

Oleksandr Onoshko, PhD Vladyslav Khotunov, Stanyslav Marchenko^{*1}

¹Cherkasy State Business-College, Ukraine

**Corresponding author's e-mail: onoshkosasha99@gmail.com*

vkhotunov@gmail.com

Abstract

In recent years, distance learning has become more and more popular. The idea of distance education is not new. It is believed that the first attempt to create a distance form of education was made 350 years ago. Of course, this was not the distance learning we know today. Having gone through several stages in its development, at the beginning of the twenty-first century it makes a huge breakthrough. This is primarily due to the fact that personal computers and the global network are becoming widely available, and it has become possible to provide access to educational content from almost anywhere in the world. Thus, the chosen topic has been relevant for many years and, apparently, will be of interest for a long time to come. This work is devoted to some methodological problems of distance education and their solutions.

Keywords: distance education, technocratic ideology, computers and the global network, educational content.

Introduction

Distance learning, which has long become a reality of world education, needs not only empirical, but also theoretical understanding. There is already a lot of material here.

From a theoretical point of view, distance learning has a number of advantages and some disadvantages, which are a continuation of the advantages themselves. First of all, distance teaching is very democratic, since it provides an opportunity to receive education, including higher education, for the most diverse segments of the population (disabled people, pensioners, housewives, prisoners, etc.). Thus, not in words, but in deeds, the constitutional right of citizens to receive education is realized.

Distance learning is cost-effective because the costs and fees are much lower than with other traditional forms of higher education. It is also convenient that students are not tied to a specific place, but can choose it at their discretion (home education is most often used).

The disadvantages include not the highest quality of education, if we compare distance teaching with full-time teaching at large universities. Since the payment for distance education is low, the salaries of teachers are appropriate, which cannot but affect the quality of the services provided. In distance learning, self-education and self-control play an important role. But due to the fact that with the help of the Internet today it is possible to quickly find the answer to almost any task, the problems of compilation and plagiarism are especially acute. The teacher most often communicates with students without visual contact, which makes it difficult to objectively assess the level of their preparedness. At the same time, if a student is really interested in the high quality of the education he receives, then the distance system can provide him with everything he needs. This again depends on the desire and self-discipline. From a theoretical point of view, distance learning has a number of advantages and some disadvantages, which are a continuation of the advantages themselves. First of all, distance teaching is very democratic, since it provides an opportunity to receive education, including higher education, for the most diverse segments of the population (disabled people, pensioners, housewives, prisoners, etc.). Thus, not in words, but in deeds, the constitutional right of citizens to receive education is realized.

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The types of distance learning for primary and secondary education vary greatly across income groups of countries. Thus, 75% of high-income countries offer online learning platforms (YouTube video tutorials, resource websites, online classes, etc.). Among lower- and upper-middle-income countries, education through television and online platforms is almost equally popular. Of particular note is that only 40% of low-income countries have organized any form of distance learning. It is very significant that, despite the predominance of other types of learning, approximately 10% of all countries deliver printed learning materials at home to students, this can be seen in figure 1.

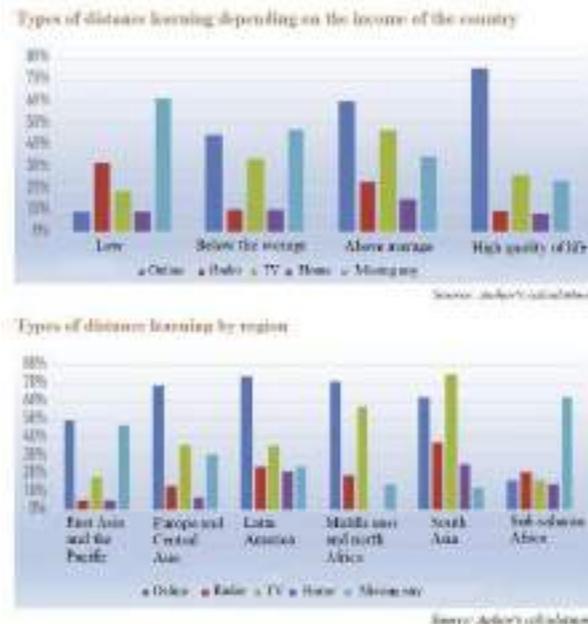


Figure 1. Types of distance learning depending on the income of countries and regions

Overview

This work discusses and offers solutions to the following points:

- Understand what “distance learning” is by looking at various definitions
- List the means of training in distance learning;
- Analyze the technology of education in the system of distance education.
- Consider the principles of functioning of distance learning

Decision

The idea of the project is to improve the conditions for distance learning of students under certain conditions, such as the availability of high-quality interactive means of communication (computers, high-speed Internet, etc.), the responsibility and self-motivation of students, the implementation of strict control by the close circle of like-minded people, is a means of ensuring affordable quality education.

Conclusion

Summing up the above, it should be noted once again that distance learning has great prospects for further development. This is due to the growing demand in the market of distance learning services. At present, not just training, but universal education is becoming more and more in demand, allowing you to find a wide variety of information from various areas of theoretical and practical knowledge. The concept of meta-education is being formed, providing a person with a meta-qualification, and here distance education services turn out to be indispensable. Since technical teaching aids are constantly being improved, not only methodological innovations are necessary, but also a theoretical understanding of those new formations that occur in the field of distance teaching.

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OVERVIEW OF SEGMENTATION ALGORITHMS FOR GRAPHICAL IMAGE PROCESSING

Pavlenko Valentyn, PhD Vladyslav Khotunov, Kutsevskiy Serhii

ISMA University of Applied Science, Latvia

**Corresponding author's e-mail: valikpost8@gmail.com,
vkhotunov@gmail.com*

Abstract

Image segmentation algorithms are rapidly being integrated into our lives, simplifying routine tasks. The use of these technologies allows us to optimize tasks and processes that take up a portion of our personal time, such as creating stickers on social media. Segmentation algorithms for image processing simplify the search for license plates, facial recognition, the search for new planets in space, MRI or other details in an image.

Keywords: photo, segmentation, technology

Introduction

In computer vision, image segmentation is the process of dividing a digital image into multiple segments (sets of pixels, also called superpixels). The goal of segmentation is to simplify or change the representation of an image into more meaningful or simpler parts for analysis. Ideal image segmentation assumes that each pixel is correctly associated with its corresponding image segment. However, this goal is often unattainable, making it important to analyze segmentation methodologies and review recent developments in the field. Ideal image segmentation is also often not achieved due to excessive or insufficient segmentation.

Image segmentation has a wide range of applications, including content-based image retrieval, computer vision tasks, the film industry, materials science, printing, medical visualization, object detection and recognition, traffic control and video surveillance. In medical visualization, segmentation helps in forensic medical examinations, finding tumors and other pathologies,

measuring tissue volumes, diagnosing and investigating anatomical structures, planning, modeling and visualizing surgical operations. With the proliferation of diagnostic images from computer tomography and magnetic resonance imaging, there is a need for reliable algorithms that differentiate anatomical structures and other areas of interest in the resulting tomograms. The requirements for brain image segmentation differ from those for chest image segmentation. Image artifacts affecting brain images are more noticeable. Therefore, when choosing an image segmentation algorithm, all aspects should be taken into account. There is no universal algorithm for segmenting every medical image. Each image processing system has its specific limitations.

Overview

The most common approaches to image enhancement are local binary features, spectral descriptors, basis space features, and polygon-based descriptors. Imagesegmentation has a wide range of applications, including content-based image retrieval, computer vision tasks, film industry, materials science, printing, medical visualization, object detection and recognition, traffic control and video surveillance. In particular, in the field of medical visualization, segmentation helps in forensic medical examinations, finding tumors and other pathologies, measuring tissue volumes, diagnosing and studying anatomical structures, planning, modeling, and visualizing surgical operations.

Segmentation has become a popular image processing algorithm for entertainment purposes. It plays an important role in programs for applying filters and lenses, creating game avatars, and so on. Similar technologies have gained particular popularity in messengers and social networks.

Image segmentation is a complex task by nature, and the results often do not achieve the desired efficiency. The existence of many algorithms and approaches to solving this problem leads to a lack of recommendations for using specific algorithms for specific situations. First and foremost, it is worth recalling the most common classification of segmentation methods proposed by Haralick and Shapiro in 1985.

Decision

Several problems requiring solutions have been identified:

- Familiarization with the image processing process and the role of segmentation within it;
- Overview of modern approaches to image segmentation, formation of a comprehensive classification of image segmentation techniques;
- Analysis of the advantages and disadvantages of the considered approaches, features of their implementation and operation;

– Software implementation of some of the presented image segmentation algorithms with the aim of demonstrating their strengths and weaknesses.

To use the software, the Python programming language and useful software packages for image segmentation and visualization will be employed. Threshold-based, superpixel– based, and semantic segmentation methods will be examined.

Conclusion

Segmentation algorithms for images are a powerful tool in the field of computer vision and are widely used in various industries such as medical visualization, traffic control, face recognition, and object detection. Although there is no universal algorithm for segmenting every medical image, choosing the right algorithm can significantly improve image processing results and help solve various tasks.

PROBLEMS OF DEVELOPMENT OF TRUST MANAGEMENT IN THE BANKING SECTOR AT THE PRESENT STAGE OF TECHNOLOGICAL DEVELOPMENT

Perminov Stanislav,

*Postgraduate student ISMA University of Applied Sciences, Latvia
Orcid.org/0000-0002-9353-8365*

Abstract

The digitalization is the key trend of the development of banks. The ensuring to the competitiveness of banks in the trust management market, it's necessary to taking into account the key trends in the development of the financial market, to develop a long-term strategy for digitalization and long-term investment in the main business models.

Kew words: digitalization, bank, banking activity, digital strategy.

For banks, changes in the structure and direction of market development creates difficulties in ensuring competitiveness. The COVID-19 pandemic has been a big challenge for the financial industry in general and for banks in particular, however, as a result of the pandemic, there are lasting influences that are forcing banks to change the way they compete. The first impetus to development was global digitalization, including banking. In just a year, the number of digital services in banks has increased significantly, but the

digitalization of banks at the current stage of development of the world economy is insufficient. Requires a rethinking of the business model, it is necessary to expand the range of services, taking into account the expansion of the market and changes in the rules of the game on it.

According to experts, digitalization remains one of the key problems in the development of banks, which is difficult to solve and implement, about 30% of banks do not have a well-defined digitalization strategy with an understanding of the overall development strategy, the purposefulness of digitalization and understanding of changes in operating models, 45% of banks have insufficient rates of implementation of digital technologies into activity. In general, 68% of top management of banks understand the need for a digital transformation strategy and challenges (Study on the digital..., 2020).

In general, the study confirms that 84% of banks are studying customer behavior, their level of digitalization, innovation and new technologies in the industry, the behavior of competitors, etc., but as a result of such research, only 31% of banks seek to expand their knowledge beyond the financial industry, explore the possibilities of technologization, share experiences and develop new business models. The mere expansion of a bank's digital services will not be sufficient to remain competitive, much less secure. It should be noted that banks do not experience financial difficulties with digitalization processes, only 17% of banks identify costs as an obstacle (Study on the digital..., 2020).

The key problems of opening new areas of business activity for banks are: insufficient experience in the market, lack of skills, incomprehensible business cases (Fig. 1).

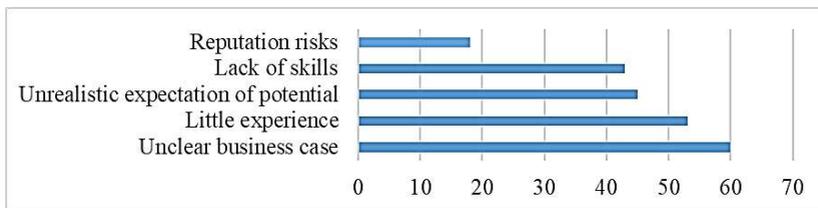


Fig. 1. Key problems when opening new areas of digital business in banks% (Study on the digital..., 2020)

In general, it is worth noting that increased competition with technology companies is forcing banks to enter the platform market, no longer for the sake of digitalization as a process, but for the sake of competition and survival with

a clear economic rationale. Banks offer their services in collaboration with municipalities, universities, retail chains, which helps to attract new customers, but there are no clear digitalization strategies and a clear understanding of the development of digital technologies in this direction in the trust management market.

At the present stage of development of banking activities, most banking services are available on the Internet; compared to 2018, the growth of representation in the global network is demonstrated. So, in 2018, for example, the indicator of the possibility of registering current and savings accounts online was only 34%, while in 2020 the same indicator is already 47% (Study on the digital..., 2020). By 2022, the digitalization of banking activities is intensifying and covering most of the personnel and banking operations, however, efforts at the present stage of development are insufficient, so, on average, banks assign only a little more than 5% of their staff to digital projects (Fig. 2).

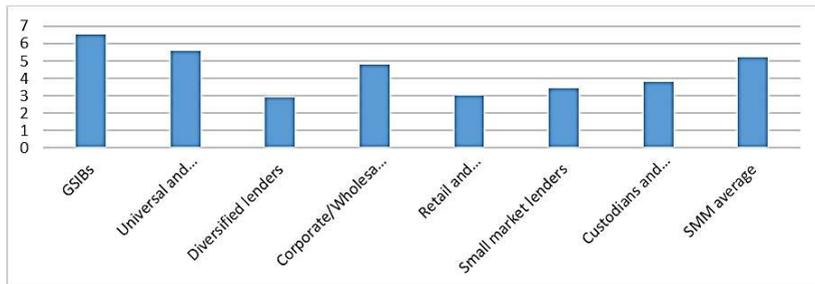


Fig. 2. Digital transformation FTEs as % of total staff, 2022
(ECB Survey..., 2022)

At the same time, other segments remain poorly covered, and only information about banking services is provided on the Internet, without the ability to conduct transactions, however, it is worth noting that more complex products (mortgage lending, trust management) are more difficult to offer digitally, although, as evidenced by the development of the platform market – it is possible and has a fairly high level of potential. It is these areas that can bring more profitability to banks and improve the overall efficiency of banks. The majority of banks see obstacles to the development of this sector in: lack of cost-benefit analysis (88%); lack of know-how (43%); lack of technical and

digital infrastructure of a new generation (40%); complexity of data protection and regulatory regulation (60%) (Study on the digital..., 2020).

One of the problems of digitalization of banks for the formation of a proposal in the global network is the involvement of all employees working with digital products, and even more so, offering complex products. This requires not only a general digital transformation, but also the digitalization of processes, training of employees and management. In general, in order to ensure the competitiveness of banks in the trust management market, taking into account the key trends in the development of the financial market, it is necessary to develop a long-term strategy for digitalization and long-term investment in the main business models.

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CURRENT SITUATION AND PROSPECTS OF THE AUTOMOBILE MARKET DEVELOPMENT IN UKRAINE

Polishchuk Anastasiia^{1*}

Zmicerevska Diana²

Kuznetsova Nataliya³

^{1,2} ISMA University of Applied Sciences, Latvia,

³ Cherkasy State Business College

*Corresponding author's e-mail: polishch241116@gmail.com



Abstract

This study examines the main problems of the decline in car sales, presents the results of a study of the state of the car market in Ukraine, and determines the prospects for the development of car sales.

Keywords: automobile industry, trends, development, import.

Introduction

Automotive industry is an important component of the economy of every developed country, because it is at the stage of constant development and stimulates the country's economic growth. In today's world, almost every family has a car that they use for their own needs. In European countries, the automotive industry occupies a central place in national economic policy. Currently, the study of the automobile market and the determination of the main trends and prospects for the development of the automobile market of Ukraine are of particular importance.

Overview

Today, Ukraine has one of the lowest levels of motorization in Europe: 232 cars per 1000 people. The Ukrainian car fleet is mainly replenished with used cars brought from abroad. Thus, in 2021, Ukrainians registered only 107,8 thousand new cars against 533,2 thousand cars imported from abroad and registered for the first time. And in 2021, 945200 cars (used cars) were sold on the domestic market [1].

According to the Association of Automobile Manufacturers of Ukraine, 56100 new cars were sold in 2022, which is 36% less than in 2021. At the same time, the used car market remains stable. According to the AUTO.RIA portal, 572000 used cars were sold in 2022, which is 5% less than in 2021. Thus, in 2022, sales of new passenger cars in the structure of the Ukrainian automobile market accounted for only 6.7% of the total number of registered sales transactions. To reach the European average of 610 cars per 1000 people, Ukraine would need to supply at least 15 million cars. It will take another 30-40 years to maintain the pace of imports (which is impossible under martial law), and this is without taking into account the decommissioning of equipment.

With the beginning of the full-scale invasion, according to preliminary expert assessments, almost a million vehicles were removed from the active part of Ukraine's fleet (of which at least 200000 were completely destroyed). Sales of new cars decreased tenfold. As of the beginning of 2023, the number of offers for the sale of used cars within the framework of the largest Ukrainian online marketplace AUTO.RIA has decreased by 30% compared to February 2022 [3].

Prospects for the development of the car market in Ukraine are related to several factors. First of all, it depends on the economic situation in the country and the stability of the political environment. The development of infrastructure, in particular the road network and service centers, also plays an important role. Vehicles – primarily the ability to be mobile in the rear, the ability to meet family needs, conduct business activities, as well as transport cargo, goods and evacuate in case of danger. So, the problem of filling the car fleet of Ukraine is quite relevant today.

Decision

In March 2022, the Verkhovna Rada adopted a resolution that temporarily exempted the country from paying customs duties when importing vehicles from abroad for the period of martial law. As stated in the explanatory note to draft law 7190, it is designed to ensure the effective and smooth functioning of the national economy in wartime and provides for the improvement of tax legislation. That is, the new conditions apply to all citizens of Ukraine without any conditions, clarifications or exceptions [2].

Such an effective solution solved several problems on the car market of Ukraine at once:

1. Made it possible to buy affordable cars for which there is the highest demand (which are in short supply in Ukraine) abroad, and to officially go through customs clearance without paying customs fees. In a situation where a large part of citizens have lost their jobs, businesses and stable incomes, such savings significantly help the family budget.

2. Stimulated related sectors of the economy. Temporary exemption from customs payments does not mean cancellation of customs formalities and other procedures. Which entails the payment of customs brokerage services, car certification, expert inspection, registration at Service Centers of the Ministry of Internal Affairs and payment of a fee to the Pension Fund (from 3% to 5% of the cost of the car). But it also works in areas such as car insurance, gas stations and fuel trading, generally enabling citizens to move around and stimulating economic activity. It also saved jobs and reduced the forced resettlement of Ukrainians across the border.

3. The mobility of Ukrainians increased during the war. According to the UN, the total number of forcibly displaced persons in Ukraine was about 11 million. About 2,8 million people were evacuated by train. At the same time, bus routes run irregularly, and air travel is still not working. Therefore, about 8-9 million Ukrainians were evacuated by road transport 3-4,5 times more than by rail. In addition, I often had to go to the station. In many cases, the only way to evacuate from places where fierce fighting is going on is to use personal transport, which is likely to save lives. After all, the Ukrainians, who were evacuated by their own transport, were in more comfortable conditions and could take everything they needed with them, which made the place of stay less stressful. As the war continues, ensuring the mobility of Ukrainians is of strategic importance.

4. Provide opportunities for economic activity. Having your own car is a means of transportation, a way to get to work by car or self-employment. Taxi, delivery of goods, transportation, etc. Cars are also very necessary for the transportation of humanitarian aid, volunteer work, and military needs [3].

Conclusion

In general, the future of the automotive market in Ukraine looks promising, with significant opportunities for growth and development. By continuing the implementation of policies that support the development of the automotive market and solving the challenges facing the industry, Ukraine can position itself as a key player in the global automotive market.

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RISK MANAGEMENT IN THE BANKING SECTOR IN MODERN CONDITIONS

Anna Pylypenko¹, Maxim Grinchuk², Viktor Zdir^{3*}

¹ *Anna Pylypenko, Student*

² *Maxim Grinchuk, Asist.prof.*

³ *Viktor Zdir, PhD of Economics*

**Corresponding author's e-mail: pilipenkoanna0@gmail.com*

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Abstract

The key to effective functioning and sustainable economic development is a reliable banking system of the country. The banking system condition depends on the stability of banking institutions and their ability to resist the negative effects of the factors that cause various banking risks. Therefore, awareness of the risks surrounding the banking business and perfect management can ensure the reliability of the banking system of Ukraine. The article considers the economic essence of banking risks, their classification and defines the components the risk management system in the banking sector.

Keywords: bank risk, classification of banking risks, risk management, risk management system.

Modern transformations in the Ukrainian economy require an emphasis on reforming its real sector. In many ways, this is due to the need to attract significant additional investments in the field of production and service provision. At the same time, during the period of reforms, this process is

restrained by the high risk of loss of bank investments in domestic enterprises. Economic problems of banks' relations with enterprises of the real sector and related banking risks are not adequately reflected in economic studies. This does not reflect the real picture of the riskiness of bank loans and investments in the Ukrainian economy.

The main goal of banks is to make as much profit as possible. But depending on the increase in the volume of operations carried out by the bank that bring profit, the level of banking risks also increases. The banking sector is very sensitive not only to socio-economic factors, but also to natural and climatic, political and many other conditions. In turn, understanding the essence of risks, correct assessment and management of them makes it possible to avoid or significantly reduce the inevitable losses that arise in banking activities.

The main task of banking risk management consists in the rational management of banking risks, in the most correct and effective assessment of the structure and level of risk that arises during the execution of a particular banking transaction.

Banking risk is a certain situational characteristic of banks' activity, which shows the uncertainty of its results and reflects the probability of deviation of the reality from the planned.

According to the "Methodical recommendations on the organization and functioning of risk management systems in banks of Ukraine": risk (from the bank's point of view) is a potential possibility of a lack of income or a decrease in the market value of the bank's capital due to the adverse influence of external or internal factors. Such damages may be direct (loss of revenue or capital) or indirect (imposing limitations on the organization's ability to achieve its business objectives). These restrictions limit the bank's ability to carry out its current activities or take advantage of business expansion opportunities.

Banking risk management is a process by which the bank detects (identifies) risks, assesses their magnitude, monitors them and controls its risk positions, as well as takes into account the interrelationships between different categories of risks.

The risk management process consists of the following stages: identification of risks and their causes; risk assessment; minimizing or limiting risks by applying appropriate management methods; implementation of constant control over the level of risks using a feedback mechanism.

The classification of types of banking risks is shown in fig. 1.

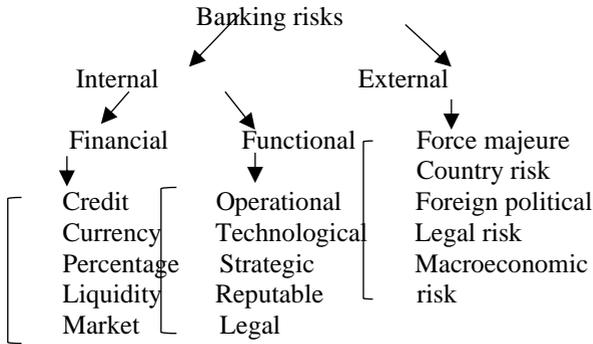


Fig. 1. Types of banking risks

In various scientific works and studies, which are devoted to the problems of banking risks, various approaches to their classification are given.

Along with the identification of types of risks and the factors affecting them, an important role in the banking risk management system is played by the assessment of each specific risk, its quantitative and qualitative measurement, and the determination of methods by which the risks of each category or group will be assessed.

In order to determine the level of banking risks, banks need to create risk assessment systems that should determine the following components:

- the amount of possible expenses and the size of the risk;
- the probability of the occurrence of this or that negative event;
- the duration of the period during which the risk will operate.

The most common methods of risk level analysis are shown in fig. 2.

Types of risk analysis methods

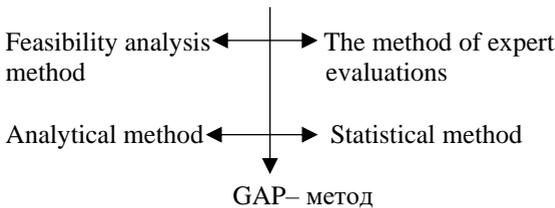


Fig. 2. Types of risk level analysis methods

The essence of the cost feasibility analysis method is the detection and identification of potential risk areas. This approach is used as a result of the

fact that in the course of the bank's activity, the degree of risk of expenses from certain directions and individual elements is not the same. This approach makes it possible to identify "bottlenecks" in banking activity from the point of view of riskiness, and then to develop certain ways of liquidation.

The analytical method involves risk analysis with the establishment of the optimal risk for each type of banking operations and their totality as a whole. The most famous and widespread analytical method of risk assessment is the method of stress testing.

The essence of the expert evaluation method is to study the evaluations made by experts, and then a general expert evaluation is formed. Examples of expert assessment methods include the assessment of creditworthiness ratings of bank clients, the calculation of the amount of risks in the credit portfolio of a banking institution, compliance with economic standards in the banking system, and credit classification depending on the degree of risk.

The statistical method is used if there is a sufficient amount of statistical information to conduct a quantitative analysis. The essence is that there is an analysis of all statistical data that relate to the effectiveness of the bank's implementation of the considered operations.

The GAP method is also used to assess interest rate risk and liquidity risk. Under this method, certain assets and liabilities are allocated over time periods. By comparing the flows obtained from placed assets and liabilities for each time period, the level of liquidity is determined and evaluated.

According to the above classification of banking risks, the risk management system in the bank should consist of subsystems for managing credit risk, liquidity risk, interest rate risk, market risk, currency risk, operational and technological risk, reputation risk, strategic risk and legal risk.

The process of risk management in banks should cover all its structural levels – from management bodies to the level at which risk is directly accepted or generated.

Risk management in banking is a process aimed at managing threats and opportunities affecting the creation or preservation of capital value. This process, carried out by the supervisory board, managers and all other employees, begins with the development of the strategy and covers all the activities of the bank, and is also aimed at the development of measures that will allow to bring the identified risk into compliance with the acceptable level of risk.

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AUTOMATIC FACE RECOGNITION USING MACHINE LEARNING AND FEATURE EXTRACTION TECHNIQUES

Hamza Rauf**

ISMA University of Applied Sciences, Latvia

**Corresponding author's e-mail: hamzarauf158@gmail.com*

Abstract

This work is an attempt to unravel the classical problem of human face recognition. The researcher addressed the problem of automated face recognition by functionally dividing it into face detection and face recognition. Different approaches to the problems of face detection and face recognition were evaluated, and five systems were proposed and implemented using the MATLAB technical computing language. The researcher gathered a face database of 30 individuals consisting of over 450 facial images to test fully automated face detection without verification, fully automated face detection with verification, manual face detection and automated face recognition, fully automated face detection and recognition and pose invariant face recognition. Successful results were obtained for automated face detection and for automated face recognition under robust conditions. Fully automated face detection and recognition was not realized because an eye detection system could not be implemented. Pose invariant face recognition was also successfully implemented under controlled conditions.

