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AGRICULTURAL SCIENCES

JUSTIFICATION OF THE SCIENTIFIC MECHANISMS OF SUSTAINABLE DEVELOPMENT OF AGRICULTURAL LAND USE (on the example of the Chernyakhiv Agrarian Group PE, Ukraine)

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ОБГРУНТУВАННЯ НАУКОВИХ МЕХАНІЗМІВ СТАЛОГО РОЗВИТКУ АГРАРНОГО ЗЕМЛЕКОРИСТУВАННЯ (на прикладі ПП «Черняхівська аграрна група», Україна)

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Abstract

This study was conducted with the aim of establishing the main ecological and economic risks of sustainable development of the agricultural production sector. On the example of the analysis of the production activity of the private enterprise "Chernyakhiv Agrarian Group" (Ukraine) an analysis of the structure and quality of soils and related types of cultivation, the scale of the use of mineral fertilizers and their impact on products and the surrounding natural environment was carried out. It has been established that the use of mineral fertilizers in the economy has a planned and calculated character, the use of plowing as an effective method of soil cultivation gives a high yield. Increasing the productivity of the land at the enterprise is achieved thanks to cultural and technical measures, elimination of unjustified small contours of the fields, rational use of mineral fertilizers. The introduction of the latest innovative means and technologies leaves a consistently high level of profitability of agricultural enterprises.

Анотація

Дане дослідження було проведене з метою встановлення основних еколого-економічних ризиків сталого розвитку аграрного сектору виробництва. На прикладі аналізу виробничої діяльності приватного підприємства «Черняхівська аграрна група» (Україна) був здійснений аналіз структури і якості ґрунтів і пов'язаних з ними видів обробітку, масштабів використання мінеральних добрив та їх впливу на продукцію і навколишнє природне середовище. Встановлено, що використання мінеральних добрив в господарстві має плановий розрахунковий характер, використання оранки як ефективного способу обробітку ґрунту дає високу врожайність. Підвищення продуктивності землі на підприємстві досягається завдяки культурно-технічним заходам, ліквідації невиправданої дрібноконтурності полів, раціональному використанню мінеральних добрив. Впровадження новітніх інноваційних засобів і технологій залишає стабільно високим рівень рентабельності сільськогосподарських підприємств.

Keywords: soil, degradation, mineral fertilizers, land use system, sustainability

Ключові слова: ґрунт, деградація, мінеральні добрива, система землекористування, сталий розвиток

Земельно-ресурсний потенціал є одним з головних факторів соціально-економічного розвитку регіону, первинним фактором суспільного виробництва і розвитку інфраструктури, невід'ємною частиною природної системи. На сучасному етапі соціально-економічної перебудови аграрного землекористування суттєво загострилися еколого-

економічні суперечності. Деградація ґрунтового покриву, ерозія, втрата ґрунтами гумусу, наростаючий дефіцит елементів живлення – це основні проблеми сучасного використання земельних ресурсів. Найбільшу небезпеку для навколишнього природного середовища становить забруднення ґрунтів ра-

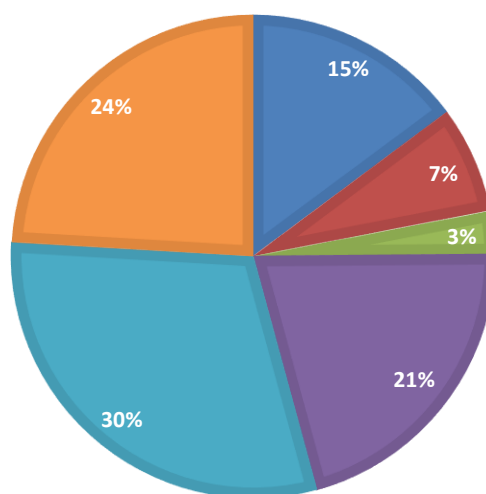
діонуклідами, важкими металами, збудниками хвороб. За таких умов надзвичайної актуальності в Україні набувають питання охорони земель та створення передумов для формування сталого землекористування [1].

Основними причинами погіршення екологічної ситуації є відсутність прогресивних технологій, недотримання науково обґрунтованих сівозмін, перевага монокультури в деяких агропідприємствах, низькі норми внесення органічних добрив, порушення технологій застосування мінеральних добрив і пестицидів, збільшення площ кислих, засолеваних, техногенно забруднених земель через призупинення робіт із вапнування та гіпсування ґрунтів [2].