Keywords: Pose invariant, face detection, face recognition, Feature extraction

Introduction

Face recognition is an essential neurological mechanism that begins from the infant stage and continues till the end of life. The eye retina captures face information in the form of light. The light signal is transferred for visual processing in the temporal lobe neurons of the brain. Further, the processing of visual signal happens in the cerebral cortex (parietal temporal-occipital and prefrontal areas of brain synapses). The right side of parietal temporal-occipital is responsible for accumulating the processed visual information. The accumulated knowledge plays a significant role in face recognition, and this ability of humans remains unaffected even in the presence of changes in illumination, viewing angle, or distance. For recognition of faces, the neurons of our brain use the first order relational information as well as the second order relational information. The first order relational information deals with the spatial arrangement of facial key features (locations of eyes, nose etc.). All human beings have the same basic features (i.e., first order relational information), which can-not be discriminated and therefore the sole use of these information without the second-order information lacks the potential to differentiate one person from another. The second order relational information establishes the relationship with the first-order relational information.[1] ose variations can occur across any of the three dimensions: (1) left or right (Yaw, along the Y-axis); (2) above or below (pitch, along the X-axis); and (3) clockwise or anticlockwise (roll, along the Z-axis). The natural pose variations that often creep in (left or right) are along Yaw or Y-axis ranging from 0 to 45°.



Figure 1. Pose Variations

Proposed system

One of the simplest ways to recognize someone's particular identity is by their face. A personal identification method called face recognition analyzes a person's physical features to determine their identity. The process of recognizing a face mainly consists of two phases: face detection, which occurs quickly in people, barring situations where the object is nearby. The second phase is introduction, which identifies a face as belonging to a specific person. Afterwards, the stage is duplicated and created as a model for facial image

recognition (also known as "face recognition"), a biometrics technique that has been extensively researched and created by professionals.

white. Each pixel is represented by one bit. This type of image is useful in computer vision applications where only image or overview information is required. It can be created based on a greyscale image that uses 0 for pixels with a gray level below the threshold value and 1 for other pixels, but this way of creating is not useful because most of the information is lost and the result of the image is smaller.

Gray image: these images contain brightness information. The number of bits used to display each pixel is related to the number of different available brightness levels. A typical image contains 8 bits per second. Pixel, so there are 256 different possible greyscale (N_g) values or intensity values from 0 to 255.

• **Colour image:** images are usually displayed as RGB models (red, green, blue) and each pixel has 24 bits. Brightness and colour information is linked and displayed. The SIFT and creates a set of SIFT descriptors to display the face image. The algorithm implemented in this module, and then to recognize the face. The recognized face is compared with the face models stored in the Face Gallery and the most similar model is selected as the recognized face. The last reliability module is to identify whether the recognition result is correct, followed by a classifier.[5]

Binary image: this is the simplest image with two greyscale values, 0 and 1, or black and in many applications. The two information is separated by transferring information to the RGB. The primary goal of utilizing SIFTS on face recognition using Eigen faces (facial space). This module also detects the surface of the object in the detected area of the face and transforms and reduces the face. The element extraction module is used to create a face representation.

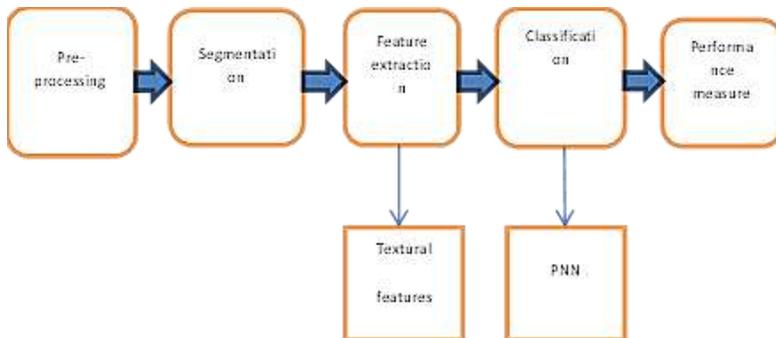


Figure 2. Proposed flow chart

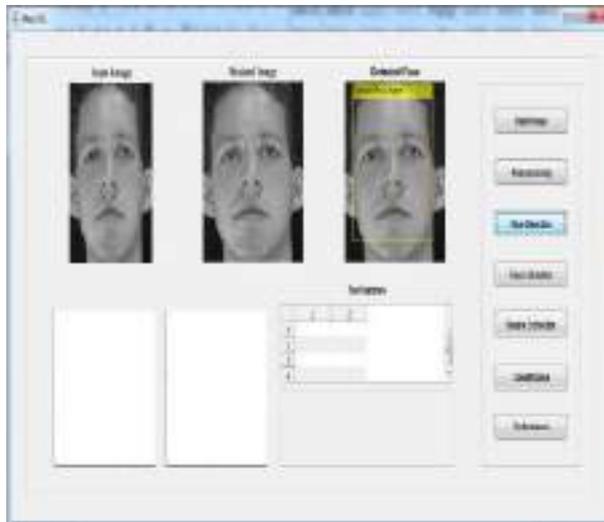


Figure 3. GUI Window Detected Face



Figure 4. GUI Window Extracted Region



Figure 5. GUI Window



Figure 6. DRLBP Image

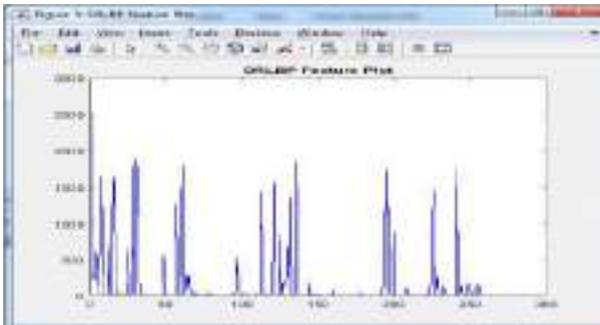


Figure 7. DRLBP Histogram

Rotational invariance is obtained by calculating descriptors relative to a reference in a local neighbourhood. References make calculations fast and keep calculations in Local Binary Mode (LBP) simple. The proposed method not only preserves the complete structural information extracted with LBP, but also captures complementary information using amplitude information, thereby gaining greater discriminatory power. For selecting function,

Gray Level Co-Occurrence Matrix-Single of the for the most part popular statistical methods for measuring image consistency in sequence is the "gray level co-occurrence matrix" (GLCM). The GLCM means provides reasonable texture in sequence for an image that can only be obtained from two pixels. The results show that compared to the use of DRLBP and GLCM technology, this method can improve the recovery accuracy. Finally, evaluate performance factors such as accuracy, recall, and accuracy. [11-12]

Table 1

Result Comparison

	Accuracy (%)	Specificity (%)	Sensitivity (%)
Proposed work	98.72	99.53	98.86

III CONCLUSION

The system proposes new approach in extension with local binary pattern called DRLBP. By using these methods; the category recognition system has developed for application to image retrieval. The category recognition is to classify an object into one of several predefined categories. The discriminative robust local binary pattern (DRLBP) is used for different object texture and edge contour feature extraction process. It is robust to illumination and contrast variations as it only considers the signs of the pixel differences. The proposed features retain the contrast information of image patterns. They contain both edge and texture information which is desirable for object recognition, the simulated results shown that used discriminative robust local binary pattern has better discriminatory power and recognition accuracy compared with prior approaches.

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STRENGTHENING EDUCATION SYSTEMS AND INNOVATION

Viktorii Riashchenko*

ISMA University of Applied Sciences, Latvia

**Corresponding author's e-mail: viktorii.riashchenko@isma.lv*



Abstract

Innovation in educational systems is vital to improving the school's efficiency and productivity in the 21st century. The computers and smart devices are threatening the integrity of knowledge and knowing by damaging the authority of teachers in classrooms changing the way teachers are perceived. In recent pandemic world's education system proved that students can learn their lessons from the home. They do not need to go to school or college

to complete their education. This article will explain how this innovation in education is useful for today's generation and how it will be harm them. In this article, the method of SWOT-analysis is used, with the help of which the strengths and vulnerabilities of distance learning are identified. The results analyse the future of distance education, in particular, special attention is paid to the experience of implementing hybrid education as a likely promising direction of further learning.

Keywords: Innovation in education, distance education, type of innovation in educations

Introduction

The education system, as a social institution, is essential to the survival and well-being of the needs of society in any nation. Education should not only be comprehensive, affordable and excellent, but also constantly evolving to meet the demands of a rapidly changing and volatile globalized environment. The education system must be designed to foster creative and critical thinkers who focus on contributing knowledge to society. According to Organisation for Economic Cooperation and Development (OECD), problem solving, knowledge building, collaboration, expert engagement, self-regulation, and the application of technology are the learning outcomes of 21st century education. Education system development must be systemic, coherent, and measurable. Faculty, teachers, researchers, administrators, and policy makers are all challenged to improve teaching and learning philosophies and practices or other aspects involved in the teaching and learning process to ensure that students achieve quality of life and work. In this century, the development of society has reached new horizons. Modern demands on education have to meet this process as well as the current trend of globalization and the complete digitalization of all areas of social life. At the same time, new challenges like pandemic and any country situation, increase the demands on the organization of educational work, so that for the future, the most important trends that will determine the further development of the educational sector must be identified and analysed. The relevance of this issue is also increased by the fact that there is no unified point of view or system of views among researchers on what is the future, essence and innovative potential of many current trends, i.e., whether they have future prospects for use or are only a short-term response to urgent problems. Given the current situation of the world, global, and knowledge economies, the shortest paths to integrating education systems into the knowledge economy are reconstructing the concept of knowledge, understanding what innovation really means, and enriching human capital by increasing the rate of schooling.

Researchers point out that students are ready for this restructuring, but teachers and institutions may not be ready, and suggest that this shift must be made with extreme caution. Some researchers suggest that individuals should actively participate in the adoption of technologies, as it is not very likely that every new instructional technology or ICT will be included in the curricula, which are hardly designed on an annual basis and where it is not very common to make any updates during the year. **Innovation in Education**

The definition of innovation is sometimes mixed with the concept of invention, change, and reformation in education. Some scholars also define innovation in education as a process, and some even explain it in terms of innovation theories in business development. These different definitions of innovation in education are very confusing when we try to discuss innovation in education. Pratte (1974) said that the term 'educational innovation' is sometimes mixed, sometimes it is understood as description and evaluation, and sometimes it implies improvement. According to Innovation of education paper (2018), the definition of educational innovation is different from innovation in education. Innovation in education has a broader definition than educational innovation. The definition includes educational, social, scientific and technological, economic, administrative, and other innovations. In light of the literature to date, innovation in education can be broadly defined as the development of alternative ways to achieve behaviour change in individuals when the previous way (learning theory/learning task/teaching method/learning approach, etc.) is not working effectively. The two old terms "teaching" and "learning" seem to be replaced by the new terms "innovation" and "self-regulation." It is logical to think that in a world where individuals change the world and are changed by the global world, the old teaching methods, beliefs and ways will soon have no practical use.

The OECD (2016) has listed four types of innovation in education based on the Oslo Manual. According to the Oslo Manual, innovations can be divided into four types: Process, product, organizational, and marketing innovation. Product innovation is the performance of services or goods in education that have been improved from their original characteristics or use. It includes significant changes in materials and parts, product features, ease of use, existing software, and other functions. Process innovation is the performance of new or substantially improved services or products that involve significant changes in software, equipment types, or techniques. Marketing innovation is a new marketing approach that focuses on changes in product design, product placement, product packaging, pricing, or sales promotion. Organizational innovation is the introduction of new organizational approaches or strategies in the firm, workplace structure, or

relationship with other organizations. On this basis, the OECD (2016) modified the existing definition to adapt it to the education environment. According to OECD (2016), innovation in education can be classified into four categories:

- 1) introduction of new services or products, such as new curricula, educational resources, or textbooks;
- 2) introduction of a new process in service delivery, such as the use of technology in e-learning activities;
- 3) introducing new approaches in the organization of activities, such as the use of ICT to interact with parents and students;
- 4) introducing new marketing techniques, such as the cost of each course at the college.

Methodology

The theoretical pedagogical research methods were used in the work: Abstraction, Concretization, Comparison and others. In particular, with the help of the comparative method it was possible to compare the main trends in the development of education. With the help of concretization, the problem of using distance education as a key trend in the world education system is reflected. Special attention is paid to the method of analysis SWOT, which has been actively used in various fields of science since 1969. The main content of the method is a detailed analysis of identified factors essential for decision making, it allows to formulate and characterize the prospects of development of a process, idea or activity. To predict the probable development of distance education, we will conduct a SWOT analysis of the effectiveness of educational resources in this type of training. The main criteria will be selected: financial resources: Investment, financing, physical factors: space, equipment, location, human resources: teaching staff, technical staff, involvement of specialists, access to information resources, analysis of various internal processes, possibility of professional development, availability of loyalty programs, etc. To identify the strengths of online learning compared to the traditional model, we use the analysis SWOT to determine where exactly the advantages lie. Consequently, using the above criteria, we can determine the strengths of online learning in higher education institutions.

Table 1

SWOT-analysis matrix of the process of distance education implementation (Created based on the Educational trends 2022: essence and innovation potential)

Strengths	Weaknesses
Ability to obtain grants	Depending on Internet access
Lack of significant renovation of the material and technical base	The requirement in systematic motivated self-education of students and faculty
Expansion of the target audience	Becoming a limitation in the use of other online resources
Expansion of the Creative Commons license	A methodological limitation of teachers' freedom, limitation of teachers' creativity
Improving the competence of distance learning participants	

Discussion and Conclusions

The main characteristics of innovation are to introduce new changes into the old system. Sometimes changes are good for the organization or a group of people, but sometimes they have a negative impact on the system. Therefore, the introduction of an innovation in an old and rigid system, especially in the education system, is sometimes met with rejection. The biggest obstacle to the introduction of innovation in education is both students and teachers, as they are directly confronted with the changes. As of 2022, there are several educational trends: distance learning and other forms of education that will be actively integrated into the European system of bachelor education. Distance education and digitalization of learning will be actively used in the education system. It could be stated that distance education has certain disadvantages, but the development of the latest educational resources and the improvement of the existing ones can solve some problems. We also predict that the future trend will be media education because it meets the requirements of the information society and modern challenges (such as hybrid warfare and the Covid-19 pandemic). Educational systems change people and their societies and vice versa, societies always change and so do the internal dynamics of the country they belong to.

In general, the use of ICT is only one way to support the content of the curriculum. Teachers must distinguish between innovation and the use of technology in education, both of which belong to different concepts. In summary, the use of technology in education can be a part of the application of innovative practices and innovation in education. Innovation itself fits

better with practices in which curricular levels of instruction are enhanced by technology or technologically enhanced materials, techniques, and equipment. In other words, technology facilitates the delivery of content to students.

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BPO MAINTENANCE

Elena Santhirasegaram

Latvia, ISMA,

e-pass: jelena.santirasegaram@gmail.com

Abstract

The study examines the means of a full-scale assessment of an organization's potential. The level of assessment is examined within the framework of a prepared procedure. This procedure allows to ensure the organization's potential discovery in conditions where traditional motivational methods do not work.

Keywords: innovation, methodology, design, programme, position, responsibility, motivation

Introduction

The paper includes three parts. The first part analyses technologies for unlocking potential in unusual conditions [1]. The second part deals with the procedure for assessing the market value as a part of a system providing means for handling difficult situations [2]. The third part presents the results of applying the maintenance procedure on a realistic case [3-4]. As a result of assessment, there were recommendations provided related to the current state, points of weaknesses and potential growth of the company.

Main Part

This approach is intended to detect large-scale circumstances affecting the entrepreneurship system. As they are identified, a comprehensive assessment of the BPO organisation's state for periods of various durations is carried out. This assessment serves as a common business platform for the collection, processing and analysis of business information.

The purpose of the study is aimed at maintenance procedure that provides a system of measures to get out of difficult situations.

Research tasks:

- 1) continuous analysis of violations;
- 2) the choice for adjusting the organizational structure in the short term;
- 3) implementation of the medium term scenario;
- 4) development long term guidance.

Results

Conclusion presents the main results, as well as the general findings obtained during the study. As a result, the proposed approach makes it possible to improve the implementation performance of the taken decisions until the final goal is achieved. The practical results are concluded in the development of a methodology, which describes the actions that allow assessing the contribution of intangible assets. The novelty of the approach is in the mechanisms of internal self-organisation that is accompanied by the changes in the organisational structure.

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IMPLEMENTATION OF MODERN MANAGEMENT USING CLOUD BASED SOLUTIONS

Thirumavalavan Santhirasegaram

Latvia, ISMA

e-pass: Van_chandraa@hotmail.co.uk

Abstract

The relevance of this study lies in the implementation of a workable software product. The essence of workability is manifested in achieving compliance between the requirements for the product and the measure of efficiency, justified in terms of assessing its labour intensity.

Keywords: technologies, Infrastructure, plan, control, profile, environment, applications

Introduction

A successful Modern Management aka digital workplace is designed to empower employees to maximize their productivity. In many of the enterprises, it's critical that employees have connection within and across teams and organizations, as well as with customers, partners, vendors, suppliers, and guests. Those connections need to be available whether they are physically in the office, working from a remote location, or doing a bit of both.

Overview

The global pandemic forced us to rethink the digital workplace. Prior to COVID-19, we were already championing an effort to be more open, transparent, and collaborative, as many companies were moving their employees from traditional office settings into more contemporary environments optimized for teams. Teams were already becoming more collaborative, and the nature of work was changing. But never has it become more necessary for workforces to learn to quickly adapt to becoming more agile and innovative than since the pandemic.

Aim of this study is to emphasize and understand the importance of Digital Workplace which would be the New World Order for almost majority of the enterprises who use IT in their business and those who plan to implement IT in their daily business.

The Objective of the study is Modern Management in Business which uses IT in their everyday functions.

Tasks to be discussed during the Planning and Realization:

- importance of Modern Management;

- cloud Infrastructure – Advantages over on-Prem AD Infrastructure;
- technologies and tools of Microsoft Cloud Infrastructure;
- access and Identity Management;
- realization of demo Azure Cloud Environment;
- Work/Access from any approved location without compromising the Security. Example – Work from a different city, Work from a different country, Working from a coffee shop, library.

Results

The practical value of the study lies in:

- New World Order or necessity of change in approach of working ethics of a business which is streamlined using IT management.
- Evolution in small scale business to understand the use of IT in their business to future.

The scientific novelty of the study lies in the continuous development of approach that allows us to achieve the performance of the implemented solution or product. This approach emphasizes that all types of business can use the IT products in their daily economical activities. Cloud Solution expands the use of IT to all business irrespective of the size of the organization and purpose of business.

THEORETICAL MODELLING OF THE PROCESSES IN NANODEVICES: PROBLEMS AND PERSPECTIVES

Emma K Shidlovskaya*

Institute of Aeronautics, Riga Technical University, Latvia

**Corresponding author's e-mail: shidlovska@inbox.lv*



Abstract

Applicability of cluster embedding method with non-orthogonal wave functions for theoretical study of the processes in nanosystems is studied. We demonstrate that our cluster embedding method is compatible with quantum transport theory based on time-dependent DFT. We conclude that quantum

transport theory methods may be applied if we use one-electron approaches both with orthogonal and non-orthogonal wave functions. Possibilities to generalise quantum transport theory methods on the case of temperature-dependent electron transitions and theoretical modelling of temperature-dependent processes in nanosystems are discussed. Application of quantum transport theory methods to theoretical modelling of nanodevices is considered.

Keywords: embedded molecular cluster model, non-orthogonal wave functions, quantum transport theory, current in nanodevices

Introduction

When we theoretically describe nanodevice we have to treat the whole quantum system as two subsystems: small finite fragment of the system containing nanodevice (cluster) and the rest of the system containing electrodes. Problem "cluster in the field of the rest of system" is successfully solved in the frameworks of embedded molecular cluster (EMC) model with *orthogonal* wave functions. We have modified EMC model treating cluster embedding problem in the frameworks of one-electron approximation with *non-orthogonal* wave functions. We have proposed new cluster embedding scheme based on this approach [1].

Our present aim is further development of cluster embedding method with non-orthogonal wave functions for quantum-chemical modelling of processes in nanodevices. We study possibilities to combine our cluster embedding method with quantum transport theory approaches. Our goals are calculation scheme for theoretical treatment of processes in nanosystems and calculation of electric current in nanodevices.

Cluster embedding equations

Our cluster embedding scheme [1] is based on Hartree-Fock (HF) method. In the last years HF one-electron equations are rarely used. Calculations usually are carried out in the frameworks of density functional theory (DFT) with one-electron Kohn-Sham equations. For theoretical modeling of nanodevices we are planning to apply quantum transport theory based on DFT. Therefore, we should find cluster embedding equations our variation procedure gives when we use DFT Kohn-Sham approach.

Deriving the equations we see that total energy of many-electron system described by non-orthogonal one-electron wave functions on the both HF and DFT Kohn-Sham levels may be written in the same way. Varying expression for the total energy and analyzing our variation procedure we demonstrate [2] that our cluster embedding method based on HF calculation scheme is compatible with DFT Kohn-Sham calculation scheme. Cluster embedding equations remain the same if instead of Fock operator we use Kohn-Sham Hamiltonian. Therefore,

there exists possibility to use quantum transport theory based on time-dependent DFT (TDDFT) and our cluster model (with non-orthogonal one-electron wave functions). We came to conclusion that our embedding scheme may be combined with TDDFT if electron transitions are described correctly: occupied and vacant cluster states are localized in the cluster region in the same manner. Our initial embedding equations [1] are established to give localized in the cluster region occupied states while vacant ones are delocalized [3]. To get occupied and vacant states of the same localization degree, we have modified [3] our initial cluster embedding equations.

Quantum transport theory and cluster model

One of the approaches for calculation of electrical properties of nanodevices is quantum transport theory method based on TDDFT developed by Gross with co-workers [4]. We study possibility to combine our cluster approach with approach of Gross et al. Method of Gross implies that wave functions of nanodevice central part are orthogonal to the wave functions of the electrodes. We show [2] that approach for electric current calculation developed for orthogonal wave functions may be applied for non-orthogonal wave functions if we transform initial equations assuming that overlaps between wave functions are small ($S^2 \ll S$). Using this assumption we may combine our cluster embedding method with approach of Gross et al. and calculate electric parameters of nanodevices.

We conclude [2] that our cluster embedding method is compatible with electric current calculation method based on TDDFT [4]. Using our cluster embedding method and combining it with electric current calculation methods based on TDDFT we propose calculation scheme for electric parameters of nanodevices.

Conclusions

We demonstrate that our cluster embedding method is compatible with DFT Kohn-Sham method. We conclude that our embedding scheme may be combined with time-dependent DFT (TDDFT). It means that we can use electric current calculation methods based on TDDFT and obtain electric parameters of nanodevices from the first principles. We use TDDFT based quantum transport theory method of Gross et al [4] and propose approach for calculation of electric parameters of nanodevices. Consideration of calculation procedures and derivation of corresponding formulas leads us to the following conclusions.

Quantum transport theory methods for electric current calculation may be applied if we deal with one-electron approaches. In this case we can easily construct one-electron density and get continuity equation for electric current.

To treat processes in nanodevices, we should consider temperature-dependent electron transitions. In the frameworks of one-electron approach we can define temperature-dependent occupation numbers for vacant and occupied one-electron states. One-electron density may be constructed and continuity equation for electric current may be obtained using these occupation numbers. If processes in nanodevices may be described by temperature-dependent electron transitions between stationary one-electron states we can easily treat them applying TDDFT approaches (including this one based on our cluster embedding method).

Situation is more complicated if we want to overcome limitations of one-electron approximation using approaches like configuration interaction (CI) or perturbation theory (PT) methods. Our cluster embedding scheme is compatible with PT or CI methods because occupied and vacant cluster states are localized in the cluster region in the same manner. One-electron density may be constructed for these methods, too. But possibility to get continuity equation and expression for electric current in general form requires further study.

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**THE SUBJECT OF THE ARTICLE: THE PROBLEM
OF STAFF TURNOVER IN THE BUSINESSES ON THE BASIS
OF THE HOSPITALITY INDUSTRY**

Muslimakhon Shokirova

Prepared by: 1-year Masters student

Annotation

This article researches the basic of the theoretical and practical aspects of staff turnover in the enterprises of hospitality, the distinguishing characteristics of this sphere from other services and develops motivation strategy of personnel to reduce staff turnover of the hospitality businesses. Turnover is a familiar topic in today's hospitality industry. It describes the situation of an employee leaving the business due to several reasons. In general, a high turnover rate contributes in a negative way to the success of a hospitality business. Not only big companies are affected also small to medium sized organization are faced with the negative aspects of turnover. It is well known that the hospitality industry has a high turnover rate the consequences for business leaders are often not discussed. In many cases turnover leads to additional labor costs due to expensive recruitment processes but sometimes turnover also leads to the closure of a business. To avoid similar issues, it is necessary to know about strategies that, if implemented correctly, will lead to a reduction of turnover. There are a lot of models and programs available for use in managing hospitality enterprise.

Introduction

The attraction and retention of high-quality employees is more important today than ever before. A numbers of trends (globalization, increase in knowledge work, accelerating rate of technological advancement) make it vital that firms acquire and retain human capital. In human resources context, turnover can be viewed as the rate at which an employer gains and misplaces employees or how long employees tend to stay in a particular organization. Turnover is measured for individual companies and for their industry as a whole. Turnover is one of the most researched phenomena in organizational behavior. As it is typical for most studies on turnover, the focus is mainly on members leaving rather than entering the organization. If an employer is said to have a high turnover relative to its competitors, it means that employees of that company have a shorter average tenure than those of other companies in the same industry. High turnover may be harmful to a company's productivity

if skilled workers are often leaving. Organizations are increasingly concerned about their capability to retain their key employees such as high performer and employees who make an important contribution to stimulate organization's innovative behavior. Therefore, it is essential that organizations understand the reasons why employees leave their organization. Over the years, there have been many of research articles exploring the various aspects of turnover, and thus several models of employee turnover have been promulgated. Consequent upon this, this research seeks to review some of the past models with a view to understanding the trend and proffer recommendations to organizational policy makers. Turnover is a familiar topic in today's hospitality industry. It describes the situation of an employee leaving the business due to several reasons. In general, a high turnover rate contributes in a negative way to the success of a hospitality business. Not only big companies are affected also small to medium sized organization are faced with the negative aspects of turnover. Since hospitality businesses try to avoid turnover and the resulting disadvantages, the development of strategies that help to increase employee motivation and reduce turnover is a much-discussed topic among the hospitality industry. In many cases turnover leads to additional labor costs due to expensive recruitment processes but sometimes turnover also leads to the closure of a business. Staff turnover and ways of its reduction is becoming an extremely relevant topic today in the context of shortage of professionals in a very dynamic labor market. The motivation system is an integral part of the management system of an enterprise whose main task is to stimulate employees to achieve the strategic goals of the organization.

The object of the research is business activity of hospitality enterprise.

The subject of the study is processes of staff turnover of the hotel businesses.

The problem of the study is staff turnover that impact results of the company in a negative way.

The aim of the research is development of recommendations and measures to reduce turnover of personnel in the enterprise.

To achieve the aim, the following tasks should be performed:

1. To consider modern approaches to assessing staff turnover.
2. To perform marketing research of employees.
3. To develop recommendations and measures to reduce turnover of personnel in the enterprise.
4. To make evaluation of proposed measures.

The hypothesis of the study was the assumption that motivation of the labor activity of personnel in the hospitality business has the same great influence on staff turnover, as in any other organization.

The study used a system of methods: organizational – comparative; archival method (analysis of documents), observation; data processing methods – qualitative and quantitative analysis; as well as statistical, mathematical and graphic methods.

Theoretical and practical aspects of employee turnover in hospitality industry

Process models for defining employee turnover

In today's society turnover has a major impact on the wellbeing of individuals and the business performance. The hospitality industry has one of the highest turnover rates compared to all the other industries. This high turnover rate is the result of employees leaving a company for individual and organizational reasons. Frequent examples are: working hours (individual) or the change of a business concept (organizational). Turnover in the hospitality industry not only causes financial problems for the manager of a company, but also inconveniences for the guests, such as a deterioration in service quality. Furthermore, the departure of an employee leads to a change in the way a company communicates and new employees will need some time to adapt the way the company communicates (6, p. 15-22). Since hospitality businesses try to avoid turnover and the resulting disadvantages, the development of strategies that help to increase employee motivation and reduce turnover is a much-discussed topic among the hospitality industry. It is well known that the hospitality industry has a high turnover rate the consequences for business leaders are often not discussed. Today many employees in the hospitality sector face a lack of acceptance, money and flexibility. Many employees are unable to start a family due to low salaries and nonfamily-friendly working hours. In addition, most employees wish for more leisure time due to the exhausting tasks that are usually part of working in the hospitality industry. As a result, many people decide to leave the hospitality industry and to find a more appealing job, which again leads to a higher turnover rate. In today's hospitality industry the term turnover is well discussed, the reasons leading to a high turnover rate are well known and employers try their best to avoid turnover. In addition to this, it is interesting that already in 1958 James G. March and Herbert A. Simon investigated the causes for turnover (7, 58). They introduced the first process model of employee turnover, which stated that employees leave an organization if the payment is not reasonable, they are not satisfied with the job or if there are many alternatives (7, 60). Since this model started to raise interest for

analyzing turnover, the next mentionable process model was developed in 1977 by William Mobley. Mobley developed the process model called “Intermediate linkage model” (7, 75), which analyses the process of how an unsatisfied employee decides to leave the organization. He analyzed the process that occurs from the moment an employee defines that he/she is not satisfied with the current job and the decision to actually leave the company. First, he defined the four stimuli that determined the actual decision to leave an organization, they are defined as: job satisfaction, advantages of other 11 activities inside the business, advantages of other activities outside the business and nonwork-related beliefs (7, 82). After defining the four stimuli he created the process model that define the actual steps an employee goes through during the process of evaluating the pros and cons of leaving an organization. Simplified, the process starts with the evaluation of the current job and the decision making on being dissatisfied with the job, followed by the process of searching for alternative job opportunities and the evaluation of these alternatives and the process ends with the resolution of leaving the business.

Analysis of employee turnover at the enterprise

Today, staff turnover is also one of the many challenges faced by modern businesses. Therefore, in order to find a solution to the problem, it is necessary to carry out the following: to identify the factors affecting the departure from the enterprise, and ways to retain employees by assessing the level of staff satisfaction, conducting an appropriate analysis, on the basis of which information will be obtained on the causes of this phenomenon for making decisions to eliminate the problem of staff turnover.

One of the main disadvantages of the hotel business in personnel management is the lack of stability for employees in many enterprises. Continuous development and structural changes, increased competition, the introduction of new technologies lead to a decrease in the 29 share of low-skilled labor. The reason for the rather high turnover of the company's staff lies, among other things, in the ineffective system of motivation for the work of the hotel staff. Further, to determine the causes of staff turnover, a study of the personnel of the enterprise was conducted.

Impact of employee turnover on hospitality industry

In our society, the hospitality industry is one of the most important industries worldwide, it not only satisfies the needs of human being such as, eating and drinking, it also provides many jobs and a positive impact on the gross domestic product of a country. However, the hospitality industry is one of the main contributors to reducing unemployment, many cases show that people working in the hospitality industry have a low income and a bad social

acceptance. These examples are just two of the many reasons for a high turnover rate in the hospitality industry. Furthermore, employee turnover negatively contributes to motivation, employee engagement, work environment and job satisfaction. Besides the negative impact on the work environment and the individuals working in the organization, turnover contributes in a negative way to the financial performance of the organization. Turnover leads to higher costs for training and hiring new employees but also the knowledge that an employee is taking with him/her has value to the company. In addition, especially in the hospitality industry, the turnover of a high-performance employee leads to decrease of service quality, due to the lack of communication and routines. As the negative impact of turnover on the hospitality industry is well known, many researchers have identified the different types of turnover and developed strategies that aim to reduce it. Staff turnover may be caused by lack of opportunities for career development, remuneration and working condition. Staff turnover if not taken into consideration will damage the image of the organization, where customers will lose trust in the organization. Moreover, productivity of the organization will also decrease, while employees will be demotivated to work for a company with high staff turnover rate. Paying employees, a market related salary may help management in retaining valuable employees. Employee turnover is a significant factor in the attainment of organizational goals and objectives. In addition, it is of vital importance to an organization's employees. The retention of skilled and talented employees has become a major challenge for all organizations. In all organizations around the world, employee turnover is receiving more attention because it slows down the performance of employees and organizations. Moreover, it increases organizational expenses that accrue from employee recruitment and training. Research has indicated that employee turnover is a persistent challenge that all organizations face. It influences both employees and the organizations they work for: employees may be required to learn new skills in new jobs, while firms may incur costs due to the hiring and training of new recruits. Employee turnover is one of the most prevalent problems that the human resource departments of organizations deal with in their operations. Many organizations spend a large percentage of their resources trying to mitigate this challenge because of its negative impact on performance. The main reason for trying to annihilate employee turnover is to lower the costs related to employee recruitment, training, development, and reimbursement planning. Studies have shown that a rising rate of employee turnover can impede an organization's growth, performance, and overall effectiveness. In that regard, the main goal of human resources is to devise strategies that lower the rate of

employee turnover. The attainment of optimal financial performance is one of the major goals of organizations. High turnover rates result in negative financial outcomes due to expenses related to compensation, recruitment, training, and employee development. The replacement of employees is costly because the cost of recruiting and training a new employee could overshadow the value the employee brings to the organization. The competence of incoming employees is the main determinant of the degree of financial loss incurred by an organization. Negative financial outcomes are usually experienced when high-performing employees are replaced by low-performing individuals who are inefficient and unproductive. Experienced employees exhibit a higher rate of productivity than non-experienced employees. In that regard, when a large number of inexperienced employees come into an organization due to high employee turnover, the overall productivity of the firm decreases. Competence and skills are the primary factors that determine the productivity of an employee. New employees are usually associated with waste because of a lack of knowledge regarding the optimal functioning of organizational processes. Resources such as energy and time are limited, and new employees tend to waste them as they struggle with acclimatizing themselves to an organization's way of doing things (9, 112). Experienced employees use these resources with caution and, as a result, enhance their efficiency. On this basis, a conclusion can be made that employee turnover negatively affects an organization's performance because it lowers productivity and efficiency. The quality of customer service and the quality of products and services are critical in determining the level of customer satisfaction. Quality can be either tangible or intangible. Therefore, it is important for organizations to retain experienced and talented employees who are conversant with the quality requirements of company services. Experienced employees are required in order to maintain a high quality of products and services. The loss of experienced employees could lead to low-quality services that could result in low customer satisfaction. Replacing experienced and talented employees with inexperienced ones compromises the quality standards of an organization's products and services. Today's business world is characterized by a high rate of globalization and stiff competition. Therefore, it is inevitable for companies to retain experienced and talented employees who can innovate and generate ideas for new products. The success of innovation and new product development is primarily determined by the competence of the workforce. Companies that have highly dynamic product lines and innovation exhibit lower rates of employee turnover than companies that do not innovate. The reason for this

phenomenon is that inexperienced employees struggle with innovation and the generation of new ideas while experienced workers easily innovate.

The hospitality industry is the major industry that illustrates how important employees are for the success of a business. The hospitality industry is characterized by a high personal contact between employees and customers, this clearly implies how significant motivated and well-trained employees are. Motivated and inspired employees will not only contribute in the development of ideas and improvements, they will also be fully involved in the organizational activities and will help to achieve the goals of the business. Since many years, researchers have developed a big amount of Human resource management best practice strategies. These strategies often focus on different aspects of HRM.

Strategies for reduction of problems with staff turnover

Today, organization leaders have the opportunity to select and implement various strategies. The majority of these strategies focus on dysfunctional turnover, this means that the aim of these studies is to avoid turnover that harm the organization. In most cases organizational leaders in the hospitality industry are faced with harmful turnover, however before choosing the best fitting strategy it is required to determine whether the leaving of a certain employee could have a positive impact on the business performance. As a result of having many strategies to choose from, it can be complicated to choose the right one. However, the majority focus on the term “turnover intention”, which describes a person’s behavior during the process of deciding to leave the organization. By focusing on the development of an employee from the moment he/she starts working for the organization, 18 managers are able to predict and avoid actual turnover. The success of this strategy is mainly based on recruitment, employee engagement and employee retention. In general, this means that a strategy that focuses on avoiding turnover intention by developing the employees from the beginning is, if executed correctly, successful.

Despite the proven success of employee building strategies, there are many other strategies that rather focus on the leader her/himself and her/his leadership style in order to reduce turnover. One of the most recognized leadership styles is called “servant leadership”, a leadership style that focuses more on the employees’ interest than the leader’s interest. This refers to having a people-oriented leadership style, the leader wants his followers to achieve career success and professional growth. In addition to this, a major part of servant leadership is the ethical behavior of the leader, by focusing on morality and a high level of ethics the leader is able to raise the positive work environment in the organization. Many studies show that if a leader

implements a server leadership style, the turnover rate and the intention of employees to leave the organization is reduced (12, 28).

It is advised to managers working in hospitality enterprises to use CANE model. In this case implications for employers are as follows:

- Turnover is less when employees have a high level of value for their work. These employees persist more than colleagues who report low levels of value. Employers can help employees value their work through consistent praise, recognition, and special incentives.

- Turnover is less at work sites where employees feel supported by the organization. Organizations can increase the level of support their employees feel by listening more, understanding employee issues, and acting accordingly.

- Employees who feel better about their jobs persist more, exert more effort, and are less likely to leave.

- Older employees tend to be more motivated, persistent, exert a greater effort, and are less likely to leave in the face of difficulties.

- Salaried employees are more motivated than hourly employees.

- Women are more likely to say their work is more interesting, more important, and more useful; however, turnover for women is higher than men.

- When employees feel they cannot perform certain tasks, managers should reduce the size of complexity of the task into smaller "chunks." This helps the employee to build self-efficacy.

- Employees who perceive their work conditions to be unfair and/or unreliable need evidence that the system is there to help them be effective. If negative perceptions are correct, management should rectify them.

Conclusion

The hospitality industry today is facing many difficulties, one of the major difficulties is a high turnover rate. The simplified definition of turnover states that turnover occurs if an employee is not satisfied with the current job. Due to this high turnover rate many organizations are facing issues, for example, a bad work environment and a decrease of performance. The main reasons of staff turnover may be: non-competitive personnel remuneration system, inefficient recruitment and adaptation system, unsatisfactory working conditions in the enterprise, lack of training and career development, poor organization of labor and management in general in the organization, problematic relations of subordinates with the manager, unfavorable social and psychological climate, negative image and poor reputation of the organization. Staff turnover can have negative and constructive consequences, which depend on both its quantitative size and the qualitative composition of the dismissed / dismissed employees of the organization. The main goal of

turnover management is to optimize its level. As demands and expectations of both employees and companies alike have changed over time, so has the popularity of various theories. In today's workplaces, theories are not often referred to in regular daily tasks, but they are used to resolve situations where there are opposing viewpoints or major challenges, such as trying to understand the motivations of consistently underperforming or unengaged employees in an effort to combat high turnover rates, low productivity and low levels of engagement. The knowledge gained from motivational theories is somewhat of an automated professional competency for many HR professionals, who do not necessarily actively refer to them, though they do use them. HR theories are more commonplace in consulting companies, start-ups, and large corporation.

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COMPARATIVE ANALYSIS OF MANUAL TESTING METHODS ON THE EXAMPLE OF AN ONLINE SHOPPING APPLICATION

Shuranova Sofiia, PhD Vladyslav Khotunov, Kholupnyak Katerina*¹

¹*Cherkasy State Business-College, Ukraine*

**Corresponding author's e-mail: sophiashuranova@gmail.com,
vkhotunov@gmail.com*



Abstract

Web applications for online stores have become an integral part of modern e-commerce. It is increasingly common to find a better and more reliable web application that meets the needs and requirements of users. A large number of web application owners care about user satisfaction and are willing to invest resources and time in this area. To ensure high quality, such applications, just like any other software, must be thoroughly tested before they are released to the market. Various testing methods can be used for this purpose, including automated testing and manual testing. This article is an attempt to determine the most effective and best approach to manual testing of a web application before its release to the market. This work attempts to create a solution to allow people to use the effective learning strategy, process new data, and transfer it into long-term memory.

Keywords: manual testing, online store, web application, information technology, testing methods.

Introduction

According to the 2016 E-commerce Europe report on European B2C e-commerce, 57% of European Internet users shop online. [4] And the total volume of online commerce in Europe in 2015 was 455 billion euros. That's a 13.3% increase over 2014. [3]

After just 6 years, the proportion of Europeans shopping online has risen to 72%. We can read about this in the European B2C eCommerce Report 2021 by Ecommerce Europe. [2]

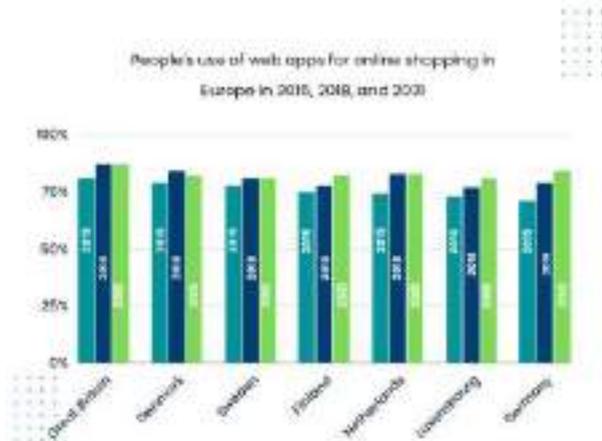


Figure 1. People's use of web apps for online shopping in Europe in 2015, 2018, and 2021

These results are not surprising because online shopping is a flexible shopping experience that includes shopping online. Shoppers who cannot visit a regular store or prefer to shop online can benefit from online shopping.

But how do you make the shopping process quality and convenient, despite its format? In 1956, American mathematician Jacob Rabin developed the first program to check programs for correctness. But with the advent of more sophisticated programs and systems that require more thorough testing, program correctness checking has become more important and widespread. There are now many methodologies, standards, and tools for software testing.

Along with the renewal of testing methods, user requirements for web applications have also grown. For example, SolarWinds has collected data and identified a correlation between the time it takes for a web page to fully load and the corresponding bounce rate. The data from the study can be seen in Figure 2.

The result of the Web Page Load Time vs Bounce Rate study, shown in Figure 2, shows that page load time directly affects the bounce rate. [1]

This is only the page load time. Checking other components of the web page plays a more important role in providing quality service to the user.

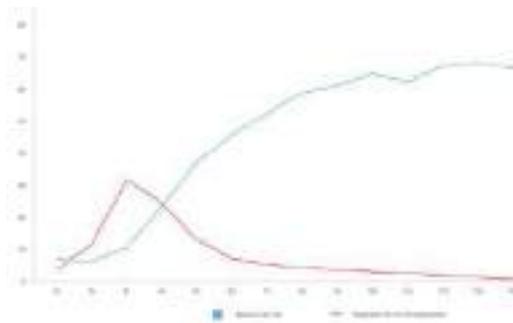


Figure 2. Web Page Load Time vs Bounce Rate

Overview

This work discusses and offers solutions to the following points:

- Manual testing as an optimal approach for a web application
- Comparison of manual testing methods

Improving the quality-of-service delivery through manual testing

Decision

The idea of the project is to test web applications for online shops, which will allow web application owners to improve the quality-of-service delivery by performing manual testing techniques. Unlike other similar tests, the unique idea of web application testing is to do different types of manual testing on different web applications and find the best manual testing technique specifically for web applications.

Conclusion

Modern society is oriented towards the idea of ease and satisfaction in every area of one's life. On the one hand, we have a huge number of opportunities to acquire something new, but on the other hand, finding a truly quality web application to acquire this new thing is quite difficult.

Circumstances require us to find new and effective solutions quickly so that we don't have to spend a lot of time looking for them, which becomes an incentive for testers. The market is shifting from just providing shopping opportunities to online shopping opportunities with convenient, quality, and reliable services. One of the best ways to achieve this is through role-based user testing (manual testing).

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THE ANALYSIS OF INTELLECTUAL CAPITAL FORMATION AT THE SCIENTIFIC INSTITUTIONS

Inese Spica, Baiba Berzina, Ernests Spics, Rozite Katrina Spica
*ISMA University of Applied Science & Scientific Institution Business
Competence Centre, Latvia*

**Corresponding author's e-mail: inese.spica@gmail.com*

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Abstract

At the present time the formation of intellectual capital and its efficiency is actively developing field of science management. The formation of intellectual capital and its efficiency is relatively young field, there are no best practices and standards formulated main directions for the analysis of formation of intellectual capital efficiency in Latvia. Currently there are not many approaches and tools on the technological business environment used by different scientific institution for analysis of formation of intellectual capital efficiency. This work is an attempt to find the best economic indicators for the analysis of formation of intellectual capital efficiency on the technological business environment in Latvia.

Keywords: intellectual capital, efficiency, formation, scientific institution, Latvia.

Introduction

Taking into consideration the present technological business environment situation in Latvia it is important to make use of these conditions for further improvement and development of the intellectual capital formation and its efficiency.

The object of the present research paper is intellectual capital formation. The subject of the research paper is the efficiency of intellectual capital

formation. The objective of the paper is to study the integration process of technological business environment and intellectual capital formation problems, to elucidate the factors influencing the intellectual capital formation and its efficiency, to develop proposals for solving problems and for the analysis of formation of intellectual capital efficiency by making use of relationship between these factors in investigation of intellectual capital formation in Latvia.

Overview

The tasks advanced in order to reach the objective:

- Identify the concept of intellectual capital formation;
- To carry out analysis of the factors influencing intellectual capital formation in the process of the technological business environment integration;
- To carry out analysis of economic indicators characterising intellectual capital formation and its efficiency at the scientific institutions in Latvia.

Theoretical study methods are reported analysis of intellectual capital formation, technological business environment management, study of correlation between intellectual capital formation factors and the technological business environment. Empirical pilot methods are observation for the purpose of studying mutual influence between intellectual capital formation factors and the technological business environment, study of economic indicators characterising efficiency of formation of intellectual capital at the different scientific institutions in Latvia, analysis of the technological business environment management in Latvia, economic and statistical analysis of the formation of intellectual capital efficiency on the technological business environment, economic experiment, study of international evaluation of scientific institutions, public and non-government institutions data in Latvia.

Research basis are economic indicators of intellectual capital formation, scientific institutions and its technological business environment in Latvia. The research period is from the year 2012 till the year 2023, separate themes have been studied for a shorter period of time or by way of comparison.

Conclusion

In Latvia the most significant problems of intellectual capital formation are shortage of R&D personnel and expenditure, shortage of business competence of intellectual capital formation at the different scientific institutions.

The solution of intellectual capital formation problems is based on the study of technological business environment, intellectual capital formation and management, and ensuring effective solution of intellectual capital formation problems in Latvia.

Authors

Inese Spica, Riga, Latvia.

Current position, grades: professor at the ISMA University & lead researcher at the Scientific Institution Business Competence centre, Dr.oec.

Scientific interest: entrepreneurship, economics, business competences, intellectual Capital

Baiba Berzina, Riga, Latvia.

Current position, grades: researcher at the Scientific Institution Business Competence Centre, PhD student at the ISMA University, MBA

Scientific interest: business and economics

Ernestis Spics, Riga, Latvia.

Current position, grade: researcher at the Scientific Institution Business Competence Centre, PhD student at the ISMA University, MPA

Scientific interest: culture management, business competences

Rozite Katrina Spica, Riga, Latvia.

Current position, grade: researcher at the Scientific Institution Business Competence Centre, PhD student at the Latvian Academy of CultureI, MA

Scientific interest: culture management, business competences

**UNMANNED AERIAL PLATFORM PROTOTYPE WITH
A MULTIFUNCTIONAL HARDWARE AND SOFTWARE SYSTEM
FOR ACQUIRING AND PROCESSING IMAGES AND DATA
FOR PRECISION AGRICULTURE**

**Symagulov Adilkhan^{1,2,*}, Kuchin Yan², Jan Rabcan³, Nadezhda
Nikitina¹, Ravil Mukhamedyev^{1,2}, Laila Tabynbaeva⁴**

¹*Satbayev University (KazNRTU), Kazakhstan, Almaty*

²*IICT MSHE RK, Kazakhstan, Almaty*

³*University of Zilina, Slovakia, Zilina*

⁴*LLP Kazakh Research Institute of Agriculture and Plant Growing, Almaty
040909, Kazakhstan*

**Corresponding author's e-mail: asmoglove00@gmail.com*



Abstract

UAVs are increasingly used in solving the problems of precision agriculture. In particular, they allow mapping fields, monitoring the condition of plants, identifying and spraying weeds. The authors have developed and successfully tested a prototype of a multifunctional hardware-software system for collecting and pre-processing images and data in order to solve the problems of precision agriculture.

Keywords: precision agriculture, UAVs, IUAVT, remote sensing data

Introduction

The use of unmanned aerial vehicles (UAVs) in various areas of human activity is a relatively new and promising area of technological development for countries with a variety of types of economies.

This also applies to monitoring tasks in the field of agriculture. Obtaining objective information about the state of fields and plants for assessing the quality and planning agrotechnical activities is a key element of precision farming technology (precision agriculture – PA).

PA is a crop productivity management system based on a complex of aerospace, information and communication technologies [1]. It provides

irrigation, fertilization and herbicides only for those parts of the fields that need it. PA includes:

- Gathering information about farmers' fields, culture and region
- Processing and analysis of the received information for planning agrotechnological activities
- Implementation of agrotechnological measures (precise and dosed application of fertilizers, herbicides, biophages)

Method

One of the ways to solve these problems is intelligent unmanned technologies (IUAVT) [2], which can be used at almost all stages of PA to solve a wide range of agrotechnical problems (Figure 1).

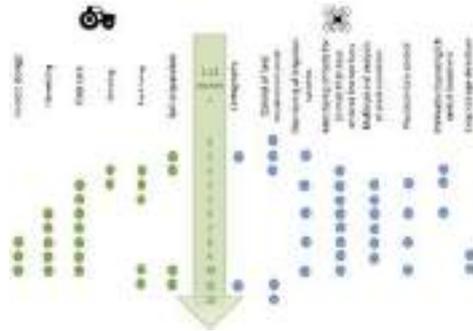


Figure 1. Agrotechnical measures and possible use of UAVs

Due to the relative cheapness, UAVs have an advantage in performing monitoring tasks on a small and medium scale [3, 4, 5, 6, 7].



Figure 2. Hardware components of IUAVT

Results

To solve the problems of precision agriculture, a hexacopter prototype was developed and tested, which is part of a multifunctional software and

hardware system for collecting and processing images. The UAV has the following parameters (Figure 3):

- Takeoff weight: 4kg
- Flight time: up to 45min
- Flight speed: 0-60km/h
- Takeoff/landing: vertical
- Flight altitude: 3 – 3000m
- Operating frequencies: 2.4GHz, 5.8GHz
- Satellite positioning systems: GPS, GLONASS, BEIDOU
- The size of the area for takeoff / landing: 2x2m
- Diameter along the axes of motors: 800mm
- Number of engines: 6
- Type of motors: brushless 3-phase
- Control: manual, semi-automatic, automatic (takeoff/landing, waypoints)
- Route planning: via PC using modem and telemetry
- Positioning accuracy in standard mode – 0.6m, in RTK mode – centimeter.
- Software: QGroundControl, DroneLink



Figure 3. UAV prototype of a multifunctional software and hardware system for image acquisition and processing

As an example of a project for testing automation the Siebel CRM testing automation system will be considered. Using a set of open-source software an automated testing system was created that are not inferior to the characteristics of the complete, large, and paid solutions. Technically, the created tests are http queries sent to the server, and test scenarios can be described using any

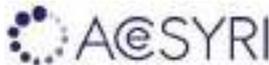
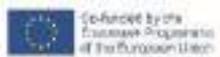
programming language. This makes the solution more flexible and easily scalable. Rejecting the finished programs for automated testing, which requires significant hardware and software resources it was possible to significantly reduce the cost of testing automation and to achieve faster and more reliable tests.

Conclusion

The developed flight part of the complex with attachments has been tested. It is efficient, efficient enough in terms of performance and application in real conditions for surveying and mapping fields using specially developed coverage algorithms [8]. The presence of a multispectral camera makes it possible to calculate various spectral indices to assess the state of plants. An RGB camera combined with RTK allows field mapping with centimeter accuracy.

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Authors



Adilkhan Symagulov, 1994, Almaty, Kazakhstan.

Current position, grades: programmer-engineer at Institute of Information and Computational Technologies.

Scientific interest: machine learning, data processing, natural language processing etc.



Yan I Kuchin, 1980, Almaty, Kazakhstan.

Current position, grades: programmer-engineer at Institute of Information and Computational Technologies.

Scientific interest: geophysics, machine learning, data processing, natural language processing etc.



Jan Rabcan, 1980, Zilina, Slovakia

Current position, grades: as. professor, PhD

Scientific interest: data mining, artificial neural network, machine learning etc.



Nadezhda Nikitina, 1986, Almaty, Kazakhstan.
Current position, grades: data scientist at Satbayev University, actuary.
Scientific interest: theory of probability, mathematical statistics, machine learning, mathematical modeling



Ravil I Muhamedyev, 1959, Irkutsk, Russia.
Current position, grades: professor at Satbayev University.
Scientific interest: machine learning, data processing, decision support systems etc.



Laila Tabynbaeva, 1982, Almaty, Kazakhstan.
Current position, grades: Researcher of KazNII ZIR department of agriculture, PhD.
Scientific interest: geophysics, machine learning, data processing, natural language processing etc.

USING UAVS AND MACHINE LEARNING TO GENERATE PLOTTED DATA SETS FOR PRECISION FARMING

Symagulov Adilkhan^{1,2,*}, Kuchin Yan², Jan Rabcan³, Laila Tabynbaeva⁴

¹Satbayev University (KazNRTU), Kazakhstan, Almaty

²IICT MSHE RK, Kazakhstan, Almaty

³University of Zilina, Slovakia, Zilina pplied Sciences, Latvia

⁴LLP Kazakh Research Institute of Agriculture and Plant Growing, Almaty 040909, Kazakhstan

*Corresponding author's e-mail: asmogulove00@gmail.com



Abstract

In this paper, we consider a method of estimating soil salinity based on field surveys performed and data obtained during a UAV overflight of the field with a mounted multispectral camera. We applied Random forest regressor. The regressor was evaluated using Random permutations cross-validation: Mean Absolute Error: 0.577, Mean Squared Error: 0.695, Mean_R-squared scores: 0.575. The high results allow us to recommend the method for practical application.

Keywords: soil salinity, remote sensing data, machine learning

Introduction

Weed infestation of cultivated fields is the cause of reduced yields of cultivated plants. The application of precision farming methods requires ways to recognize weeds in the field and their subsequent mapping to perform a point impact (chemical or mechanical eradication). Currently, an effective way to automatically recognize and classify images are computer vision algorithms based on the training of deep neural networks [1,2]. However, such methods require the formation and markup of a large number of images. Such datasets are formed for ground-based applications, while for the use of computer vision systems with UAVs they are not enough. In order to form a large set of marked images, the field is circled using a coverage algorithm [3], and then the collected photos are marked in a special way. This work, aimed at creating a significant in volume set of images obtained from the UAV is described in this paper.

Method

Photos of the field taken with the DJI Mavic mini drone camera were given to the expert to identify weeds in the photos so that in the future we could make weed markings by ourselves. The expert identified 12 classes of objects, which included an entire bed of the beneficial crop, the beneficial crop, Soybean (*Glycine max*), and ten classes of weeds that commonly grow in soybean fields, namely: Common briar (*Amaránthus retrofléxus*), Field creeper (*Convolvulus arvensis*), Blue bristlecone (*Setaria glauca*), Common woodruff (*Xanthium strumarium*), Pink thistle (*Cirsium arvense*), Chicken millet (*Echinochloa crusgalli*), Hibiscus trionum, *Abutilon theophrasti*, *Chenopodium album*, *Apera spica-venti*. Figure 1 shows examples of weed plants.

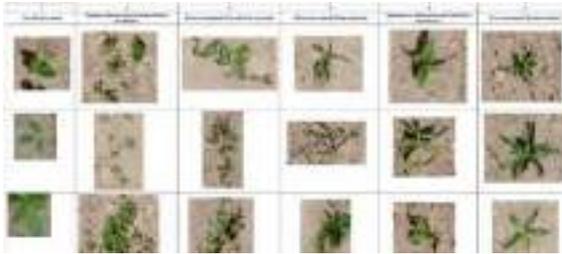


Figure 1. Images of weeds growing in soybean fields

In order to feed the image into the neural network for its further training, it is necessary to mark objects on the image. The objects (plants) are marked by rectangles (bounding boxes) in a particular software in a format compatible with the YOLO neural network. The photos of the soybean field were labeled using the free Computer Vision Annotation Tool (CVAT) software.

The images were marked manually, so each patch, individual useful plants, and different types of weeds had to be highlighted with rectangles. Figure 2 shows an example of such markup. Red, turquoise and other colors were used to highlight the weeds, and green was used to highlight the beds of the useful crop and the useful crop itself.



Figure 2. Markup of plant images

Results

As a result of markup, a text file is created for each marked image with the following line-by-line information: the first digit is the class identification number of the object (0 is a useful crop, 1 is a useful crop, 2 is an amaranth weed, etc.), and the next four digits are responsible for the coordinates of the rectangle within which the marked object in the photo is located, that is the

class label, X, Y for the center of the rectangle, width, and height of the rectangle, for example:

0 0.169373 0.489593 0.051810 0.978618

1 0.539392 0.032358 0.040800 0.064147

Markup is a time-consuming process. At the time of the recognition and identification experiments, the marked-out set of images contains more than 1000 images each of them containing dozens of images of useful plants and weeds. Among these, soybean fields are labeled at the first, second, and third growth stages:

- first growth stage 21 days from seed planting, 417 images labeled
- the second stage of growth is 42 days from planting seeds, 375 photos labeled
- the third stage of growth is 56 days from the planting of seeds, 256 photos.

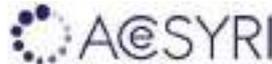
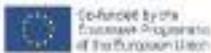
In total there are 1048 marked images of the soybean field, each containing dozens of images of useful plants and weeds.

Conclusion

The generation of a large set of marked images is a time-consuming process during which the preliminary results described in this paper are obtained. The resulting dataset is already being used to train the YOLO neural network.

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Authors



Adilkhan Symagulov, 1994, Almaty, Kazakhstan.

Current position, grades: programmer-engineer at Institute of Information and Computational Technologies.

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Jan Rabcan, 1980, Zilina, Slovakia

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Scientific interest: data mining, artificial neural network, machine learning etc.



Yan I Kuchin, 1980, Almaty, Kazakhstan.

Current position, grades: programmer-engineer at Institute of Information and Computational Technologies.

Scientific interest: geophysics, machine learning, data processing, natural language processing etc.



Laila Tabynbaeva, 1982, Almaty, Kazakhstan.

Current position, grades: Researcher of KazNIIZIR department of agriculture, PhD.

Scientific interest: geophysics, machine learning, data processing, natural language processing etc.

COMPARATIVE ANALYSIS OF THE DOCUMENT SIMILARITY METHODS BASED ON THE BERT MODEL

Saltanat Tanash*

AL Farabi Kazakh National University, Kazakhstan

**Corresponding author's e-mail: tanash.saltanat2@gmail.com*



Abstract

The purpose of this study is to solve the problem of finding relevant articles based on user interests. One of the main difficulties is the presence of various algorithms, some of which concentrate on the meaning of the text, others on the structure. To overcome this problem and select articles that are semantically comparable, the study proposes a keyword-based approach. Article authors usually use special terms in the keywords section that reflect the main idea of their publication. By creating dictionaries on relevant topics and processing texts appropriately, it becomes possible to calculate similarities and differences between different entries. Based on this score, a set of papers that are most similar to the original work can be selected. The effectiveness of this approach is demonstrated on a model example.

Keywords: similarity measures, semantic similarity of documents, BERT

Introduction

In natural language, phrases can have similar meanings even if they do not share any words, while the same words can have different meanings depending on the context. Various techniques, such as cosine similarity, knowledge-based methods, and sentence embedding, are currently being used to address the similarity problem. However, these approaches often require large training datasets. At the conceptual level, semantic understanding of a document is built upon conceptual level semantics, while at the text level, brief similarity analysis can offer insight into semantic similarity at the document level [1]. Knowledge-based methods use the path between concepts in knowledge resources to indicate their semantic similarity. Organizing documents into semantically related groups or thematic categories can help reduce the time required to find and retrieve information from large

collections. Textual-semantic similarity is used to identify common characteristics between objects such as words, documents, or queries. Different approaches to semantic measurements should be applied depending on the type of data, the problem statement, and the algorithm structure [2]. By representing words as vectors, a measure of distance can be used to determine their semantic similarity based on a threshold.

BERT uses many layers of bidirectional transformers is shown in Figure 1 [3].

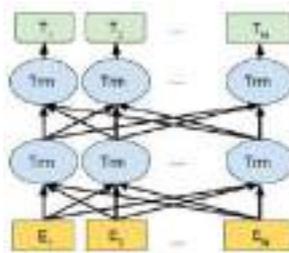


Figure 1. Bidirectional network

There are two sizes of pre-trained BERT models available: Base, which consists of 12 layers, 768 hidden size, 12 self-attention heads, and 110M parameters, and Large, which consists of 24 layers, 1024 hidden size, 16 self-attention heads, and 340M parameters.

In essence, it is composed of multiple layers of encoders stacked together (Figure 2 [3]).

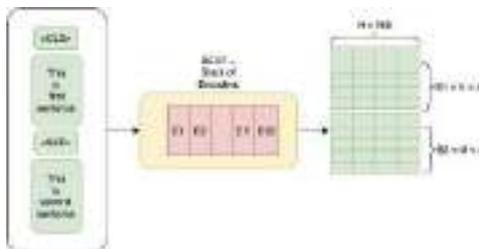


Figure 2. Architecture model

BERT is designed as an encoder-only transformer that is characterized by deep bidirectionality, as it can leverage information from both left and right

contexts in its layers. Our approach in this work involves using BERT to identify similar documents.

Overview

The way similarity or distance is measured indicates the extent to which goals are close or far apart, and this measure must align with the features present in the data. Often, these features are specific to the data or the problem context. Moreover, the selection of an appropriate similarity measure is crucial for a search task. Therefore, comprehending the efficacy of various measures is significant in order to choose the optimal one. Generally, similarity/distance measures indicate the similarity or distance between the symbolic representation of two entities, converting it into a single numerical value that depends on two factors: the characteristics of the two entities and the measure being used [4]. The similarity measure assesses how related documents are to each other. General property of all similarity measures is that they are displayed in the range $[-1, 1]$ or $[0, 1]$. 0 or -1 represent minimal similarity and 1 represents absolute similarity [5]. To determine the semantic similarity of two independent sentences using BERT, the input sentences need to be formatted in a specific way. This involves adding special tokens such as [CLS] and [SEP], ensuring that the input sentences are of the same length and do not exceed 512 tokens (including special tokens), and adding [PAD] tokens to ensure the sentences are of equal length. Additionally, token IDs corresponding to each token can be extracted from the BERT model, a mask ID can be generated to distinguish between [PAD] tokens and real tokens, and segment IDs can be generated to distinguish between different segments of the input. Once the input is formatted in this way, it can be processed through the BERT model to determine the semantic similarity of the two sentences.

Decision

The process of vectorization BERT involves assigning a segment embedding and positional embedding to each initial embedding. The segment embedding indicates whether the word belongs to the first or second sentence, while the positional embedding shows the distance between two words. Unlike recurrent neural networks, the transformer used in BERT processes all words in parallel and does not consider past context. Therefore, BERT needs a position vector comprising fast and slow sinusoids that change with each token [6]. Words with different meanings in fast graphs but the same meanings in slow graphs are considered adjacent, while words with different meanings in slow graphs are considered far apart.

The most advanced method for creating systems that match semantics involves calculating vector representations of the items, also known as embeddings. Machine learning models are used to calculate these

embeddings, and they are trained to create an embedding space where similar examples are located close together and dissimilar ones are further apart. The proximity of two items in the embedding space determines their level of similarity, with closer items being more similar.

Conclusion

The study examines the challenges associated with identifying semantic similarity in natural language texts and explores modern approaches to address them. As part of the research, an algorithm was developed to detect and process semantically similar sentences and store them in a proposed text corpus. The results of the evaluation are provided, and the algorithm is designed to analyze a processed article corpus, identify sentence pairs that exhibit semantic similarity, and then store them in a separate corpus of texts ranked by their level of semantic similarity.

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Authors



Saltanat Tanash, Almaty, Kazakhstan.

Current position, grades: AL Farabi Kazakh National University

Scientific interest: data science, big data, data analysis, artificial intelligence

FUTURE OF X86 AND X86_64 CENTRAL PROCESSING UNITS. ANALYSIS OF MODERN CPU POWER INCREASING TECHNOLOGIES

Kiril Taranenko, PhD Vladyslav Khotunov, Maiia Lyuta

ISMA University of Applied Science, Latvia

Cherkasy State Business-College, Ukraine

**Corresponding author's e-mail: taranenko102b@gmail.com,
vkhhotunov@gmail.com*

Abstract

x86 processors have come a long way to becoming what they are today. Many stages of evolution allowed us to put enormous computing power on a device that fits into our palm. But with increasing power we are coming closer and closer to the physical limitations of processors in their current form. To delay the inevitable, manufacturers are coming up with more and more alternative ways to increase processor performance that could also save or improve energy efficiency. These technologies also are giving scientists more time to find new ways to make processors and microelectronics in general that will help circumvent the collision with physical restrictions. This work analyzes modern solutions of biggest manufactures to increase performance of central processing units without increasing their raw performance and attempts to anticipate based on existing discoveries in microelectronics the future of central processing units.

Keywords: x86 processors, computing power, energy efficiency, microelectronics, physical restrictions, performance

Introduction

Central Processing Units (CPUs) have been the heart of computing systems since their inception. The x86 and x86_64 CPUs are widely used in personal computers, servers, and embedded systems. Over the years, these CPUs have undergone several changes in their architecture to meet the growing demand for performance and power efficiency.

The x86 architecture was first introduced by Intel in the late 1970s and has become one of the most widely used CPU architectures in the world. It is based on a complex instruction set computer (CISC) design, which means that each instruction can perform several operations. This design has several advantages, including the ability to execute instructions more quickly and

efficiently, reducing the number of instructions required to perform a given task, and reducing the amount of memory required to store program instructions.

The x86_64 architecture, also known as the x64 or AMD64 architecture, is an extension of the x86 architecture that supports 64-bit processing. It was introduced in 2003 by AMD as a way to extend the life of the x86 architecture while providing significant improvements in performance. The x86_64 architecture allows for larger memory addresses and more complex calculations, making it ideal for high-performance computing and server applications.

The x86 and x86_64 architectures are used in a wide range of applications, including personal computers, servers, and embedded systems. They are compatible with a wide range of software and operating systems, making them a popular choice for developers and users alike. CPUs have undergone several changes over the years to meet the growing demand for performance and power efficiency. These changes include improvements to the instruction set, the introduction of new technologies such as hyper-threading and multi-core processors, and changes to the manufacturing process to reduce power consumption and increase performance.

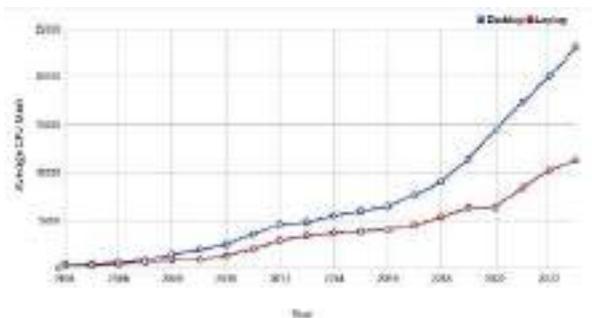
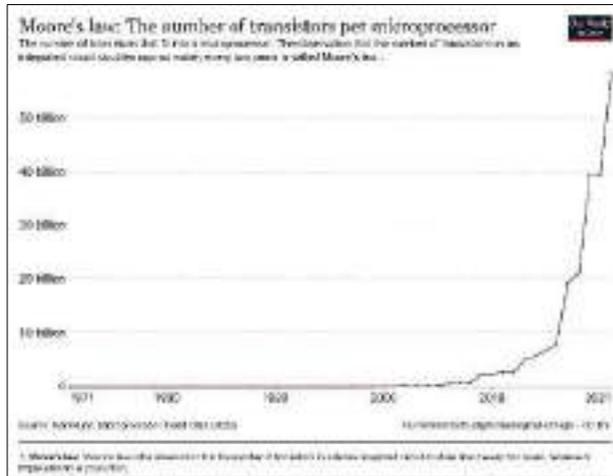


Figure .1 Year to year CPU performance comparison from 2004 to February 2023 by cpubenchmark.net [1]

Despite the fact that the CPU manufacturers improve performance and energy efficiency every year, some things will change in the near future. According to Gordon E. Moore's (co-founder of Intel) law – the number of transistors on a microchip doubles every two years. The law claims that we can expect the speed and capability of our computers to increase every two

years because of this, yet we will pay less. But It's about to change: experts agree that computers should reach the physical limits of Moore's Law at some point in the 2020s. The high temperatures of transistors eventually would make it impossible to create smaller circuits. This is because cooling down the transistors takes more energy than the amount of energy that already passes through the transistors. [2]



In a 2005 interview [3], Moore himself admitted that "...the fact that materials are made of atoms is the fundamental limitation and it's not that far away...We're pushing up against some fairly fundamental limits so one of these days we're going to have to stop making things smaller."

Overview

This work analyzing and discussing following points:

- Technologies that increasing performance wider than increasing raw performance and energy consumption
- Changes in manufacturing processes
- Future of x86 and x86_64 Central Processing Units

Decision

Today CPU manufacturers already testing some ways to increase performance without huge impact in power consumption:

- Intel CPUs became bigger in the Alder Lake generation (12th generation). Difference in the size of processor substrate between Alder Lake and Rocket Lake (11th generation) is 7.5 mm. It's an extra 20% CPU substrate

size. This extension allowed to add not only 500 additional contact pads but also add a new feature that allowed to use processor in more efficient way – effective cores. Effective cores are the same as regular CPU cores but they are working on less clock speed – between 2 and 2.5 Ghz. They are taking over background calculations, thus allowing to use performance cores only for main tasks. This feature allowed to increase performance by adding a lower impact on TDP than increasing raw performance. Even though this is great technology it has 2 major flaws. The first one is bad compatibility with old software that can cause stability and performance issues. And second one is bad OS compatibility – Intel recommending to use Windows 11 for proper functionality of their new CPUs.

- Starting with EPYC 3 generation AMD is also testing new feature that can impact performance without increasing raw power of CPU – 3D V-Cache. It is a multilayer memory crystal that is mounted on a chipset with cores and is connected to it by edge-to-edge technology. The number of transistors used in it reaches several billion, which is comparable to their number in the chipsets themselves with CPU cores. This technology allowed to drastically increase amount of 3 level cache. 3D V-Cache reduces the number of errors when requesting the required data and reduces the delay in accessing RAM. And thanks to the large volume, this amount should be reduced in a multiple, and delays will be reduced significantly. If we compare the 2 consumer processors Ryzen 7 5800x and Ryzen 7 5800x3d we can see a huge difference of 64 megabytes of CPU cache – that is 200% difference. A big flaw with heating that forced the manufacturer to lock the multiplier of the clock speed to avoid overheating. Also, the first consumer processors with this technology had a big difference in heating from one unit to another. Enthusiasts from gceid.com compared their heating results to other reviewers [4] and found a 7 degrees difference under similar test conditions. This in turn exceeded the critical mark of 90 degrees Celsius by 3 degrees. But in the new generation that was released at the end of February 2023 they have resolved this issue and even lowered the TDP of top segment CPU Ryzen 9 7950x3d by 50 W compared with the base version. Interesting fact that similar technology applied by Intel was used back in 2015 with Broadwell architecture but was abandoned due to the high cost of production and the disadvantages of the technology – unlike the 3D cache, Intel’s eDRAM was separated from the main crystal, so the speed and delays left much to be desired.

In the future there will be lots of changes in CPU production:

- To produce CPU a silicon wafer getting carved using photomask with a special ultraviolet excimer laser. But this laser also has its physical limitations. To reach smaller technical processes companies may use x-ray

because it has bigger accuracy. According to an Intel statement, they have been using x-ray ray since 2002 but for testing reasons.

- Due to physical limitations, a silicon transistor couldn't work properly if its size would be smaller than 5 nm – it'll become a conductor. Scientists are trying to resolve this problem by changing principles of CPU construction. First idea is to change silicon as the main material to something else. One of the most successful options became a material that is called carbon nanotube. A carbon nanotube (CNT) is a tube made of carbon with diameters typically measured in nanometers. Electrical conductivity of carbon nanotubes is three times higher than silicon. There are existing prototypes with 14000 transistors and 1 micrometer technical process. The second big idea was the rejection of CMOS transistors. The main contenders are TFETS transistors and memristors. Unlike the CMOS transistor for which electron tunneling is a failure – it cannot close and turns into a conductor, the tunnel field-effect transistor works on this phenomenon. If an electron lacks the energy to overcome a potential barrier, it remains behind it unless it is informed of the missing energy. However, the tunneling effect allows low-energy electrons to leak through the barrier. That is, tunnel transistors can operate at less voltage than complementary metal-oxide-semiconductor (CMOS) transistors. Moreover, the reduction of the shutter size is not at all dangerous – to avoid excessive tunneling, you need to further reduce the voltage, which leads to a decrease in heat generation. The main problems with tunnel transistors are production sustainability (the necessary material is graphene, which can cost up to 28 billion dollars per gram) and operating temperature of such transistors can reach down to -25 degrees Celsius. The second candidate to replace CMOS transistors is memory resistor. If the resistor is simply an electrical resistance that does not change, then the memristor has a memory effect – it changes its conductivity in accordance with the amount of electrical charge flowing through it. This property allows the perfect memristor to be energy-independent and energy-dependent memory, that is, to combine random access memory and solid-state drive. In this way, memristors can reverse the modern concept of data storage – instantaneous system boot, power outages will no longer cause data loss, data upload will speed up many times as it does not have to be transferred from permanent storage to RAM. And such devices are already a reality – in April 2022, Weebit Nano [5] announced the successful completion of testing SoCs (System-on-Chips) on the RISC-V architecture with the built-in resistive memory unit ReRam of 128 kb, and this year they promise to extend the resistive memory block to 8 megabytes.

Conclusion

Modern CPUs are developing at a very high speed, including due to the relative novelty of the technology. Manufacturers with each generation make smarter steps to increase processor power while balancing and improving

energy efficiency. And while modern technology has its drawbacks, I believe that in the next 20 years, the world will see a discovery that will not only transform our understanding of processors, but of all microelectronics.

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DEVELOPMENT OF A SYSTEM FOR RECOGNIZING OBJECTS ON IMAGES USING CONVOLUTIONAL NEURAL NETWORKS

Ruslan Taranenko, PhD Mariia Zakharova *

ISMA University of Applied Science, Latvia

**Corresponding author's e-mail: ruslantar02@gmail.com,
zmaria17mz@gmail.com*

Abstract

This thesis presents a system for recognizing objects on images using convolutional neural networks (CNNs). The proposed system is designed to accurately identify and classify objects within complex visual scenes. The system is evaluated using benchmark datasets, and the results demonstrate that it achieves state-of-the-art performance on object recognition tasks. The system is scalable and efficient, making it suitable for deployment in real-world applications.

Keywords: object recognition, convolutional neural networks, computer vision, image processing

Introduction

The field of computer vision has seen rapid progress in recent years due to the emergence of deep learning techniques, particularly convolutional neural networks (CNNs). CNNs have revolutionized image classification and object recognition tasks by significantly improving the accuracy of these systems.

Object recognition is a critical task in computer vision with many real-world applications, including robotics, autonomous vehicles, and security systems.

The goal of object recognition is to identify and locate objects within an image. This task is challenging due to variations in object appearance, size, orientation, and lighting conditions.

Convolutional neural networks (CNNs) overcome some limitations by automatically learning hierarchical features from the input images. CNNs consist of multiple layers, including convolutional, pooling, and fully connected layers. The output of the final layer is a set of scores, which are used to predict the presence and location of objects within the image.

Overview

- **Data pipeline:** The system starts with a data pipeline for image preprocessing, which involves techniques such as resizing, cropping, and normalization. This pipeline ensures that the input images are of consistent size and quality, which is essential for accurate object recognition.

- **Exploratory Data Analysis:** Process of analyzing, summarizing and visualizing data in order to gain insights and understanding of the dataset. EDA is typically the first step in the data analysis process and is used to identify patterns, relationships, and anomalies in the data.

- **CNN model:** The system uses a convolutional neural network (CNN) model for feature extraction and classification. The CNN model consists of multiple layers that learn increasingly complex features from the input images. The final layer of the CNN model produces a set of scores, which are used to predict the presence and location of objects within the image.

- **Performance metrics:** The system is evaluated using standard metrics such as Intersection over Union (IoU), Binary accuracy, Dice coefficient. These metrics measure the accuracy and completeness of the object recognition system and are used to compare the performance of different models.

Overall, the proposed system for recognizing objects on images using U-Net convolutional neural network represents a significant advancement in the field of computer vision. The system leverages state-of-the-art deep learning techniques to achieve high levels of accuracy and is designed to be scalable and efficient, making it suitable for deployment in a wide range of real-world applications.

Conclusion

The system leverages state-of-the-art deep learning techniques to accurately identify and classify objects within complex visual scenes. The results demonstrate that it achieves state-of-the-art performance on object recognition tasks. The proposed system represents a significant advancement in the field of object recognition using deep learning and has the potential to revolutionize a wide range of applications.

**SALES STRATEGIES FOR SMALL BUSINESS
ENTITIES GIRTS POPOVS***

Alina Tkachuk, Antonina Djakona, Viktor Zdir

ISMA University of Applied Sciences, Latvia

**Corresponding author's e-mail: tkachuk.alya08@gmail.com*

Abstract

Small business is the backbone of any economy. It is small business structures due to their mobility and flexibility that have all the prerequisites for quick adaptation and survival in crisis conditions. In this aspect, an adequate assessment of the current sales strategy and its rapid transformation in accordance with the market situation are important. Therefore, the topic of researching marketing strategies for small business entities is relevant.

Keywords: sales strategies, implementation, small business, entrepreneurs, sales activities

Main text

A sales strategy is essentially a set of tools for closing deals, converting people from "target demographics" to "loyal customers." Although there are many types and varieties of strategies, all successful ones have common elements [1]. Each strategy should have clear goals [2], for example, finding new potential customers, increasing repeat sales or increasing the number of potential customers. The basis of the sales strategy is sales information, which provides insight into where the greatest improvement is needed. Goals should be accompanied by key performance indicators (KPIs). Good strategies are usually accompanied by standard procedures [3]. At the same time, an effective sales strategy should include ways to improve the sales skills of the team. It is also important to remember that the sales strategy plan is not a static document. This is a certain approach to how a company sells its product at a certain time [4].

A small business has certain specifics in its activity. The advantages of a small business are: independence, cash flow, self-assertion, tax benefits, community impact, equity, knowledge development, flexibility and mobility. At the same time, small business has disadvantages, among which it is necessary to note limited capital for investments, significant riskiness, increased financial obligations, longer working hours, stress [5].

Despite its small size, due to globalization, small business has received a number of prospects:

1) Access to the world market. With lower trade barriers, small businesses can reach previously inaccessible customers in other parts of the world.

2) Expansion of supply chains. Products that are produced or assembled locally are often transported across national borders. The spread of these business relationships across national borders has become easier as a result of globalization. Technology has also made it easier to manage cross-border supply chains, especially when the supplier is located in another country.

3) Remote recruitment. The availability of remote personnel, also known as telecommuters, is another effect of globalization.

4) Equalizer for business. As a result of globalization, equality in business has somewhat increased. Thanks to the Internet, every company has access to marketing tools, business data and everything else necessary to compete with larger, more well-known enterprises [6].

So, modern successful marketing strategies for small businesses are:

1) Audience targeting. This strategy will allow you to target the right audience, which will allow you to reach more people.

2) Using cold email marketing. This is a great way to connect with potential customers.

3) Advertising of business on the Internet. Today, one of the most popular online marketing tactics is social media advertising.

4) Using influencers to increase brand awareness and increase sales. Influencers are people with a large following on the Internet who can influence the opinions of their followers.

5) Offers of incentives and discounts. These can be percentage discounts on products or services, or an offer of free goods or shipping with a purchase.

6) Creating a mailing list. In the newsletter, it is possible to add a registration form to the pages of the website, on the page of social networks or on the blog, etc.

7) Investments in search engine optimization. This involves optimizing a website to appear higher on search results pages

8) Creating a blog about the latest trends and events related to the business niche. Blogging is a great way to communicate with customers and share information about your business [7].

Conclusion

A sales strategy is a company's plan to connect its product or service with its target customer. At the same time, it is necessary to inform the target customer about your product, that is, to present the product in a way that makes it meaningful for customers. Globalization and the Internet have made

it possible to significantly expand the range of opportunities for the development of sales activities of a small business, which can use modern effective strategies to increase sales, among which it is necessary to note audience targeting, the use of cold email marketing; advertising business on the Internet; using influencers to increase brand awareness and increase sales; offers of incentives and discounts; creating a mailing list; investments in search engine optimization; creating a blog, etc. Choosing a strategy to increase sales using the Internet, small business entities can go beyond national markets. This opportunity allows you to increase sales even with a difficult macroeconomic situation within the country.

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SYSTEMIC DYNAMIC CONCEPTUAL MODEL OF SUSTAINABLE DEVELOPMENT IN THE ENERGY COORDINATE SYSTEM

Inese Trusina*

Latvia University of Applied Sciences and Technologies, Jelgava, Latvia

Viktors Gopejenko^{1,2}

¹ISMA University of Applied Sciences,

Ventspils ²University of Applied Sciences, Latvia

**Corresponding author's e-mail: inese.trusina@aol.com*

Abstract

The main goal of the article is to present a new approach to the assessment of sustainable development of socio-economic system, using the methods of power changes analysis and system dynamic modelling. The article presents the concept of system dynamic model of sustainable development using the concept of total and useful power in open non-equilibrium sustainable socio-economic systems. Certain possibilities of sustainable development modelling are provided by methods of system dynamics based on the theory of self-adjusting systems with inverse connections. These methods in the presence of a formalized description of the "society – environment" system in terms of sustainable measures can open up great opportunities. Using the tools and technology of the system dynamics method, the construction of a conceptual dynamic model of social production of a socio-economic system is presented and will be developing.

Keywords: sustainable development, energy flows, system dynamic, modelling

Introduction

The contemporary scientific and technical community claims that the new development paradigm will be based on the priority of the universal laws of nature, the principles of ecological economics and the widespread use of digital transformation. According to the authors, the currently used methods for assessing the sustainability of the development of socio-economic systems do not allow presenting an objective picture of regional and national development. Monitoring the achievement of sustainable development goals, managing this process and evaluating effectiveness require the development of appropriate sustainable systems of criteria and indicators – indicators of sustainable development [1]. The division of the sustainable development

system into three separate systems (Economy, Ecology and Society) and their separate indication cannot give an idea and understanding of the performance results and development prospects of the entire socio-economic system as a whole. In today's changing world, in order to talk about the sustainable development of a socio-economic system, it is necessary to consider all processes in a stable coordinate system and measure in terms of a stable coordinate system. If this coordinate system is constantly subject to change, and this is exactly what happens in the money/processes coordinate system, then we will not be able to measure the effectiveness of sustainable development, design a monitoring system.

The main goal of the article is to present a new approach to the assessment of sustainable development of socio-economic system, using the methods of power changes analysis and system dynamic modelling. The article presents the concept of system dynamic model of sustainable development using the concept of total and useful power in open non-equilibrium sustainable socio-economic systems.

Overview

The sustainable development design is an ideal image or plan of time- and space-limited purposeful changes to the design object with established sustainable development requirements for the quality of results, possible resource spending frameworks and a special organization.

The goal of project management is to introduce certain changes into the constituent parts of the world around us so that the world and its environment changed by the project are generally preserved, i.e. he remained steady. The process of substantiation, development and implementation of the project determines the content of the project management of sustainable development.

The reason for designing is a problem situation (negative change) or an unsatisfied need that gives rise to an idea that makes it possible to remove dissatisfaction, resolve a problem situation, eliminate or reduce a negative change in the "nature -society – human" system.

The society, in interaction with the nature, has a number of properties that should be taken into account in the methods of its study:

- The "society-nature" system is an integral part of the "Life" system and cannot exist in isolation from the laws of its conservation and change [2].
- The system in a discrete-continuous mode exchanges flows with the surrounding natural and social environment. The system is open.
- The system is a complex network of flows interacting in time and space (energy, material, information and cost). The system is dynamic.
- Connections and interactions of flows circulating in the system are generally non-linear. The system is non-linear.

– The system as a whole (and all its subsystems) has a certain positive value of free energy, essentially different from zero, which enables it to perform useful external work. The system is non-equilibrium.

– The system of social production is developing steadily if there is a non-decreasing rate of growth in the efficiency of using its power, the measure of which is the growth rate of useful power. In this case, the system moves away from equilibrium with acceleration.

– The system of social production degrades if there is a steady decrease in the growth rate of useful power. In this case, the system approaches equilibrium.

– sustainable development of the system is ensured by the following main factors: – increasing the efficiency of technologies; – increase in the resource return coefficient; – increasing the quality of flow control; – increase in the density of useful power.

In accordance the concept of ecological economics [3] and the methodology of the energy flows analysis in open, non-equilibrium stable systems, the socioeconomic model of sustainable development is defined and presented in Fig.1. [4] The main law of energy flow for an open life system is presented in formulae 1:

$$N(t) = P(t) + G(t) \quad (1)$$

where:

$N(t)$ – input flow -full power or energy flow of socio-economic system (SES);

$P(t)$ – output flow – useful power or free energy flows;

$G(t)$ – output flow– the losses power $G(t)$ of SES

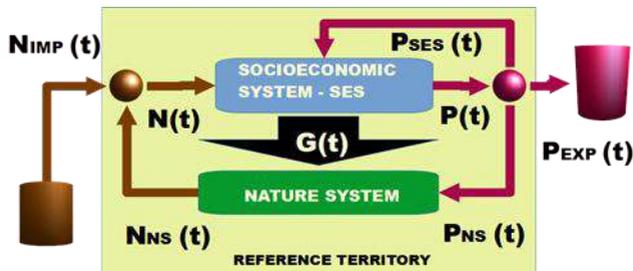


Figure 1. The socioeconomic model of sustainable development

In context of model, the sustainable development is a continuous process of building opportunities to meet the current needs of the existing socio-economic system in units of power now and in the future, improve the

efficiency of using the full power of the system, reduce power losses and increase consumption in the face of negative external influences and internal influences. The introduction of the term “power” in the formulation of sustainable development allows to create an invariant system of coordinates and energy units of measurement (watts), which allows us to create a measurable relationship between the needs and opportunities, as well as a system of indicators and criteria for sustainable development [5].

Methodology

The features of the socio-economic system impose certain requirements on the method of its study.

1. The method should provide a description of the system in interaction with the environment in terms of physically measurable quantities
2. The method must provide the ability to build initial legal concepts.
3. The main criterion for the effectiveness of public production should be the sustainability of its development in interaction with the environment;
4. The method should represent the rules for determining various flows in terms of measurable quantities;
5. The method should enable:
 - analyze the impact of technological progress;
 - conduct a systematic environmental and economic assessment
 - provide a study of the boundaries of sustainable development
 - provide research on models of the relationship of energy, information and cost flows

Certain possibilities are provided by methods of system dynamics based on the theory of self-adjusting systems with inverse connections. The method of system dynamics involves the representation of the system under study as a structure based on the action of a set of direct and feedback links that express their inherent internal patterns. The method makes it possible to study complex multi-connected systems that depend on the prehistory and include non-linearly interacting components. [6] It allows you to take into account the current situation by setting the initial conditions corresponding to this state, and makes it possible to predict the development of processes in the system over significant time intervals. Moreover, the method makes it possible to assess the effectiveness of possible development alternatives in the system under study. The direct result of the functioning of system-dynamic models should be considered not numerical forecasts of indicators, but a forecast of trends in their changes. Methods of system dynamics, in contrast to such models, assume the presence of a set such feedbacks, which can be not only positive (accelerating), but also negative (stabilizing and stagnating the

system) with variable, endogenously formed coefficients. Both socio-economic and environmental objects belong to the class of stably non-equilibrium systems that exist under conditions and due to the flow of energy flows through them. The occurrence of circulation in such systems serves as an objective source of feedback loops.

Results

Using the tools and technology of the system dynamics method, the construction of a conceptual dynamic model of social production of a socio-economic system is presented. The systemic dynamic conceptual model (Fig.2) includes the main six blocks:

- 1 – Production block
- 2 – restriction block
- 3 – the scientific and technological potential creation block
- 4 – the natural environment block
- 5– block for the transformation and formation of reserves of natural resources
- 6 – technological development

The main initiating element of this model is the "Production" (block 1). The dynamics of production is described by the equation 2:

$$R = (K_1 + \Delta \eta) (1 / T_0 P + 1) N_{\text{cons}} \quad (2)$$

where:

N_{cons} is consumed resources;

R is the total social product;

K_1 is the basic value of the of technology excellence coefficient;

$\Delta \eta$ (η) is the adjusted value of the technology perfection coefficient;

T_0 is the time constant of a production process typical of a given society

The input of "Production" block receives the flow of consumed resources N_{cons} , as well as the adjustable value of the technology excellence coefficient $\Delta \eta$ (η). The output flow of the "Production" block is the flow of free energy (useful power) R . Labor activity R_{la} has an impact on nature and generates a flow of resources – products of labor N . The dynamics of this process is modeled by an aperiodic link in according the equation 3:

$$N = \xi / (T_c P + 1) R_{\text{la}} \quad (3)$$

where:

ξ is resource return coefficient;

T_c is the time constant, characterizing the duration of labor efforts to obtain N .

The flow of technological innovations of N_{ino} (block 3) is modeled by the equation 4:

$$N_{\text{ino}} = K_{\text{tech}} / (T_g P + 1) R_{\text{ino}} \quad (4)$$

where:

R_{ino} is the flow of free energy of society going to the creation of technological innovations;

K_{tech} is a coefficient characterizing the flow of technological innovations per unit of the flow of labor resources going to creation of technological innovations;

T_g is the time constant characterizing the delay of the flow technological innovations relative to the flow of labor resources or the time of implementation of technological innovations.

The flow of technological innovation (block 6) leads to the modification of the technological method of production and technological development, which leads to a change (increase) in the coefficient of technology perfection for due to the formation of a custom value of the coefficient of perfection of technology $\Delta \eta$ (nu).

This change is modeled by the equation 5:

$$\Delta \eta \text{ (nu)} = K_{tech} / (T_L P + 1) \quad (5)$$

Block 2 characterizes the impossibility of the infinite power of investment of labour achievements in nature as an object of labour. The system receives the flow of resources from the natural environment (block 4) after the transformation and formation of stocks of natural resources in block 5.

Conclusion

Deeper analysis and further construction of natural socio-economic systems within the framework of power changes analysis approach makes it possible to appropriately develop and practice models for their study as complex nested nonlinear systems with memory and feedback. The introduction of the term "power" in the formulation of sustainable development allows to create a stable system of coordinates and units of measurement (watts), which allows us to create a measurable relationship between the needs and opportunities, as well as a system of indicators and criteria for sustainable development.

Certain possibilities of sustainable development modelling are provided by methods of system dynamics based on the theory of self-adjusting systems with inverse connections. These methods in the presence of a formalized description of the "society – environment" system in terms of sustainable measures can open up great opportunities.

Using the tools and technology of the system dynamics method, the construction of a conceptual dynamic model of social production of a socio-economic system is presented and will be developing.

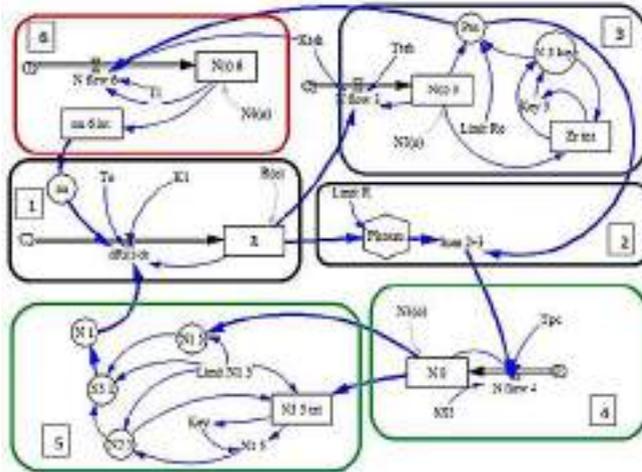


Figure 2. Systemic dynamic conceptual model

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MECHANISMS OF FORMING A SMART ECONOMY: THE CASE OF CHINA

Liudmyla Tsymbal

*Prof. Dr., Prof. Dr., prof. of department of international economy,
Kyiv National Economic University Named After Vadym Hetman,
Kyiv, Ukraine, e-mail: ltsimbal@ukr.net*

Tymur Natsvlishvili

*PhD student of department of international economy,
Kyiv National Economic University Named After Vadym Hetman,
Kyiv, Ukraine, e-mail: timurazor@gmail.com*

Abstract

The formation of a smart economy involves the use of new technologies and mechanisms for their introduction into economic activity. The change of the modern paradigm of the development of the world economic complex is characterized by the strengthening of the processes of intellectualization, digitalization, socialization and environmentalization, which form the general trend of the development of the smart economy. The development of collective intelligence is essential to ensure that all solutions contribute to the formation of a smart global ecosystem. The main factors of the development of a smart economy include: technological innovations, optimization of resources, entrepreneurial initiatives, social welfare. One of the countries that is on the road to smartization and is actively implementing smart economy technologies is China, which has developed a strategic plan to achieve innovation and stimulate its economy with the help of science and technology. The country has created high-tech zones and clusters for technological innovation, including Zhongguancun, Guangzhou, Zhangjiang, Haidian and others. Analyzing China's approaches, we can determine that the key in the process of forming a smart economy is the strategy of economic development,

based on science and technology, aimed at increasing the use of the latest achievements of science and technology in production.

Keywords: smart economy, innovation clusters, technology development, development and research

Smart economy is a multidimensional and dynamic concept that focuses on the quality of life, standard of living and well-being of individuals and communities. The concept of a smart economy is an evolutionary process, adaptive to contextual situations and characterized by three interrelated dimensions: economic, social and psychomotor. It is based on a set of moral, cultural, traditional, political, democratic principles and aims to constantly improve the quality of life of people through the efficient distribution of economic resources and the reduction of social and economic phenomena such as poverty, hunger, discrimination, inequality of opportunities, unemployment and violence. This is the process of choosing and making decisions by a person about the way to use limited resources with unlimited needs [1].

The change of the modern paradigm of the development of the world economic complex is characterized by the strengthening of the processes of intellectualization, digitalization, socialization and environmentalization, which form the general trend of the development of the smart economy. The key driving force of this new economy is the transformation of the management process, which involves new mechanisms for involving all actors and stakeholders in decision-making. The development of collective intelligence is essential to ensure that all solutions contribute to the formation of a smart global ecosystem. The main factors of the development of a smart economy include: technological innovations, optimization of resources, entrepreneurial initiatives, social welfare [2].

One of the countries that is on the road to smartization and is actively implementing smart economy technologies is China, which has developed a strategic plan to achieve innovation and stimulate its economy with the help of science and technology. The country has created high-tech zones and clusters for the implementation of technological innovations [3]. Over the past few years, China has made significant progress in building a smart economy. The country has succeeded in creating an innovative economy and uses technology and science to promote sustainable development and economic growth. Smartization technologies are most actively developed in China within the framework of innovation clusters and technology parks, the most famous are: Zhongguancun, Guangzhou, Zhangjiang, Haidian and others.

Zhongguancun is the Silicon Valley of China, which has become the leading technological center of the country. The science park is home to more

than 20,000 high-tech companies, including many startups and unicorn companies. The park has a dynamic ecosystem that supports innovation and entrepreneurship, with access to funding, resources and talent [4].

Guangzhou International Bioisland is a biomedical center located in Guangzhou, China. It is a biotechnological industrial park that supports the development of new drugs, medical devices and biotechnological services. Bioisland has attracted more than 250 companies, including international players such as Pfizer, Roche and GSK [5].

Shanghai Zhangjiang National Innovation Demonstration Zone is a technology park that has become the center of innovation and entrepreneurship in China. It has attracted a range of industries, including biotechnology, artificial intelligence and clean energy. The park has also become a center of international cooperation with leading universities and research institutes around the world [6].

Haidian Artificial Intelligence Industrial Park is a technology park located in Beijing, China. It is dedicated to the development of artificial intelligence (AI) technologies and programs. The park attracted more than 200 companies and became a center for AI research and development [7].

Technoparks and technoclusters are an important mechanism for forming an integral system of China's smart economy, and, as the practice of developed countries shows, quite successful. Innovation clusters become the driver of the promotion of technologies to the market, their implementation and effective introduction into the economic system. These initiatives have helped create an ecosystem that supports innovation and entrepreneurship, attracts investment, and fosters collaboration among various stakeholders. The formation of a smart economy in China involves the transformation of the management process, new mechanisms for involving all interested parties in decision-making. Important values of the smart economy are sustainable development, human perception and preservation of the environment. Accordingly, it allows to increase productivity, improve product quality, reduce costs and improve the environmental situation.

Analyzing China's approaches, we can determine that the key in the process of forming a smart economy is the strategy of economic development, based on science and technology, aimed at increasing the use of the latest achievements of science and technology in production. China has an ambitious "Made in China 2025" strategy, which foresees an increase in the use of Chinese components and equipment in production from 40% to 70% by 2025 [8]. To achieve this goal, smart technologies such as the Internet of Things (IoT), artificial intelligence (AI), data analytics, blockchain, and others are actively used.

The key problems of implementing the strategy and developing the smart economy are piracy, lack of qualified resources, environmental pollution, and a large share of the shadow economy. To overcome these challenges, China must first develop education, the financial system, training for entrepreneurs and managers, minimize the negative impact on the environment, strengthen control over the observance of intellectual property rights, and form a comprehensive government policy to support the smartization of economic activity.

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Author
Liudmyla Tsymbal, 29.10.1979
Ukraine

Current position: Dr.of science (Economics), Professor, department of international economic, Kyiv National Economic University named Vadym Hetman, Kyiv, Ukraine

University studies: Phereyaslav-Khmelnyskiy government pedagogical University

Scientific interest: economics of education, globalization, intellectual leadership

Publications: more 90 works

Experience: 20 years teaching and scientific activity

Natsvlshvili Tymur, 15.12.1997
Ukraine



Current position: Postgraduate (International economic relations), department of international economic, Kyiv National Economic University named Vadym Hetman, Kyiv, Ukraine

University studies: Kyiv National Economic University named Vadym Hetman

Scientific interest: economics of education, globalization, intellectual leadership

Publications: more 10 works

Experience: 6 years of scientific activity

**APPLICATION OF COMPUTER TECHNOLOGIES
IN THE MANAGEMENT OF LARGE BUSINESS
AND PRODUCTION**

Tupota Valentyn, PhD Vladyslav Khotunov, Zhytnich Kirill*¹

¹*Cherkasy State Business-College, Ukraine*

**Corresponding author's e-mail: gm.tupota.valik@gmail.com,
vkhotunov@gmail.com*

Annotation

Today, computer technology occupies an important place in the life of modern society. They have become part of a large number of products and services, allow the exchange of information over long distances, are widely used in business, while changing the process of production, promotion and sale of various tangible and intangible benefits, more rational use of production resources, allowing them to be done in different countries and improve and automate the process of managing it as a whole, making it more profitable. This paper reveals the current state of the use of computer technology in large business and production, and also proposes a system for improving the work and increasing the efficiency of an enterprise through the use of computer technology.

Key words: computer technologies, production automation, electronic business, technologies in business

Introduction

More complex software solutions and technologies require equally advanced devices and infrastructures. So it only makes sense that we can expect organizations to roll out more digital transformation initiatives in the near future. This means higher IT budgets, higher demand for technical talent, and more investment in new hardware and software.

According to Spiceworks Ziff Davis, the top three drivers for budget increases are the need to replace aging infrastructure (56%), higher priority for IT projects (45%), and increased security requirements (39%). [1]



Figure 1. Share of the production budget that is allocated to the development and application of computer technology

Also, according to research by Spiceworks Ziff Davis, 11% of the company's managed services budget comes from hosting. The same percentage for backups and 10% for hardware support and maintenance.

With more employees working from home than ever before, many full-time, millions of corporate devices will continue to operate outside the relatively secure boundaries of corporate networks.

This massive transition to remote work has raised new concerns in companies of all sizes, with endpoint security being the top concern for remote security, followed by vulnerability management and security incident response. As a result, demand for new security solutions is expected to increase over the next two years, and enterprises are significantly more likely to adopt these technologies than SMBs. [2]

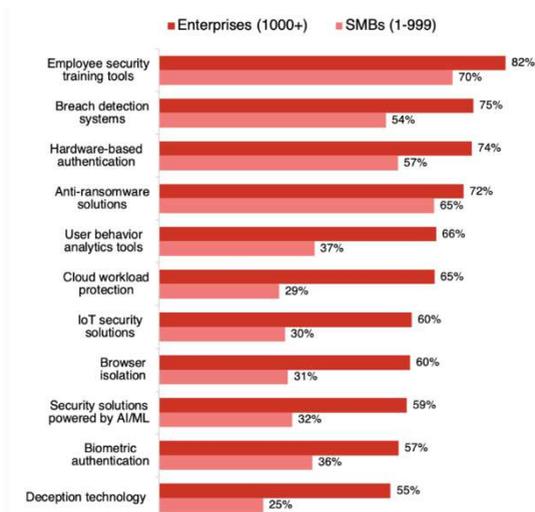


Figure 2. The use of computer technology for enterprise security

From the foregoing, it becomes clear that computer technologies are used in almost all areas of business and make its work more efficient and safer.

Review

This paper proposes a study and solution on these points:

- The current state of the use of information technology in business
- Using computer technology to automate and improve production efficiency
- Ways to improve business processes and production processes through the implementation of information technology

Solution

The idea of the project is to implement the following tasks in business and production: implementation of CRM systems

use of software for optimizing business processes, personnel management, customer interaction, communications with elements of the business chain; introduction of software and hardware systems for the automation of production and work; the use of smart office and smart production systems and other tools that this work covers in more detail.

Conclusion

Modern business, and especially production, operate in a highly competitive environment, and also depends on the influence of external and

internal factors, such as the economy, progress, global circumstances in the world, the qualifications and training of employees, and the quality of work with partners.

In order for an enterprise to fully operate, develop and make a profit, it must keep pace with progress, and in particular, use computer technologies in internal and external processes that optimize work and make it more efficient at all levels.

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ANALYSIS OF THE COMPETITIVENESS OF THE “TANTANA HOTEL”

Sarvinoz Tursunova, * Julija Mironova

ISMA Fergana Branch Latvia University of Applied Science, Fergana

**Corresponding author`s e-mail: sarvinoztursunova4@gmail.com*

Abstract

Currently, the hospitality industry plays an important role in the social part of life. This helps to meet the basic needs of travelers in terms of accommodation and food. Hospitality industry enterprises operating in the Uzbekistan city of Fergana under the name "Tantana" hotel in emerging markets Due to the weak competitive position, the hotel is losing its guests. The influence of market forces is growing and businesses must begin to improve competitiveness and customer satisfaction in order to ensure the well-being of companies, employees and owners. After all, international interest in the direction of tourism in Uzbekistan is growing, and investments, cooperation and gastro-tourism are also possible. The country's economy is going to another level, increasing demand from domestic business trips, tourism and recreation.

Keywords: Fergana, tourism, development, competitiveness

Introduction

The hotel industry today is leading for many countries. The industry employs over 250 million jobs. Billions of square feet of space and tips remain

a new kind of "consumer pro" that highlights the originality of the concept. The growth of the industry is huge. And the forecasts are very positive – according to all studies, the industry will continue to grow. This is due to the increase in people's incomes, the increase in the supply of cheap air tickets, the mobility of the modern world and the increased attention to entertainment in our society.

Tourism in Uzbekistan today is a wide range of tourism products for the most demanding taste: historical and cultural tourism, ethno-tourism, eco-tourism, health tourism and the MICE industry.

The number of tourists who visited the country in 2017 exceeded 2 million 520 thousand and increased by 24.3% compared to 2016, and the export of tourism services increased to 770 million US dollars. In 2018, the number of tourists doubled compared to 2017, reaching 5.3 million, thanks to benefits, reforms, innovations and government support. The number of domestic tourists was 14 million.

In 2018, the export of tourism services for 8 months amounted to 666.9 million US dollars, which is twice as much compared to the same period in 2017 (327.3 million US dollars). However, on January 5, 2019, the Government approved the Tourism Development Concept for 2019-2025 in accordance with UP-4861 dated December 2, 2016, the purpose of which is to turn tourism into a strategic sector of the economy. According to him, by 2025 it is planned to increase the share of tourism in GDP to 5%.

In 2018, 142 new accommodation facilities were put into operation, with a total of 1745 rooms, 4121 beds, covering 914 accommodation facilities. By 2022, the government plans to have a 50,000-room facility across the country. The construction of 1,500 rooms in Tashkent, 1,600 rooms in Samarkand, 1,400 rooms in Bukhara, 350 rooms in Khiva and 350 rooms in the Tashkent region has been approved. It should be noted that it is planned to build more than 20 hotel projects of 4* and 5* categories in Samarkand.

In Uzbekistan, most sales are made through partnerships with tour operators, which mean that hotels are dependent on this sales channel. Other sales channels are corporate, personal meetings and online. In most regions, the share of direct sales prevails over online sales, which means that although the 21st century is the era of digital technologies and the Internet, Uzbek businesses underestimate this source of profitable sales.

The concept of competitiveness is associated with the definition of the essence and the role of competition, which are caused by a number of key problems of economic activity. The ability of an enterprise to compete in a particular market directly depends on competitiveness goods, a combination

of socio-economic and organizational factors, as well as methods of enterprise activity that affect the results of competition.

It should be noted that those working in the hospitality industry are characterized by a high degree of competition, dependence on seasonality, natural, general political and other external factors. Development conditions the hotel services market, the complexity of working on it is dictated by the peculiarities of the functioning of hotel enterprises. The economic essence of hotel activities is intangible. Hotel enterprises offer the market their commercial product in a type of service in which the consumer is also involved.

In this research work, the hotel "Tantana" is considered – one of the new hotels in the city of Fergana, which is only 2 years old since the hotel is losing its guests due to a weak competitive position and the purpose of the study to study the competitiveness of the enterprise and develop proposals for its development. An analysis of the theoretical aspects of competitiveness, an analysis of the entrepreneurial activity of the hotel and an analysis of the competitiveness of the hotel will be carried out. Research methods chronological, historical and geographical analysis, marketing analysis, analysis of special literature, statistical material. Based on a hypothesis; if the proposals to improve competitiveness are implemented, it will lead to more customers and higher profits.

The main direction of increasing the competitiveness of the hotel "Tantana" is to improve the efficiency of the hotel's operational activities by improving services and providing new additional services. Also adding high-tech services, providing high quality service by motivating employees and getting stars. An important role is played by the proposal for the active development of social networks and marketing communications.

Conclusions

Summing up the results of increasing competitiveness in the hotel business, it is worth noting that every entrepreneurial activity strives to increase income from year to year. With the help of the available methods and strategies, by the same token helping to grow your business, city and, finally, the country.

There are many shortcomings that led to the loss of guests, but "Tantana" enterprise is a business that can properly apply the development proposal and succeed with its competitors to achieve this, there is much strength.

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Authors



Sarvinoz Tursunova, Fergana, Uzbekistan

Current position, grades: BBA student at ISMA Fergana Branch Latvia University of Applied Science

University studies: Business Administration in Tourism

Scientific interest: tourism

Publications (number or main): 3



Jūlija Mironova, Riga, Latvia

Current position, grades: mg., lecturer of “Business Administration in Tourism” Professional Bachelor’s study program

University studies: Economics, tourism, motivation

Scientific interest: Burnout, organisational culture, Economics, tourism, motivation,

Publications (number or main): over 5

**GLOBAL TRENDS IN THE DEVELOPMENT
OF THE AGRICULTURAL MARKET AND PROBLEMS
OF ITS DEVELOPMENT IN UKRAINE**

Diana Ustymenko^{1*}Tatyana Odinkova²Nataliya Kuznetsova³

^{1,2}ISMA University of Applied Sciences, Latvia

³Cherkasy State Business College

**Corresponding author's e-mail: dustymenko@gmail.com*



Abstract

Agriculture is one of the main sectors of the economy that ensures food security throughout the world. In addition, constant climate change and the dynamic growth of the Earth's population becomes a great pretext for stable monitoring of the dynamics of the development of agricultural activities. In this paper, global trends in the agricultural market are analyzed, as well as the production of agricultural products in the EU is considered in more detail. Ukraine is considered as a strategic exporter of grain products, which is why the paper considers in detail the problems of the development of the agricultural market in Ukraine and throughout the world as a whole.

Keywords: factors of competitiveness, agricultural enterprise, global agricultural market, Europe, Ukraine..

Introduction

Agriculture is a very important sector of the economy, which is not only of socio-economic importance for the development of national economies, but also of global importance in terms of ensuring food security throughout the world.

Overview

The global agricultural market demonstrates its dynamic development: in 2022 it grew from \$12,245.63 billion to \$13,398.79 billion in 2023 at a compound annual growth rate (CAGR) of 9.4%. The largest region in the global market in 2022 was Asia-Pacific, followed by North America.

An important factor in the development of the world agricultural market is the volume of consumption, which is determined by the population. By 2050, the world population is expected to reach 10 billion people, which will provide an increase in demand for food. According to the “Agricultural Outlook” published by the Organization for Economic Co-operation and Development (OECD) and FAO (Food and Agriculture Organization), the predicted growth rate of world cereal production by 2027 will be 13% [1]. Accordingly, to meet the needs of a growing population, it will be necessary to increase crop production, agricultural activities and trade volumes. Therefore, the issue of food supply for the population will be very acute for the world community and will be the key to solving the food problem.

A global problem affecting the development of the agricultural market in the world, incl. in Europe is also climate change, which will have a negative impact on agricultural productivity in many regions of Europe. According to research by the Copernicus Climate Change Monitoring Service (C3S), 2019 was the fifth in a series of abnormally warm years, the second warmest in the world on record and the warmest in Europe. According to the report on the state of climate in Europe in 2018, over the past forty years there has been a clear upward trend in air temperature, both monthly and annual [2]. This, in turn, will have a negative impact on crop yields and livestock productivity.

Europe, which accounts for one-eighth of the world's grain production, two-thirds of the world's wine production and three-quarters of the world's olive oil, is already facing an acute problem of adapting to climate change in all parts of the agro-industrial complex, which requires the development of programs for adapting Europe's agriculture to weather conditions. and climatic anomalies. Also global is the problem of the decline in the number of people working in the EU agricultural sector: between 2006 and 2021, the average rate of decline in the agricultural labor force used in the EU as a whole was 2.9% per year. The downward trend continued in 2021, albeit at a slower pace (-1.0%).

But in general, the EU agricultural market shows positive development trends. Between 2006 and 2021, there was a trend towards an increase in EU agricultural production by 14.1%. According to Eurostat, the contribution of agriculture to GDP in the EU in 2021 was 1.3%, which is equal to the share of agriculture in GDP in 2006. The largest part, namely: 55.3% of the total production of the EU agricultural industry in 2021, fell on the production (cultivation) of the most popular crops (cereals and niche crops). Livestock occupies 36.3% of the total production. Agricultural services account for only 8.4%. More details can be seen in Figure 1.

Ukraine is an important strategic exporter of grain products in the world, providing 50% of sunflower oil on the world market, up to 12% of wheat and

up to 17% of corn. Agricultural production in the country is one of the most important sectors of the national economy, because the country is generally considered agrarian. In particular, the agricultural sector provides an average of 10% of GDP, as well as 40% of export earnings. It should be noted that crop production remains the most popular in agriculture, the share of which in 2021 amounted to 81.4%. Over the year, crop production increased by 23%. Some reduction is observed in animal husbandry, where production volumes decreased by 5%, and the share of this sector was 18.6% [3].

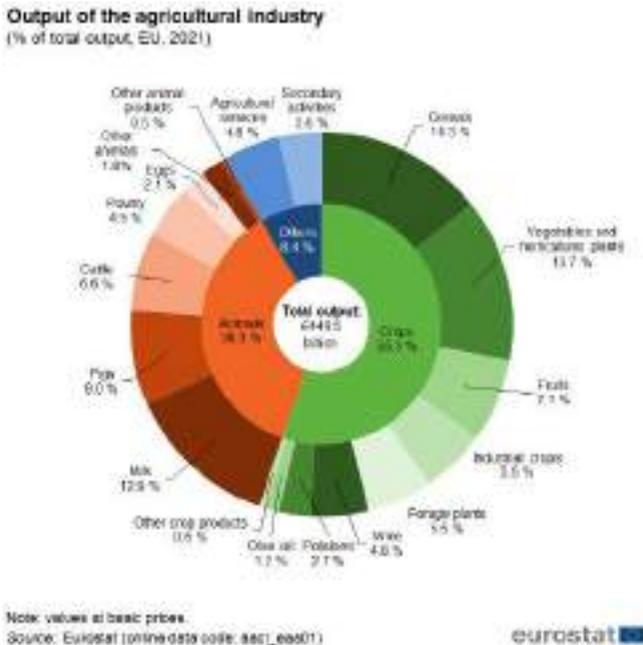


Figure 1. Production of the agricultural sector (% of total production, EU, 2021) [4]

It should be noted that quite a lot of factors significantly affect the volume of production. Agriculture is considered a specific industry. Specific features include: seasonality of work, changes in production volumes due to unpredictable weather conditions, natural disasters, pests, as well as a large

number of commodity producers, etc. These external factors are very difficult to regulate and manage.

The factors that are considered manageable include: the use of natural resources, the amount of agricultural land, the level of logistics, financial potential, effective business activities, strategy and marketing policy.

Over the past few years, the COVID-19 pandemic has had a global impact on the development of the agricultural market in the world, which provoked a deterioration in food security around the world, including the Europe and Central Asia region, although agricultural production was relatively unaffected, and the supply of basic food products to world markets, reported to have generally been adequate or stable.

Today, the key factor influencing the development of the agricultural market is the war in Ukraine, which is destroying food supply chains around the world and driving prices skyrocketing, because Ukraine provides more than half of the world's sunflower oil trade and is a leader in wheat and corn. Now, the impossibility of delivering the usual volumes of products will become a serious challenge for the world. Therefore, the UN already fears a “hurricane of hunger” and a “collapse of the global food system” [5].

In addition, the consequences of the war are very detrimental to the development of agriculture in Ukraine itself. The deliberate blocking by Russia of the Ukrainian ports of the Black and Azov Seas makes it impossible to ship all categories of goods, in particular, to export last year's grain, which contributes to huge losses for the Ukrainian economy and entails high risks for all world trade. Moreover, the prolongation of the war increases the risks of a new crop that Ukrainian farmers should harvest this year. The year 2023 will be very difficult for Ukrainian agriculture, because Ukrainian crops will be affected by difficulties with the harvesting campaign in the front-line regions, in particular, due to the physical destruction of crops, equipment and elevators. The yield of most crops will be reduced due to a shift in the timing of application or an insufficient amount of fertilizers and plant protection products.

The war factor has led to economic sanctions on several countries, soaring commodity prices and disruptions in the supply chain, causing inflation in goods and services and affecting many markets around the world. The agricultural market is expected to grow to \$19,007.8 billion by 2027 at a CAGR of 9.1%.

Conclusion

Therefore, we can say that agricultural production is an important and at the same time specific industry, the level of development of which depends on the food security of countries in the world. Ukraine, as an agrarian country

that has an enormous potential for the development of this industry, but at the same time suffers from heavy losses due to the war unleashed by Russia, alone will not be able to restore the development of its main industry – agriculture. Therefore, the country needs the support of world leaders and partner countries from the EU.

An important role in ensuring the competitiveness of agricultural enterprises in the country is played by the regulation of pricing policy in the market, the investment policy of the state for financial support of the industry, the provision of various grants for agricultural producers, simplified taxation for agricultural enterprises, the involvement of partner countries to maintain and restore agriculture in Ukraine, the consolidation of the world community in the formation of a new policy of security and sustainable development in order to avoid a food crisis in the world.

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ROI – FORMULA OR TECHNOLOGY?

Roman Ustynov

Latvia, ISMA

e-pass romaust1997@gmail.com

Abstract

This study is aimed at timely prevention of inconsistencies that exist in the preparation of business information. The omission of such inconsistencies leads to the adoption of hasty unreliable decisions. Thus, there is a violation of the interaction between the individual services of the enterprise, which is manifested in the negative spread of the efficiency effect.

Keywords: information, spread, instructions, key fields, control, effectiveness

Introduction

The basis of this effect is a contradiction caused by the presence of many methods for calculating the integral indicator ROI. At the same time, the wording of the highlighted problem is expressed as follows: "It is impossible to ensure the effective use of ROI technology without developing special instructions for its use in practice". To obtain a reliable assessment of the effective application of ROI, a methodology is needed that allows one to recognize and generalize private opinions and proposals at the level of a single technology.

Main Part

The purpose of the study is aimed at developing programs to control technology targets. In accordance with the goal, the following tasks were set:

- 1) To reveal the content of the key fields of technology.
- 2) Develop an algorithm for calculating the control indicator of each field.
- 3) Reveal the complexities and inconsistencies found during the calculation.
- 4) Suggest your own ROI design approach.

Complementing the ROI technology allows you to develop an organizationally separate set of tools, on the basis of which the activities of the enterprise, which operates throughout its life cycle, are monitored. Such a complex allows in the dynamics to take into account the changes occurring in the formation of capitalized profits, the analysis of which made it possible to single out the object of study. It's about managing the change in the reproduction fund.

Results

The main result of the study is the use of complex control of twenty parameters, including the determination of their measurement ranges. The

considered method required significant improvements related to the implementation of agreed functions at the level of individual departments. The practical value of the study lies in the development of recommendations to restore the inconsistency that caused the effect of effectiveness. The novelty of the study lies in finding an opportunity to ensure the consistency of all elements of the system. In other words, not only the key fields are controlled, but also the basis for the design of a modified technological control tool is created.

IMPORTANCE OF MOTIVATION SYSTEM

Mukhammadayub Uzakjanov

ISMA University of Applied Sciences, Latvia

Author's email: ayubhonuzakov@gmail.com

Abstract

Currently, no one doubts that an important resource of any company is its employees. However, not everyone understands how difficult it is to manage this resource. Any success of the company depends on the effective efficient work of employees. The challenge for managers is to make the most of the staff's capabilities. No matter how strong the decisions of the leaders were, then they were successfully implemented in reality by the company's employees. And this can only happen if workers work in the results of their labor. With the right motivation, labor productivity increases, accordingly, employees earn more money for the organization, the company does not spend money on personnel search and selection, and employee costs become a profitable investment.

Keywords: increase productivity, motivational tools, better performance

Introduction

Management, or enterprise management, is the process of planning, organizing, motivating, and controlling necessary in order to formulate and achieve the goal of an organization through influencing other people. Motivation is one of the main functions of any manager's activity, and it is with its help that the impact on the personnel of the enterprise is exerted. Motivation is necessary for the productive implementation of the decisions made and the planned work. The influence of motivation on human behavior depends on many factors, is largely individual, and can change under the influence of feedback from human activities.

A significant factor is that the motivational process is variable, and its nature depends on what needs to initiate it. For all that, the needs themselves are in a complex dynamic interaction with each other, often contradicting each other or, on the contrary, strengthening the actions of individual needs (Li, 2023).

Content theories of motivation analyze the factors that influence motivation. They describe the structure of needs, their content, and how these needs are related to human motivation. The most widely known theories of motivation for this group are Maslow's

pyramid, McClelland's theory of acquired needs, Alderfer's ERG theory, and Herzberg's theory of factors.

In accordance with Maslow's theory of the hierarchy of needs, people constantly experience various needs, which can be combined into groups that are in a hierarchical relationship with each other. Maslow presented these groups of needs in the form of a pyramid.



Fig. 1. Maslow's Hierarchy of Needs (Cherry, 2022)

Socio-psychological incentives follow from the special role that communication plays in human life. After all, it is communication that is an indigenous need and a condition for a person's normal life. In this regard, a comfortable climate in the team, which ensures normal communication, makes it possible for a person to self-actualize, it appears as an excellent stimulus to a feeling of employee satisfaction in work (Oriana Bandiera, 2009).

The transfer of some low-level management functions to subordinates has a double effect - the concentration of the manager's efforts on solving higher-level problems and, at the same time, has a positive effect on the motivation of employees (provided that they are trained and correctly understand all the features of work, including, where to get the necessary information and at what point to make a decision).

Overview:

This research paper gives an analysis of the existing motivation system.

Proposals:

1. Salary characterizing the assessment of the contribution to the results of the company. The salary of an employee should be determined depending on the level of his qualifications, personal abilities, and achievements in work and include various additional payments and bonuses.

2. Intangible benefits and privileges for staff: granting the right to a sliding, flexible work schedule; provision of time off, increase in the duration of paid leave for certain achievements and successes in work, length of service.

3. Measures that increase the content of work, the independence and responsibility of the employee, stimulating his qualification growth. Involving employees in the management of the institution also increases their motivation. The comprehensive

development of horizontal connections and horizontal management structures is the organizational basis for motivating employees.

4. Creation of a favorable social atmosphere, elimination of status, administrative, and technological barriers between individual groups of employees, between ordinary employees and employees of the management apparatus, and development of trust and mutual understanding within the team. Moral encouragement of employees.

5. Promotion of employees, career planning, and professional development activities.

Conclusion

The labor incentive system plays a fundamentally important role in the functioning and development of the enterprise. Stimulation is the main function associated with the process of activating the activity of people and teams through the use of incentives, levers, and ways of forming interests and motives of activity. Stimulation of labor is a powerful control lever. It actively influences the consciousness of people, and the state of social relations of the collective. Stimulation is the deliberate creation of certain situations in the workplace.

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CREATION OR IMPROVEMENT OF RF JAMMER INTERFERENCE BY HARDWARE INTERVENTION

Vakulenko Andrii, PhD Vladyslav Khotunov

¹Cherkasy State Business-College, Ukraine

**Corresponding author's e-mail: vakulenkoa73@gmail.com,*

vkhotunov@gmail.com



Abstract

Nowadays, it is very important to have verified information. Using the example of the war in Ukraine, anyone who has information about the location

of an object can pose a threat to the safety of life. Therefore, the question arises how to prevent the transfer of such information. By generating or not jamming radio signals, you can spread or prevent the spread of: Misinformation Potentially harmful information such as coordinates and locations of people or critical infrastructure. This can be avoided by jamming radio signals. My task is to improve the existing radio jumper or create my own, which could solve this problem.

Keywords: *jamming radio signals*, improve an existing radio jumper, create my own

Introduction

A radio jamming system is electronic equipment designed to block radio signals that are transmitted at a certain frequency. Jamming can be used for various purposes, such as: protection from criminals, prevention of terrorist acts, interference with the actions of hostile military units, prevention of espionage, and others.

The radio signal jamming system works on the basis of the principle of interference with electromagnetic radiation. For this, generators are used that create high-frequency signals at the same frequencies that are subject to blocking. The generated signal is transmitted to the same channel as the one being blocked and prevents the receiver from receiving the signal.

It is important to note that the use of radio jamming systems may be illegal. In some countries, the use of such systems may be restricted by law, so local laws should be read in detail before use.

On the one hand, radio jamming systems can be used to protect against unauthorized access to the radio frequency spectrum. For example, military and law enforcement agencies may use radio jamming systems to protect against radio-controlled weapons or to block radio signals in a war zone where they could become a source of danger. On the other hand, radio jamming systems can be used as a tool for cyber attacks on information systems.

For example, criminals can use radio jamming systems to block signals from GPS or mobile phones to steal sensitive information or commit criminal acts. In general, radio jamming systems have great potential for future development and can be used in various areas where it is important to ensure the security and privacy of data. However, it is worth taking into account the possible negative consequences of using radio jamming systems and ensuring their correct use in accordance with legislation.

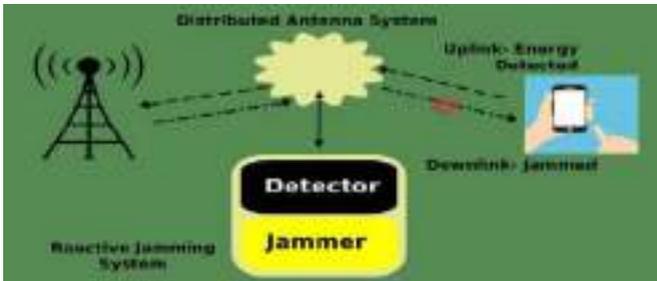


Figure 1. of the principle of operation of a radio jamming

Overview

This work discusses and offers solutions to the following points:

In order to develop radio interference, it is necessary to understand the principles of operation of radio receivers, the possibilities of radio interference, the dangers and benefits of using radio interference

Decision

The idea is to create an affordable and powerful enough radio jamming device that can then be mass-produced if investors are found to fund the project. Unlike other radio interference, it must have sufficient power, mobility and energy efficiency.

Conclusion

In conclusion, I told you how to create radio jammers, their advantages and disadvantages. With the help of such a device, the military will be able not only to prevent the dissemination of information, but also to block and disable the operation of enemy systems, for example, such as drones, and to interfere with radio-electronic intelligence



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DEVELOPMENT AND IMPLEMENTATION OF UA ANTI SPAM BOT TO COMBAT SPAM ON UKRAINIAN-LANGUAGE RESOURCES

Dmytro Vakulenko, PhD Vladyslav Khotunov, Serhii Mykhailuta*¹

¹*Cherkasy State Business-College, Ukraine*

**Corresponding author's e-mail: drsmile444@gmail.com,
vkhotunov@gmail.com*



Abstract

UA Anti Spam Bot is a program designed to combat spam on Ukrainian-language websites. This program was created using machine learning and natural language algorithms, which allow it to effectively detect and block unwanted messages on the site.

The development of UA Anti Spam Bot involved creating a machine learning model that was trained to recognize spam messages based on their content and other characteristics. To do this, a dataset from various Ukrainian-language websites was used, which allowed the creation of a neural model capable of classifying user messages.

The article describes the problem of spam and explains why traditional methods of combating spam are not effective on Ukrainian-language resources. It also describes the methodology of developing UA Anti Spam Bot, including determining its

functionality, choosing technologies, and implementing algorithms for detecting and blocking spam based on a large number of factors.

Keywords: neural network, machine learning, artificial intelligence, computer vision, unmanned aerial vehicles, web application, information technology.

Introduction

In the modern world, where the internet plays a significant role in people's lives, the amount of spam received via email and social media continues to increase. Spam not only causes inconvenience for users, but it can also pose a serious threat to the security of personal data and information. Therefore, combating spam becomes an increasingly urgent problem.

The objective of this work is to develop and implement UA Anti Spam Bot – a system that will allow fighting spam on Ukrainian-language resources. This system uses machine learning and natural language analysis methods to automatically identify and filter spam messages in the Ukrainian language.

In this introduction, we will discuss the main problems that arise when combating spam and the peculiarities associated with Ukrainian-language resources. We will also describe the main approaches and methods used to combat spam using artificial intelligence and machine learning.

Overview

The problem of spam on the Internet is extremely relevant and important. Internet users constantly receive unwanted advertisements, phishing messages, and other unnecessary notifications. That is why creating an effective system to combat spam is becoming an increasingly important task.

This article describes the development and implementation of the UA Anti Spam Bot – a program designed to combat spam on Ukrainian-language resources. The main goal of the program is to detect and block spammers who spread spam messages.

Many websites, forums, and social media platforms are facing the problem of automated spam distribution, which negatively affects users and their interaction with resources.

The UA Anti Spam Bot is a software tool that has been developed to combat spam on Ukrainian-language resources in the Telegram network. It uses neural networks to analyze message texts and detect spam characteristics. Through training on a large number of examples, UA Anti Spam Bot is capable of distinguishing spam from legitimate messages with high accuracy.

The main advantage of UA Anti Spam Bot is its high effectiveness and speed. With this tool, administrators of Ukrainian-language resources can significantly reduce the amount of spam that enters their groups and channels.

UA Anti Spam Bot can be implemented in any Telegram channel or group that works with the Ukrainian language. This allows users to protect themselves from unwanted spam and maintain the reputation of their resources.

Decision

To combat spam on Ukrainian-language resources, the UA Anti Spam Bot has been developed and implemented, which has the following functional capabilities:

Checking text content for spam using machine learning algorithms based on a set of example spam texts.

Checking the presence of spam URLs in the text by verifying the content of unwanted domains.

Checking if cards, users, channels, and groups are in the local database of scammers and automatically updating it.

The results of using UA Anti Spam Bot have shown significant effectiveness in combating spam on Ukrainian-language resources, reducing the time and effort spent on moderating incoming data, and improving the user experience.

Conclusion

This article addresses the problem of spam on Ukrainian-language resources and presents the development and implementation of UA Anti Spam Bot to combat this issue. To develop the bot, the JavaScript programming language on the Node.js engine was used, as well as libraries for text processing, network communication using the HTTP protocol, working with Redis databases, and using neural networks based on TensorFlowJs. The neural network was trained using the Python programming language and the tensorflow-lite library.

As a result of testing, it was shown that UA Anti Spam Bot effectively distinguishes spam from real messages on Ukrainian-language resources. This bot can be used in various contexts, such as social media, forums, blogs, news channels, and other web chat directions.

Therefore, UA Anti Spam Bot is a powerful tool to combat spam on Ukrainian-language resources and helps maintain their cleanliness and safety. This bot can be further developed to ensure the security and quality of web content for users.

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PROBLEMS OF SEARCH AND IDENTIFICATION SYSTEMS USING MODERN NEURAL NETWORKS

Olha Vakulenko, PhD Vladyslav Khotunov, Zakharova Mariia^{*1}

¹*Cherkasy State Business-College, Ukraine*

**Corresponding author's e-mail: vakulenkooya@gmail.com,
vkhotunov@gmail.com*



Abstract

These scientific theses focus on the problems related to existing systems of object search and identification, as well as the possibilities of using modern neural networks to solve them. The work provides an analysis of existing systems, highlighting their advantages and disadvantages. In particular, attention is paid to problems related to the accuracy and speed of search, as well as the ability to identify objects in different conditions. The theses also describe the possibilities of using neural networks to improve the aforementioned processes. It is noted that modern neural networks can provide high accuracy and speed of object recognition, as well as the ability to work in different conditions. The total volume of the theses is 2 pages.

Keywords: neural network, machine learning, artificial intelligence, computer vision, unmanned aerial vehicles, web application, information technology.

Introduction

Using modern machine learning technologies, including neural networks, it is possible to solve various data processing and analysis tasks. One of such tasks is object detection and identification on images. There are various systems that implement this functionality, but they have certain problems that make their application more difficult.

Object detection and identification systems are important components of many artificial intelligence web applications, such as computer vision, robotics, unmanned aerial vehicles, surveillance systems, and others. However, existing systems do not always provide accurate and fast results.

One of the main problems is the problem of training models on uneven data sets. Some categories of objects may be represented less frequently in the data set than others, which can lead to poor performance of the model when recognizing these objects.

Another problem is the ability of the system to identify objects that do not belong to the categories on which it was trained. For example, a system trained to recognize unmanned aerial vehicles may have difficulty identifying airplanes or other flying

objects because they have differences in various parameters on which the system was trained.

In addition, there are problems with processing images that contain noise or contamination, which can lead to inaccurate results. Also, the large volumes of data required for object analysis can cause problems with data processing speed and storage.

All these problems need to be taken into account when developing such systems.

Overview

Object search and identification systems have become increasingly popular and important in various fields, from the automotive industry to medicine and space science, as well as in the military sector. These systems are capable of automatically recognizing and classifying objects based on input data such as images, videos, or audio. However, despite the widespread use of object search and identification systems, there are issues related to their accuracy and reliability.

In this study, research was conducted to identify the main problems and propose solutions to ensure effective and accurate operation of these systems:

- The lack of or insufficient quality data for training and efficient operation of neural networks, which can result in poor performance of such systems.

- System instability to contextual changes, meaning that the system may be built on a specific set of data and parameters, and when the context changes or new data is added, the system may lose its effectiveness. For example, dependency on lighting and external factors such as changing weather conditions.

- Object search and identification systems may be vulnerable to adversarial attacks, which can alter the results of object identification. [3]

Decision

There are several ways to address problems when designing object search and identification systems. Here are a few:

- One solution may be to use deep learning and increase the amount of training data. This can be done by increasing the number of images used to train the model or by adding data from other sources [1].

- Fast (almost real-time) processing can be achieved through the use of onboard specialized devices or streaming data to remote computers.

- The use of data preprocessing technologies can improve the quality of images used for training. This can be done by additionally using neural network algorithms developed to improve data visualization, i.e., those developed for RGB images, but they can be modified appropriately to fully utilize spectral information obtained from multispectral and hyperspectral sensors [2].

- To improve object identification, physical data of objects can also be added, not just visual information.

- The use of more complex architectures and multiple independent neural networks. Neural networks with more layers and neurons may be more accurate in identifying objects.

- The use of more powerful computing systems. This will allow training more complex neural network models with larger data volumes.

- The use of 5G connectivity will help expand the architecture typologies in the near future. Further peripheral computing and IoT solutions will allow real-time computing to be performed at the data source or nearby.

Conclusion

Thanks to the technological advancements in recent years, computer vision models can match or even surpass human capabilities in image classification and object detection tasks in just fractions of a second. Despite significant progress in the development of neural networks, such systems still face certain challenges such as insufficient accuracy, lack of sufficient training data, problems with recognition speed and processing large amounts of data, and dependency on the quality of input data.

The result of research and practical implementation will be the development of an artificial intelligence system that can identify any object that we teach it to identify, whether it is animals, humans, or aircraft. This is cheaper, safer, and more accurate than traditional methods of analyzing images obtained from surveillance cameras using human labor. Accordingly, research in this area is relevant and can have significant implications for the further development of object search and identification systems and their use, for example, in defense.

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GOAL-SETTING METHODOLOGY

**Bhumika Umesh Vavaliy, Gannesh Reddyn Santhosh Ragam,
Afreen Sheikh**

Latvia, ISMA

*e-pass: bhumisorathiya481@gmail.com, ganeshchimmula81@gmail.com,
ragamsanthosh090@gmail.com, afreenshaik24473@gmail.com*

Abstract

The ranges of changes in the key parameters that affect the final value of the integral index ROI are not consistent with each other. Is required to establish norms of

change in the key attributes used in all phases of the assessment of the state of the organization.

Keywords: business information, collecting, processing, analysis, diagnostics, mechanisms, ranges

Introduction

Develop a methodology for the formation of a system of norms of key attributes of the indicator ROI. It gives confidence, greater direction and levels of motivation and it helps trigger new behaviors, helps guides your focus and helps you sustain that momentum in life [1-3].

Main Part

The practice contradiction of a ROI analysis is very prudent. The ranges of changes in the key parameters that affect the final value of the integral index ROI are not consistent with each other. However, what the ROI acronym implies in the absence of the right procurement strategy, does not equal an investment, by definition [4-5].

The problem with any goal-setting methodology is that the company's culture isn't ready for it. It is required to establish norms of change in the key attributes used in all phases of the assessment of the state of the organization.

Purpose of the study: Develop a methodology for the formation of a system of norms of key attributes of the indicator ROI. [.

Tasks of the study:

- 1) Reveal the content of the key attributes of the ROI indicator.
- 2) Develop a norm setting approach for each key attribute.
- 3) Establish norms at the level of phases of assessment of the state of the organization.
- 4) Suggest an ROI design approach.

Practical results

A diagnosis of the state of the organisation as part of the target indicator system was carried out. This required setting standards for key business fields. Conducted a diagnosis of the organization's situation within the framework of the target indicator system. This required setting standards for key business areas. A diagnosis of the state of the organization as part of the target indicator system was carried out. This required setting standards for key business fields.

Novelty of approach:

The existence of the system makes it possible to check the consistency of conditions in the event of changes in the company's activities.

- Clarity: Goals must be clear and specific.
- Challenge: Goals should be sufficiently challenging to keep employees engaged and focused while performing the tasks needed to reach each goal.
- Commitment: Employees need to understand and support the goal they are being assigned from the beginning.
- Feedback: Feedback is an important component of the goal-setting theory.

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FACE MASK OBJECT DETECTION BY USING YOLO NEURAL NETWORK

Bharath Kumar Venukanti

ISMA University of Applied Sciences, Latvia

**Corresponding author's e-mail: Bharathvenukati@gmail.com*

Abstract

The usage of facial recognition technology in the context of security and several other law enforcement applications is gaining popularity. Since the beginning of the COVID-19 outbreak, a significant number of people in every region of the globe has required to wear face masks. In this thesis, an artificial neural network system that can be taught to recognize people's facial characteristics is detailed. This system works even when individuals have half of their faces enclosed with face masks. The goal of the face mask detection is to identify anyone who is wearing a black mask and colour mask. In this project, the YOLOv5 neural network will be developed for the recognition of face masks. The algorithm appears to be working well based on the early results. It will be determined how well the final performance performs in terms of accuracy and recall.

Keywords: Face Mask Object Detection, mask wearing person, covid19

Introduction

The COVID-19 wreaked havoc on humanity last year regardless of age, gender, or geographic location. For a brief period, the virus brought the entire planet to a halt. In addition to causing physical hardship, COVID-19 also contributed to economic crises in many developed and developing countries as well as in many third-world countries. As a result of the epidemic of COVID-19, numerous nations have introduced new

restrictions regarding the usage of face masks as a method of infection prevention. In the years leading up to COVID-19, people developed the habit of wearing masks to protect themselves from the harmful effects of air pollution; this practice has continued into the present day. When others are self-conscious about their appearance, they hide their feelings from the public by covering their faces. In addition, when dealing with patients suffering from respiratory infections, medical professionals often use face masks as part of their droplet prevention measures. The rational use of surgical face masks, when exposed to high-risk areas, would be a reasonable recommendation for those who are particularly vulnerable. Because evidence suggests that COVID-19 can be transmitted before symptoms appear, wearing face masks by everyone in the community, including those who have been infected but are asymptomatic and contagious, may help to reduce the spread of the disease. The rapid spread of COVID-19 led the World Health Organization (WHO) to declare. [1-2]

COVID-19 a worldwide pandemic by 2020 because of the virus's rapid transmission. The surgical mask has some benefits, as follow:

1. To prevent the spread of respiratory viruses from sick people to healthy people, surgical masks are often worn during surgery. [3]

A surgical mask should be always worn by anyone with asthma symptoms when exposed to the elements even if they have only mild symptoms.

2. It is recommended that one wear a surgical mask whenever they travel by public transport or live in overcrowded areas. To ensure proper mask wear and removal, it is critical to practice good hand hygiene both before putting on and after removing the mask. Since many nations have laws forcing people to wear face masks in public areas, masked face identification is vital for face applications such as object detection and surveillance.

Proposed Work

The suggested system follows the following technique, which is comprised of two basic steps: Initially, it is necessary to develop a face-matching model utilizing deep learning techniques. Compiling a collection of faces that comprised those with and without face masks was the most difficult component of this Endeavour.

We designed a computer vision-based face detector using the freshly created dataset, OpenCV, Python, and Tensor Flow, as well as our own custom machine learning framework. Using computer vision and deep learning, it was determined whether or not a person was wearing a face mask. This expedites the spread of computer vision in emerging fields including digital signs, autonomous driving, video recognition, customer service, language translation, and mobile application development.

A proposed model that integrates first and multiple detectors will be put forth in order to enhance the overall recognition performance. Even when the face is partially obscured or when there are numerous faces in the image, this method can aid in the detection of masks. This approach would also enable the detection of masks in photographs with complex backgrounds or when the person wearing the mask is moving. The suggested model will be put to the test using various datasets, evaluated, and compared with other NN techniques like Yolo V4.



Figure 1 Proposed face masks detection system

3. Simulation Result

Fig showing black color mask wearing person data set its own developed dataset.



Figure 2. Black and Color Mask Wearing Person Detection



Figure 3. Black Mask Wearing Person Detection

The trained model is supplied with an image that either contains masks or does not contain any masks at all and contains human faces. Initially, the image was passed via the default face detector module in order to search for human faces. In order to accomplish this, the image or the video frame must first be resized. Next, a face detector model is applied, which outputs only the face of the person who was detected, without the background. The input that will be sent to the model that was trained earlier will be this individual's face. This gives an output indicating whether or not there is a mask. One more model is educated using the facial features of humans. Labels containing the person's name and email address are added to the photographs that are used for the training of the model. These labels are delivered alongside the images itself. This is accomplished with the help of Open CV [4-5].

Pre-trained Model

Results of Training and Examinations In order to get the best accuracy results possible from the pre-trained model used in this thesis, a total of 50 epochs were used. When more epochs are applied, every graph demonstrates that the loss decreases as the accuracy increases

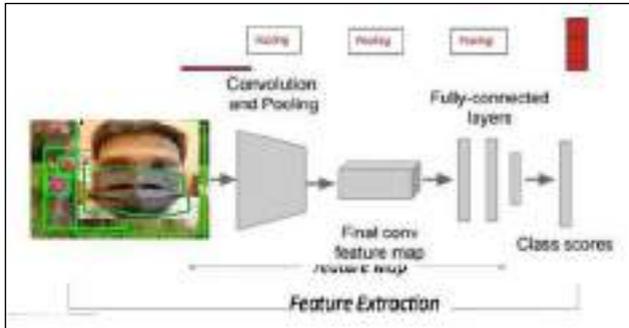


Figure 4. Black Mask Wearing Dataset



Figure 5. black mask wearing person detection from group image

In the this steps, trained and test model for black color mask detection from group image for this model also used yolov5 for the black color mask wearing person detection from group image.

Model Architecture

Fusing layers.

- Model -: 213 layers, 7012822 parameters, 0 gradient, 15.8 GFLOPs
- Black Mask – 998768685
- Image 1/1 /contented/yolov5/1010.jpeg: 640x480 1 mask, done. (0.029s)
- Results saved to runs/detect/exp39

Fusing layers.

- Model -: 213 layers, 7012822 parameters, 0 gradients, 15.8 GFLOPs
- Not a Black Mask
- Image 1/1 /content/yolov5/1005.jpeg: 640x480 1 mask, done. (0.029s)

- Speed: 0.4ms pre-process, 28.7ms deduction, 1.6ms NMS per image on form (1, 3, 640, 640)
- Results saved to runs/detect/exp35

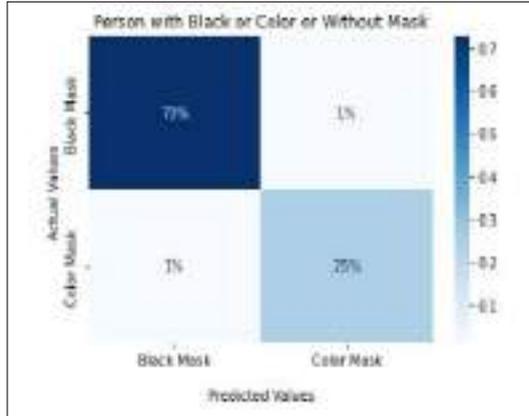


Figure 6. confusion matrix for black mask and color mask

Table 1

Comparison result with existing architecture and proposed architecture

	Architecture	Accuracy (%)
Proposed work	yolov5	99.00
Existing work	Yolov4	93.00

Conclusion

In conclusion, this study is to use the YOLOv5 neural network to create an accurate and effective model for recognizing black facemasks on people's faces in real-time.

The model that is being used will be a huge help to the public health care system. In the future, it could be used to tell if someone is wearing their mask correctly and face mask recognition using NN algorithms will find this paper to be a useful resource

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IMPROVEMENT OF THE MOTIVATION SYSTEM FOR THE COMPANY IN THE HIGHLY REGULATED INDUSTRY

Verdenhofa Olga, Dr. sc. admin., Kozlova Aleksandra*

ISMA University of Applied Sciences, Latvia

**Corresponding author's e-mail: kozlova.aleks@gmail.com*

Abstract

Keywords: motivation system, regulated industry, pharmaceutical company, amotivation, age groups

Introduction

The company's performance in the regulated industries is a challenge since, on the one hand, the company must comply with numerous legal requirements and norms. On the other hand, it is necessary to keep its development pace and remain competitive in the market. One of the significant elements of the competitive edge is the motivation of employees [1]. In contrast, motivated employees are more likely to be committed to the company's goals and be more engaged in their work. Retaining such employees makes the company go beyond the set list of targets, leading to innovation and better performance, which are prerequisites for increased profitability and long-term success. The pharmaceutical industry belongs to one of the most highly regulated industries, disregarding pharmaceutical production or operations within the supply chain [2, 3]. Pharmaceutical supply chain processes, including storage and

distribution, are among the most regulated in the European Union as soon as medicines are critical products that have a direct impact on human health, and ensuring their safety, efficacy, and quality is of utmost importance. The EU has a comprehensive regulatory framework for the pharmaceutical industry. The pharmaceutical supply chain in the EU is subject to strict regulations to ensure medicines' safety, efficacy, and quality. These regulations cover every stage of the supply chain, from raw materials manufacturing to human resource management processes. [4, 5, 6] Moreover, from 2023 through 2024, it is planned to continue the revision of the regulatory framework, especially for the pharmaceutical supply chain, with a narrower focus on the environmental, social, and governance (ESG) practices, that will impose additional requirements on the employee-related policies to the pharmaceutical companies operating within the supply chain. [7]

At the same time, the EU has a strict regulatory framework for the companies participating in public procurement processes to ensure fair competition, transparency, and equal treatment of all participants of the procurement process. The regulatory framework covers the selection of participants, and award of public contracts, including requirements for the evaluation of bids, the use of selection criteria, and the use of award criteria accordingly. [8, 9] In many countries, including Latvia, accountability of the company and evaluation of its performance includes indirect evaluation of human resource processes, including the financial and non-financial motivation of the employees. Consequently, pharmaceutical companies operating in the fields of production, storage and delivery of goods and especially delivering the goods to public institutions due to procurement, have even more strict regulations and must adapt the human resource policies and activities accordingly. These companies are not so flexible in developing various human resource management policies. The article aims to define by what means motivated the employees in pharmaceutical wholesalers and suggest measures for improving motivation using the available tools.

Overview

The object of the article is a pharmaceutical company that is mainly operating as the full-spectre distributor of pharmaceutical goods and medical devices in the Republic of Latvia. The company actively involves in public procurement as soon as it is a representative of several producers on the territory of Latvia whose registered medicines are included in the list of reimbursed medicines [10] in the country (e.g. producers of Croatia, Ukraine – Slovenia, and others). This means that this is not a choice but an obligation of the distributor to participate in the procurements in order to deliver such medicines to health institutions, prosecution instances, and similar state-

controlled or semi-state-controlled entities. In most cases, given the existing regulation, the company must participate in the procurement unless the medicines are unavailable in stock. This situation occurs on the market due to the pricing model which is applied to the medicines included in the reimbursement list and existing regulations [11], based on which when the patient is prescribed not the medication but the active ingredient, the pharmacist proposes the cheapest medicine with the given active ingredient, that is accordingly reimbursed. The more costly medicines are not reimbursed and are less frequently purchased by the individual. Given the high costs associated with supply chain management in the pharmaceutical industry, the producers evaluate the in-detail sales. They might decide to cancel the medicine registration on the market due to the lack of turnover, which often leads to the situation that only one medication with the specific active ingredient is available on the market. Similarly, non-reimbursed medicines with the same active ingredient present even lower statistics of purchase occurrence. Consequently, the situation when there is only one distributor of the specific active ingredient medicine on the market is often. When the need occurs for state-controlled or semi-state-controlled entities to fill in their stock, this distributor must participate in the process.

The object of research is specific to the product portfolio as it mainly focuses on the particular types of diseases and related medicines the company has developed its competency over more than 25 years of operation. In the case of the object of the research, the percentage of the turnover related to procurement deals fluctuates from 18 to 22 per cent per year. The changes occur according to the seasonal changes in demand, inflation and other external factors impacting the performance. Still, the company participates in 15 to 25 procurements annually. Every participation process involves evaluating the company as the procurement participant based on the EU and local regulations, including evaluating the social aspect. For example, the average hourly rates of employees specified in the offer in the profession group are calculated and assessed [12], meaning the rates cannot be lower than on average in the specific professional group; however, too high hourly rates due to additional bonuses are also a point of consideration as it can be treated as an unfair play and the participant would be excluded from the procurement. In the case of pharmaceutical supply, this result might not only cause fines as the disability to supply state-regulated essential medicines but also as a lack of quality assurance that, in turn, might be a signal of weak regulatory compliance to the distribution requirements and norms both on the national and EU level.

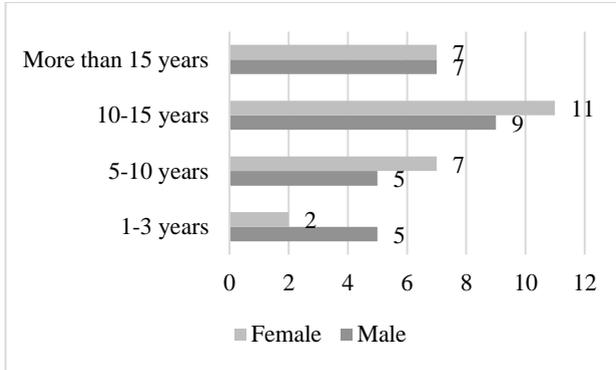


Figure 1. Employee time period of work according to the gender

Therefore, the company needs to balance its human resource practices, wishes, and needs of employees with the existing regulations. The company employs 55 employees (where two employees recently joined the company); therefore, 53 will be considered as the main population of the research. The demographics of the employees are presented in Figure 1. At the same time the age of the employees is also a challenge for the company management as soon as the age is very diversified (Figure 2).

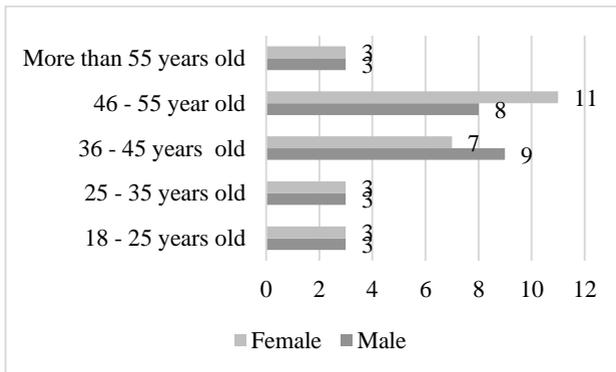


Figure 2. Employee age according to the age

Due to the regulations and the overall industry trends the salaries in the company are relatively low (average 930 euros net) and the pressure

experienced by the employees due to the peculiarities and specifics of the industry is substantial. Moreover, it has to be added that given the age group and the management of the company who leads the entity for more than 25 years, the applied human resource management practices are rather conservative and very traditional – the motivation of employees includes the following measures: annual bonuses of the fixed amount for all the employees, corporate events 3 times per year (company anniversary, Christmas, spring events). The motivation of employees is not measured and the system of motivation is not revised, as well as diversification of the motivational measures is not considered (e.g. educational programs are not considered as a motivation measure and are performed on request of the employee or if required by compliance means). At the same time the company is not reconsidering and revising the salary and bonus system, the 7-10% inflation fixed increase is used in the last 15 years and is not considered as motivation tool. The lead to the numerous intra-company issues – the company experiences the great turnover of young employees, older employees are in many cases vaguely motivated and perform their duties on the acceptable level, still not trying to reach additional goals or outperform the expectations, the plan set is often not reached at all as there is no system of fines in the human resource management of the employees. Overall, given the background, this can be presumed to occur due to the extremely low employee motivation.

It is broadly discussed that when compared to their younger counterparts, older employees possess a number of advantages in a variety of different areas, including incentives and associated with stress work skills. In addition, providing younger employees with an increased number of career possibilities boosts their levels of motivation.

Consequently, when assessing the motivation of employees, especially in different age groups, autonomous and controlled motivation can significantly improve one's ability to manage financial stress. Autonomous motivation involves engaging in a task or behavior because it is personally meaningful and satisfying, while controlled motivation involves doing something due to external pressures or rewards.[18] In this regard authors performed the assessment of the motivation of the employees in the object of research. The assessment was based on the literature analysis stating two main survey-type tools are evaluating the motivation – WEIMS survey, or Work Environment Impact Measurement Survey and Multidimensional Work

Motivation Scale (MWMS). [13] For the research, MWMS tool was used while scale measures a range of factors related to work motivation, including intrinsic motivation, extrinsic motivation, and amotivation. By assessing

motivation levels across different dimensions, the MWMS can provide a comprehensive understanding of the factors driving employee motivation in the pharmaceutical industry. This information can be used to develop targeted initiatives to address areas of concern and improve employee engagement and productivity. Moreover, this tool is translated to the language most employees state as their native language. [14, 15].

The authors managed to gather two groups of 15 of the age group less than 45 years old and 15 of the age group more than 45 years old. The survey was accordingly coded and was fully anonymous. Analyzing the results in SPSS the Levene's Test for Equality of Variances stated the significance level in all pairs is higher than 0.05, therefore it is possible to assume that the variance of two groups are the same.

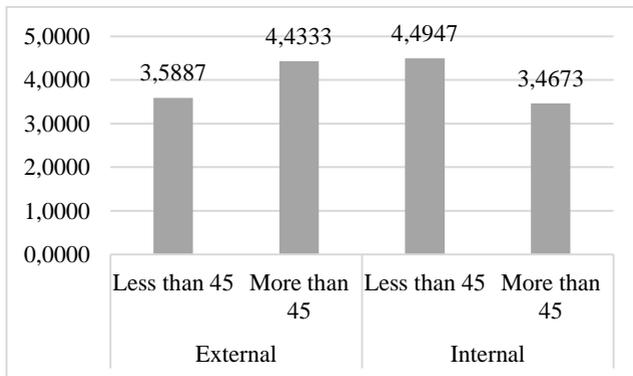


Figure 3. Internal and external motivation factors according to the different age groups

The p-value in the pair of external motivation factor is 0.001, the p-value in the pair of internal motivation factor is 0.000, therefore there is difference between the mean values of external and internal factors of motivation for the employees under the age of 45 and above the age of 45 at 5% significance level. At the same time the amotivation level does not differ across the groups with 0.695 significance level. This provides the opportunity to define the amotivation level of 3.067 across all respondents presenting rather high amotivation as soon as given the reverse coding this value means the employees are more demotivated than motivated to perform their duties at a whole. As detected the external motivators are more important for the age

group above 45 years old and for the group below 45 years old the internal motivation factors are more impacting the performance.

Discussion

Amotivation, which refers to a lack of motivation or disinterest in a task or activity, can indeed be a primary problem to focus on before improving motivation in the workplace. This is because amotivation is a more severe form of low motivation, and it is challenging to address other motivation issues when employees are completely disengaged. In contrast, employees who are experiencing low intrinsic or extrinsic motivation may still have some level of interest in their work or some external factors driving their engagement. However, employees who are amotivated may not have any interest or belief in their ability to perform the task, making it difficult to improve motivation without first addressing the underlying issue. And then the influence degree of the identified motivators has to be taken into consideration in the development of appropriate groupings, which made it possible to come up with the most effective motivation strategies for the employees. [16] For younger employees, internal motivation may be more important because they are still in the process of establishing their career goals and personal values. Internal motivation is driven by internal factors such as personal fulfillment, autonomy, and a sense of purpose, which are essential for younger employees who are looking to find meaning and direction in their work. Internal motivation also has long-term benefits for younger employees. Research has shown that employees who are intrinsically motivated are more likely to stay with their current employer, perform better, and be more creative and innovative in their work. This is particularly important for younger employees who are just starting their career and are looking for opportunities to learn, grow, and advance. At the same time while external motivation factors such as job security, competitive salaries, and benefits may be important for older employees, it is important to recognize that both internal and external motivation are important for employees of all ages. Therefore, it is essential to consider individual differences when it comes to work motivation and to develop strategies that take into account the unique needs and values of each employee.

It is important to address internal and external motivation differently in different age groups as individuals in different age groups may have different needs, values, and expectations when it comes to work motivation. Therefore, organizations may need to adopt different strategies to address internal and external motivation in different age groups. For example, younger workers may benefit from more frequent feedback and recognition, opportunities for skill development, and clear paths for career advancement. It is also important

to note that individuals within the same age group may have different motivations, and therefore, a one-size-fits-all approach may not be effective.

Conclusion

Addressing amotivation may require identifying the root cause of the disengagement, which may be related to factors such as poor job fit, lack of clear expectations, or a mismatch between individual values and organizational goals. Once the underlying issues are addressed, organizations can work to build motivation by creating a supportive work environment, setting clear goals and expectations, and providing opportunities for growth and development. While all forms of low motivation are problematic, addressing amotivation should be a primary focus before attempting to improve other forms of motivation. By addressing the underlying causes of amotivation and creating a supportive work environment, organizations can help employees rediscover their motivation and become more engaged and productive. Next, the external and internal motivators should be studied in detail of various elements included in the each of them and to consider individual differences in motivation when developing strategies to address internal and external motivation. By adopting different strategies for different age groups and considering individual differences, organizations can create a work environment that is supportive, engaging, and motivating for all employees.

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TECHNOLOGY DESIGN LIMITATIONS

Karajevs Vsevolods

*Latvia, ISMA,
e-pass: karajevs@inbox.eu*

Abstracts

This study identifies mechanisms that fail to validate the contribution of a new proposal during the course of enterprise improvement. Modifying them in a timely manner prevents the organisation from making changes that lead to a loss of performance. This is achieved through a careful selection of innovative proposals made on the basis of unique assessment tools. Such tools ensure that a phase-by-phase fundamental assessment is carried out. The assessment is based on readiness monitoring algorithms that allow the organisation to draw reliable conclusions about the state of the organisation. In doing so, the determination of the organisation's operability is made with a view to issuing recommendations for exiting an unsustainable state.

Keywords: needs, solutions, destruction, unique assessment tools, procedure, stages, standarts

Introduction

The ability to exit is conditioned by a perceived contradiction. It boils down to the fact that since the needs of the external environment outstrip the offerings of the evaluation industry, continuous maintenance of the evaluation toolkit is necessary to produce reliable solutions. In the course of accompaniment, a transition is made from piecemeal assessment to a

fundamental in-depth diagnosis of the organisation [1, 2]. The wording of the highlighted problem is summarised this way: “It is not possible to issue objective recommendations for improving the organisation without introducing unique assessment tools”.

Main Part

The object of a full-valued evaluation is its completeness. This category applies to a system of means of determining the fitness for work of an organisation, developed based on algorithms for assessing its condition at a particular point in time. In the context of comprehensiveness, the subject of assessment manifests itself in the fact that each element of the assessment system is configured to use uniform algorithms to reproduce a sustainable process". The purpose of consistent disclosure is to develop a procedure to ensure that states are defined in a strictly defined manner. Four objectives were formulated in accordance with the purpose. First, the content of the approach to developing a unique assessment tool needs to be disclosed. Secondly, the phases of the life cycle of a full-valued assessment should be described. Thirdly, the life-cycle stages of a full-valued assessment need to be explored. Fourthly, it is sufficient to apply Sensemaking technology to form the diagnostic toolkit.

Conclusions

In application terms, it has been determined that algorithms tuned to determine the health of an organisation can find the weak links in the organisation that prevent the organisation from being in a sustainable state. They are determined by going through four phases of a full-scale assessment. Talking about scientific ways, the developed tools allow you to evaluate the organization in a system of reasonable-specified standards with clearly defined ranges. Going beyond such boundaries is associated with corrective actions to get out of an unstable state. In addition, there are effective mechanisms available to management to change the boundaries of key business indicators when necessary.

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TESTING AUTOMATISATION IN MODERN WEB-APPLICATIONS

**Yelis Marina^{1,2}, Yunicheva Nadiya^{1,3}, Symagulov Adilkhan^{1,2},
Kuchin Yan¹, Jan Rabcan⁴, Chynybekov Islambek⁵**

¹*IICT MSHE RK, Kazakhstan, Almaty*

²*Satbayev University (KazNRTU), Kazakhstan, Almaty*

³*Almaty University of Power Engineering and Telecommunications
(AUPET), Kazakhstan, Almaty*

⁴*University of Zilina, Slovakia, Zilina*

⁵*Educational Institution "Almaty Management University"*

**Corresponding author's e-mail: k.marina92@gmail.com*

**Abstract**

The quality of the health care system manifests itself in three "dimensions" – medical, economic and social. For objective assessment and management of the health care system it is important to incorporate this set of data, process it with the help of a decision-making support system and display it in a form convenient for decision-makers. As such display systems are often and effectively used geographic information systems. In this paper we describe the interface and its technology stack, which is part of the intelligent GIS for multi-criteria analysis of healthcare data (IGISMA).

Keywords: intellectual GIS, web interface, healthcare, multi criteria decision support system, Explainable Machine Learning, IGISMA

Introduction

Geographic Information Systems (GIS) have been increasingly used in the healthcare industry for data analysis and decision-making processes. These systems can help healthcare professionals visualize, analyze, and interpret complex health data, such as disease outbreaks, demographic trends, and resource distribution. See Appendix 1.

However, as the amount of data being collected and analyzed continues to grow, it has become increasingly important to incorporate multi criteria decision support system (MCDSS) to generate recommendations.

In this thesis, we will consider an intelligent GIS for multi-criteria analysis of healthcare data (IGISMA) that displays the available data of healthcare facilities with a data analysis subsystem. The main purpose of this data analysis subsystem is to assess the impact of healthcare facilities' indicators on the target attributes reflecting the quality of healthcare services. Depending on the amount of available data, it is possible to evaluate the impact of the initial indicators on various medical, and economic attributes and management. We use machine learning algorithms to analyze various types of data and make decisions. Preliminary results of the work are described in [1-5]. Here we consider a web application that collects data and visualizes the results of processing.

Data and the interface

Web-based application utilizes Yandex.Maps and Vue.js (Nuxt) as the frontend framework. The main purpose of the application is to display data on a map in a user-friendly manner. Yandex.Maps is a popular mapping service that provides detailed maps, satellite imagery, and street views. It is widely used for geolocation, route planning, and navigation. Vue.js (Nuxt) is a progressive JavaScript framework used for building user interfaces. It simplifies the development process and allows for easy integration with other tools and libraries. [6]

The application displays data on the map based on geographic coordinates. The data is loaded from a JSON file, which contains information about different locations and their attributes, such as names, addresses, and descriptions. Users can interact with the data by clicking on markers or select the indicator displayed on the points and select the type of the clinic, see Figure 1 and Figure 2.



Figure 1. Screenshot of the web application



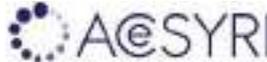
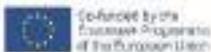
Figure 2. Screenshot of the web application

Conclusion

In conclusion, the application displays data on the map based on geographic coordinates, which can help users visualize and understand the location-based information more easily. Overall, this project demonstrates the potential of web-based applications and mapping services in facilitating data visualization and decision-making processes, especially in field of healthcare. Future work can focus on enhancing the application's functionality and user experience by incorporating more advanced features and technologies such as interpretation of the SHAP values and show recommendations for medical facilities on the map.

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Appendix 1

№	Төрү	Элементтер	Түрү	Көрсөткүчү
1	Аймактык административдик бирдиктердин маалыматтары			
2	Салт-санаа өндүрүшүнүн маалыматтары	Салт-санаа өндүрүшүнүн маалыматтары	Салт-санаа өндүрүшүнүн маалыматтары	Салт-санаа өндүрүшүнүн маалыматтары
3	Салт-санаа өндүрүшүнүн маалыматтары	Салт-санаа өндүрүшүнүн маалыматтары	Салт-санаа өндүрүшүнүн маалыматтары	Салт-санаа өндүрүшүнүн маалыматтары
4	Салт-санаа өндүрүшүнүн маалыматтары	Салт-санаа өндүрүшүнүн маалыматтары	Салт-санаа өндүрүшүнүн маалыматтары	Салт-санаа өндүрүшүнүн маалыматтары
5	Салт-санаа өндүрүшүнүн маалыматтары	Салт-санаа өндүрүшүнүн маалыматтары	Салт-санаа өндүрүшүнүн маалыматтары	Салт-санаа өндүрүшүнүн маалыматтары

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Authors



Marina Yelis, 1992, Almaty, Kazakhstan.

Current position, grades: PhD student at Satbayev University.

Scientific interest: machine learning, data processing, computer vision, etc.



Nadiya Yunicheva, 1968, Almaty, Kazakhstan.

Current position, grades: Leading researcher, Institute of Information and Computing technologies.

Scientific interest: methods of the interval analysis, data analysis of geophysical and climatic research.



Adilkhan Symagulov, 1994, Almaty, Kazakhstan.

Current position, grades: Engineer and junior researcher in scientific projects

Scientific interest: Machine Learning, Deep Learning, Data Science, etc.



Yan I Kuchin, 1980, Almaty, Kazakhstan.

Current position, grades: programmer-engineer at Institute of Information and Computational Technologies.

Scientific interest: geophysics, machine learning, data processing, natural language processing etc.



Jan Rabcan, 1989, Zilina, Slovakia

Current position, grades: as. professor, PhD

Scientific interest: data mining, artificial neural network, machine learning etc.



Chynybekov Islambek, Almaty, Kazakhstan.

Current position: student of Almaty Management University,

Scientific interest: software engineering, NLP.

DEVELOPMENT OF METHOD TO IMPROVE THE ACCURACY OF LITHOLOGICAL CLASSIFICATION USING BOOSTING AND DEEP LEARNING ALGORITHMS ATION IN MODERN WEB-APPLICATIONS

Nadiya Yunicheva^{1*,3}, Ravil I. Mukhamediev^{1,2}, Yan Kuchin^{1,2}, Jan Rabcan⁴ and Elena Mukhamedieva¹

¹*Institute of Information and Computational Technologies MES RK, Kazakhstan, Almaty*

²*Satbayev University (KazNRTU), Kazakhstan, Almaty*

³*Almaty University of Power Engineering and Telecommunications (AUPET), Kazakhstan, Almaty*

⁴*University of Zilina, Slovakia, Zilina*

**Corresponding author's e-mail: naduni@mail.ru*



Abstract

The method for improving the accuracy of lithological classification using boosting and deep learning algorithms has been developed. The methods are based on increasing the size of the floating data window, using data from nearby wells, and using data from the underlying horizon. The most significant increase in accuracy is observed when increasing the size of the data window. Increasing the data floating window size from 50 to 300 centimetres increases the weighted f1_score (maximum value 1) for the binning algorithm from 0.576 to 0.612 and for the specially designed convolutional network (CNN03 architecture) from 0.523 to 0.624.

Keywords: uranium mining, machine learning, regression model, boosting

Introduction

Nuclear power plants, despite the environmental risks involved, remain one of the cleanest ways to generate energy and reduce greenhouse gas emissions. The raw material used to produce energy is uranium. In 2018, the largest uranium mining companies produced 86% of the world's uranium production, of which NAC Kazatomprom JSC accounted for 21% [1]. Companies use two main mining methods: open pit (underground and open pit), which accounts for 45.9% of production, and in-situ leaching (ISL), which accounts for 48.3% of global uranium production [2] and which is used by NAC Kazatomprom JSC as the main mining method. The ISL mining process is illustrated in the figure to the left. In the mining process, an acid or alkali solution is fed through a network of specially drilled injection wells, which transforms ore in the ore-bearing layer into a productive solution. The mud produced is extracted through a network of pumping wells and further processed at the surface. Two basic schemes of drilling the network of wells are used: linear and hexagonal. The choice depends on many parameters, including the lithological composition of the host rocks and their filtration properties.

However, despite the undoubted environmental merits of ISL, there are several problems:

1) Application of this method requires sufficiently accurate determination of the lithological composition of rocks, because before well construction it is necessary to make sure that uranium is in permeable rocks and can be extracted by leaching solution. In addition, insufficient accuracy of lithological interpretation can lead to incorrect landing of the filter in impermeable rocks, leading to its inoperability and the financial losses associated with drilling and well construction [3] in the order of 1-4 million dollars per year [4].

2) It is necessary to know the filtration properties of rocks to estimate reserves and extract the maximum amount of uranium, but inaccuracies in the calculation of filtration characteristics using the existing methodology, which uses only one type of logging, leads to errors in the calculation of recoverable reserves [5]. In addition, the existing methodology is unsuitable for

determining filtration properties if the well is in an acidified block in which uranium mining has already begun. In such a case, the physical properties of the host rocks are distorted by the action of acid.

3) Not all isolated ore intervals in the ore-bearing horizon actually contain uranium. Some of them are in so-called zones of reservoir oxidation (ROZ), and contain only decay products of uranium.

ROZ extraction requires intensive work of different specialists and requires considerable time. Often, geological sections containing ROZ are not made in time and are not available at the gamma ray interpretation and reserves calculation stage. An alternative method, fission neutron logging (FNL-m), is only performed on 1-5% of wells due to its technical complexity and high cost. Ignoring ROZ may lead to incorrect reserve estimates, i.e., if there is actually no uranium, the reserves calculated by the accepted method using the gamma activity of its decay products may appear to be significant. This will lead to drilling and equipping dozens or even hundreds of "empty" wells, and the financial losses may amount to 5 to 10 million dollars a year. In general, inaccuracies in determining the lithological composition, filtration characteristics and ROZ lead to errors in the technological process of filter installation, errors in determining ore reserves and, ultimately, significant financial losses. The existing methods of the decision of the listed problems are developed since the 70-s of the last century, are not subject to essential modernization and demand a large quantity of highly professional manual work. At the same time, a number of methods based on the use of machine learning algorithms are proposed for solving the problems of logging data interpretation [6-22].

Methods

The methodological scheme of the study consists of the following steps:

- Methods and procedures for preprocessing raw data were developed to explore the possibilities of feature engineering (application of nearest wells, sliding window dimensions, adding, combining, excluding properties, analysis of significance of properties)

- Application of machine learning methods:

- Boosting algorithms.

- Deep learning algorithms.

Decision

At the first stage, we developed methods and procedures of initial data preprocessing, which allow to investigate the possibilities of feature engineering (application of nearest wells, sliding window dimensions, adding, merging, excluding properties, analysis of properties significance).

The set of procedures solves the following tasks of reading and preparation of initial data and includes the following procedures: reading the file with data in GIK (Excel) format, reading the logging data and lithological column within the selected horizon, normalization of logging curves, aggregation of

rock codes, formation of floating data windows, splitting the data set into training and test, finding the nearest well.

In the second stage, methods were developed to improve the accuracy of lithological classification using boosting and deep learning algorithms. The methods are based on increasing the size of the floating data window.

Boosting methods (xGBoost) provide the following parameters of points classification: accuracy=0.587, weighted_f = 0.576 with a window size of 5 points, the accuracy of classification increases with increasing of the floating window size, up to accuracy=0.621, weighted_f = 0.612 with a window size of 300 points.

Models were also developed and computational experiments were conducted using convolutional networks, achieving accuracy=0.627, weighted_f (f1_score) = 0.634, with a window size of 300 points (Figure 1):

accuracy	macro_prec	macro_rec	macro_f
0.621	0.518	0.437	0.431
weighted_prec	weighted_rec	weighted_f	
0.634	0.621	0.612	

Figure 1. Some results of computational experiments

Changes in model quality when the window size is increased for the XGB model (Figure 2):

Accuracy	Weighted_f	floating data window
0.587	0.576	5
0.591	0.579	10
0.589	0.576	25
0.599	0.59	50
0.619	0.607	200
0.621	0.612	300

Figure 2. Some results results when the window size is changed

The deep learning model gives an accuracy increase of about 2% compared to the best results of the boosting model.

Conclusion

Thus, as a result of improving the accuracy of geophysical well survey data interpretation problems in uranium fields using machine learning methods, including boosting and deep learning methods, the RK fields can achieve several million dollars per year due to the reduction of critical errors leading to well losses and more accurate forecasting of production volumes. Solving these problems will

make a significant contribution to the development of applications based on machine learning in the mining industry.

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Authors



Nadiya Yunnicheva, 1968, Almaty, Kazakhstan.

Current position, grades: Leading researcher at Institute of Information and Computing technologies.

Scientific interest: methods of the interval analysis, data analysis of geophysical research.



Yan I Kuchin, 1980, Almaty, Kazakhstan.

Current position, grades: programmer-engineer at Institute of Information and Computational Technologies.

Scientific interest: geophysics, machine learning, data processing, natural language processing etc.



Ravil I. Mukhamediev, 1959, Irkutsk, Russia.

Current position, grades: The chief scientist, professor at Satbayev University (KazNRTU).

Scientific interest: Machine Learning, Deep Learning, Data Science, etc.



Jan Rabcan, 1989, Zilina, Slovakia

Current position, grades: as. professor, PhD

Scientific interest: data mining, artificial neural network, machine learning etc.



Elena Mukhamedieva, 1971, Almaty, Kazakhstan.

Current position, grades: research assistant at Institute of Information and Computational Technologies.

Scientific interest: machine learning, data processing etc.

COMPARATIVE ANALYSIS OF SOFTWARE-DEFINED WIDE AREA NETWORK TOPOLOGY PROTECTION SYSTEMS

Otep Zhanali

Al-Farabi Kazakh National University, Almaty, Kazakhstan

**Corresponding author's e-mail: zhanali.otep@aic.kz*



Abstract

A software-defined network (SD-WAN) in a wide regional network (WAN) has become a trend used by large companies with geographically remote branches. The main goal is to be based on a software solution that provides a cost-benefit balance, given the high cost of WAN network usage. The development of SD-WAN has led to many solutions from different manufacturers, but it has also increased the number of threats and vulnerabilities to this technology. This article aims to compare commercial mechanisms with opensource solutions implemented in a specific architecture. And describes the SD-WAN directed cyberattack vectors, how to respond to them when simulating using the GNS3 software. The proposed topology is based on a design with two branches and headquarters, one via MPLS and the other via broadband internet, which provides redundancy, connected via two communication channels. The results of this study found that the commercial solution (FortiGate) provides better security mechanisms focused on privacy, integrity, and accessibility. However, the opensource solution (FlexiWan) provides tools to adapt to future threats thanks to community efforts.

Keywords: Software-Defined Wide Area network (SD-WAN), cybersecurity, FortiGate, Flexiwan.

Introduction

The need to connect multiple nodes located in different geographically distributed locations to each other gave rise to the concept of a Wide Area Network (WAN). WAN is a type of telecommunications network that connects several nodes located in different geographical regions [1]. Currently, the communication protocols used by large companies need to be developed in

accordance with new technological requirements, so that all WAN connections are secure. In this context, software – defined networks (SDN) is an approach that bases its operation on software drivers and application programming interfaces (APIs), allowing it to communicate with the physical infrastructure of the hardware, to create control and device configuration [2]. SDN allows physical devices to act as a network device that separates the control plane from the data plane, being the central controller responsible for control [3]. Manual configuration of network devices requires careful consideration of several aspects a) the deployment time of new services or applications may be high and B) incorrect configuration may cause service delays and poor performance [1].

New trends in WAN networks have introduced software-defined networks in Wide Area Networks (SD-WAN). This internet technology virtualizes network services and allows for flexible management, simplification and scaling of configuration complexity [4]. SD-WAN separates the control and data planes. In this context, the data plane performs tasks such as sending(forwarding), configuring and monitoring, while the data monitors the information of users and applications [5]. In Figure 1, you can see three levels of the classic SD-WAN architecture: Data, Control and Application. The data level handles bandwidth and data transfer virtualization, the control level independently implements and manages network functions. The application layer provides services where internet service providers and developers can define network requirements to provide those services [6]. In addition, SD-WAN has components located in several geographical locations, which causes delays in transportation [7]. For communication between levels, we have two interfaces a) NorthBound Interfaces (NBI), which communicate SD-WAN controllers and applications, and B) southbound Interfaces (SBI), which communicate network devices and controllers respectively [8].

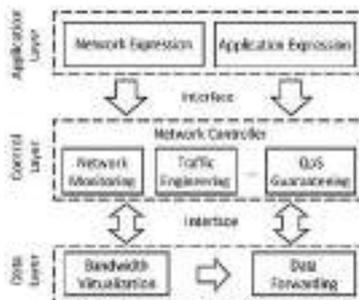


Figure 1. SD-WAN architecture

The importance of analysing and using these technologies lies in identifying comparative advantages in terms of management, safety, and performance. The purpose of this work is to conduct a comparative analysis of security mechanisms in SD-WAN opensource and commercial architectures. The methodology used for the research is the introduction of a simulated environment that allows experiments on these technologies.

Simulation scheme

Two SD-WAN solutions were used in an experimental methodology to compare cybersecurity mechanisms to respond to attacks in general. For modelling, the GNS3 tool was chosen based on cost, durability, reliability, and the ability to simulate SD-WAN networks, which allows you to design, configure and test large-scale topologies that provide physical, virtual and multi-device interaction [9]. The Flexiwan controller was used for the open-source topology, while the switches and edge routers were configured via OpenSwitch and Flexiwrouter, respectively. In the case of the commercial architecture, FortiGate was used for the SD-WAN solution; the core of the MPLS network used Cisco routers and switches. Nessus was used to obtain fingerprints, which allows you to search and evaluate vulnerabilities in computer systems in an automated way. In manual inspection, NMAP meets the specifications necessary for optimal scanning. In the case of web penetration test, the Nikto tool and the Burp Suite community version were configured. Brute force attacks used word lists consisting of at least 1,000 standard keys [10], using Hydra as a means of automating this type of attack.

GNS3 emulates the expected actions of CPE (customer premises equipment) and the interconnection of the main networks. Most commercial SD-WAN deployments use the same architecture that connects the head office to many branches. Depending on the provider, the components have a different structure and number. In the case of the solution proposed by Flexiwan, it can be used in the Ubuntu 22.04.1 distribution, and Fortigate manages devices through the web interface. The simulation scenarios are represented by a design with two nodes (branches) and headquarters connected via MPLS and the Internet network, as shown in Figure 2. Table 1 shows the parameters of the configured scripts.

Table 1

Simulation parameters

	Values	
	FortiGate	FlexiWAN
CPE	3	3
MPLS/Internet	Yes	Yes
SSH	Yes	Yes

Web control	Yes	Yes
HTTPS	No	No
Cloud control	Yes	No
Version	7.0.0	4.1.3
CPE	FortiGate KVM	Flexirouter on Ubuntu 22.04.1
IPsec tunnel	Yes	Yes
	Pre-shared Key (PSK)	Pre-shared Key (PSK)

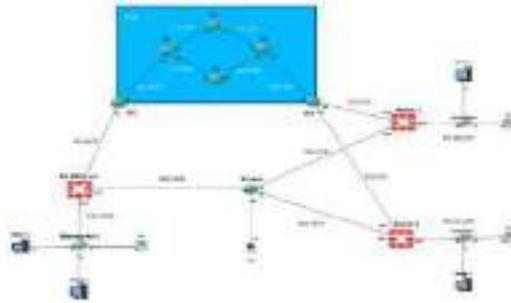


Figure 2 .SD-WAN topology used in modeling

Simulation results

DoS

SD-WAN solutions will differ depending on the manufacturer. In the case of FortiGate, communication networks are managed in a CPE web client, although web management is not normally open, a simple Flood SYN attack on Port 443 completely disables the head office or branches. However, FortiGate supports a DoS attack prevention policy at the IPv4/IPv6 level, but the initial configuration may leave the vulnerability open. In the case of FlexiWAN, the controller is in the cloud behind the web application firewall (WAF) service, which makes it more secure against this type of attack. Flexirouter CPE devices also have a web control interface called Flexiedge on the 8080 TCP port, and as we see in Table 2, in the initial configuration, it is also vulnerable to a Flood SYN crash.

Towards Table 3, a commercial solution prevailed at the web management level, as Flexirouter web management did not have a mechanism to limit the number of attempts to log in to Flexiedge. Instead, Fleximanager access control keys can be hacked and obtained according to the calculation

specifications. Fortigate, on the other hand, offers several specific actions to log in. For example, you can access it with keys that do not have a password policy, because the Hydra tool can find simple keys (for example, 12345, admin) in less than a minute. Fortigate also has mechanisms to reduce brute force attacks. Regarding the CLI management section, both solutions offer SSH management, however, the default Ubuntu 22.04.1 solution (the version recommended in the documentation) leaves the OpenSSH Server stranded by several vulnerabilities detected in CVE.

Table 2

	DoS attacks		
	Fortigate	Flexiwan	
	CPE (Firewall)	CPE	Controller
TCP port	80	8080	80
TCP SYN Flood attacks (HPing3) single source	Success	Success	Failed
ICMP Flood attacks (HPing3) single source	Success	Success	Failed
Application layer attacks (slowhttptest)	Success	Success	Failed

Brute Force

Table 3

	FortiGate		FlexiWAN	
	Controller	CPE	Controller	CPE
SSH (Hydra) 6 characters long	Failed	Failed	Failed	< 1s
Web login (Burp Suite) 6 characters long	Failed	Failed	Failed	< 1s

Vulnerabilities

According to the nikt0 automated scanner, there are no visible vulnerabilities in either The Fleximanager driver or the FortiGate control interface. Performing manual tests did not find vulnerabilities such as SQL Injection, XSS, and CSRF. The Northbound API provided by Fleximanager does not show any vulnerabilities. The authentication method provided by Flexiwan is reliable, each request to it is made within the admin portal with a

unique token created by the user. The vulnerabilities found are due to outdated versions of applications. In Table 4, We note that there are several vulnerabilities in Flexiwan CPE vulnerabilities found are due to outdated versions of applications. In Table 4, We note that there are several vulnerabilities in Flexiwan CPE.

Table 4

Vulnerabilities

	FortiGate		FlexiWAN	
	Controller	CPE	Controller	CPE
NMAP	N/A	N/A	N/A	CVE-2020-14145 CVE-2019-6111 CVE-2019-6110
Nessus	N/A	N/A	N/A	CVE-2020-14145 CVE-2019-6111 CVE-2019-6110

Cryptography

When a person in the middle performs an attack, all traffic is encrypted according to the type of algorithm provided by each solution, such as authentication header (AH) and encapsulation security load (ESP). Both solutions allow the implementation of IPsec tunnels between headquarters and branch CPE, ensuring the integrity and confidentiality of information. In FortiGate, the IPsec tunnel can be configured using a sample selector with initial parameters, however, it still uses algorithms such as MD5 to ensure integrity and authentication. Flexiwan does not allow you to select settings for tunnels. Table 5 shows the parameters of each solution.

Table 5

IPsec tunnel parameters

	Өндүрүшү	
	FortiGate	FlexiWAN
IKE version	1, 2	2
Authentication methods	Preshared Key, Certificado digital	Preshared Key
Encryption algorithms	DES-MD5, DES -SHA1 DES-SHA256, DES-SHA384, DES-SHA512	AES-CBC-128
Hashing algorithms	MD5, SHA-256, SHA-512, SHA-384	SHA-256, SHA-128

Conclusion

In many emerging technologies used in critical or business systems, it is very important to maintain their security at a high level. This article discussed the most common threats in the SD-WAN network. Simulations for commercial and open source solutions were performed in GNS3 software. Security tests conclude that a commercial solution offers better cybersecurity mechanics and provides a reduction in overall attacks. Although there are mechanisms against Brute force or dictionary attacks, the opensource solution does not limit the requests that are made per minute when you visit the web admin portal. The FlexiWAN community is trying to make it as strong as the FortiGate solution to resist attacks such as XSS, CSRF, or the Northbound REST API. Both solutions involve privacy and integrity, and cryptographic algorithms used for authentication and integrity have been found to be reliable in using IPsec tunnels. The biggest difference is that Fortigate has the flexibility to implement different cryptographic algorithms, which is not possible in Flexiwan. We must also confirm that most of the vulnerabilities are related to the original (default) configurations or that they are not secure. In the same way, we must make the management through the CLI as secure as possible, according to the initial configuration it comes very vulnerable. A deeper comparative study of other attack vectors will allow us to create a better cybersecurity perspective among different solutions and develop possible threat policies to protect the infrastructure of enterprise SD-WAN networks.

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Author



Otep Zhanali, Almaty, Kazakhstan.

Current position, grades: 2nd year Master's student Al-Farabi Kazakh National University

Scientific interest: Information technology, electronics, telecommunication systems and networks

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