Застосування мінеральних добрив і хімічних засобів захисту рослин з метою підвищення врожайності сільськогосподарських культур загострили екологічну проблему. Агрохімізації, на відміну від забруднення природи відходами промислового виробництва, є цілеспрямованою діяльністю. внесені мінеральні добрива, а також засоби захисту рослин від шкідників і хвороб сільськогосподарських рослин частково вимиваються і потрапляють до водних об'єктів. За даними Міністерства екології та природних ресурсів України, у 2021 р. разом із стічними водами до поверхневих водних об'єктів надійшло: 42,4 тис. т завислих речовин; 403,4 тон нафтопродуктів; 801,2 тис. т сульфатів; 637,6 тис. т хлоридів; 9,1 тис. т азоту амонійного; 57,9 тис. т нітратів; 2,2 тис. т нітритів; 271,4 т СПАР; 735,7 т заліза; 7,5 тис. т фосфатів. У 2021 р. підприємства сільського господарства скинули 84 млн м³ забруднених стічних вод, що на 11,9 % більше порівняно з 2020 роком [3].

Україна належить до держав, які характеризуються високою розораністю своїх територій та недостатньою лісистістю. Житомирщина, північна область України, має досить неоднорідну структуру складу земель – загальна лісистість території області становить 37,7%, проте у Лісостеповій частині вона значно нижче (10-15%), а ступінь розораності у деяких районах вища за середню по Україні. Станом на 1 січня 2021 р. площа сільськогосподарських угідь Житомирської області становила 50,6 % території. Інтенсифікація сільськогосподарського використання земель потребує моніторингу поширеності деградаційних процесів, визначення та впровадження заходів щодо охорони земель та забезпечення екологічної стійкості агроландшафтів [3].

Робота виконана з використанням загальноприйнятих методик хіміко-аналітичних досліджень [4], математичних методів обробки експериментальних даних та цифрових звітів представлених аграрним приватним підприємством «Черняхівська аграрна група». Аграрне підприємство веде свою виробничу діяльність на площі 3,5 тис. га, що зосереджені переважно в Черняхівському районі Житомирської області. ґрунтові умови господарства представлені дерново-підзолистим покривом з середнім ступенем опідзолення, за гранулометричним складом ґрунт супіщаний, материнська порода – водно-льодовикові відкладення. За агрохімічними показниками ґрунт на глибині орного шару (0-22 см) містить: гумусу (за Тюрнімом) 1,0-1,4%; легкогідролізованого азоту (за Корнфілдом) – 7,8-8,3 мг; рухомих форм фосфору (за Кірсановим) – 10,9-11,7 мг; обмінного калію (за Кірсановим) – 9,1-10,0 мг /100 г ґрунту. Забезпеченість ґрунту елементами живлення, особливо калієм, дещо низька (рис. 1).



■ рН сольової витяжки ■ Гідролітична кислотність ■ Уміст гумусу ■ N ■ P ■ K

Рис. 1

Агрохімічна характеристика ґрунтів ПП «Черняхівська аграрна група», рік проведення аналізу – 2021р.

Дані агрохімічних аналізів свідчить про те, що ґрунти малогумусні зі слабо кислою реакцією ґрунтового розчину. Вони характеризуються невисокою насиченістю основами і елементами мінерального живлення, чим і зумовлена їх низька родючість. Негативною властивістю даного ґрунту є здатність утворювати ґрунтову кірку і ущільнюватися після обробітку.

Раціональне землекористування передбачає, насамперед, охорону ґрунтів через ефективний порядок, умови і форми експлуатації землі. Проведений аналіз впливу різних видів обробітку ґрунту на врожайність ріпаку озимого на аграрному підприємстві показав ефективність застосування оранки, за якої в середньому за три роки урожайність насіння ріпаку була вищою над іншими способами обробітку на 0,22-0,48 т/га (таблиця 1).

Таблиця 1.

Вплив видів обробітку ґрунту на врожайність ріпаку озимого, т/га			
Обробіток ґрунту	Роки		
	2019	2020	2021
Поверхневий обробіток ґрунту	1,6	1,93	2,04
Оранка	1,73	2,07	2,44
Плоскорізний обробіток ґрунту	1,40	1,69	1,72

Плоскорізний обробіток якісно виділяється із поміж системи обробітку ґрунту формуванням низької врожайності, та в середньому за роками склав менші показники як у поверхневого обробітку на 0,26 та оранки – 0,48 т/га. Слід зазначити, що формування врожаю ріпаку відбувалося протягом 2019-2021 років неоднаково, що свідчить про залежність формування врожаю від погодних умов, проте зберігає залежність та загальну тенденцію щодо ефективності застосування ґрунтообробних агрегатів.

Розробка системи удобрення здійснюється з врахування об'ємів майбутнього урожаю, спираючись на результати агрохімічного аналізу відповідних ґрунтів [5]. На збільшення врожайності ріпаку на фоні зростаючих норм внесення мінеральних добрив, зокрема на ПП «Черняхівська аграрна група», максимальні врожаї було отримано на пісчаних ґрунтах за внесення повного мінерального добрива NPK 75:75:75, та отримано по 1,9 т/га насіння ріпаку, що значно вище ніж в сусідніх агроформуваннях.

Пряму залежність на формування врожайних показників має висота рослин (рис. 2).

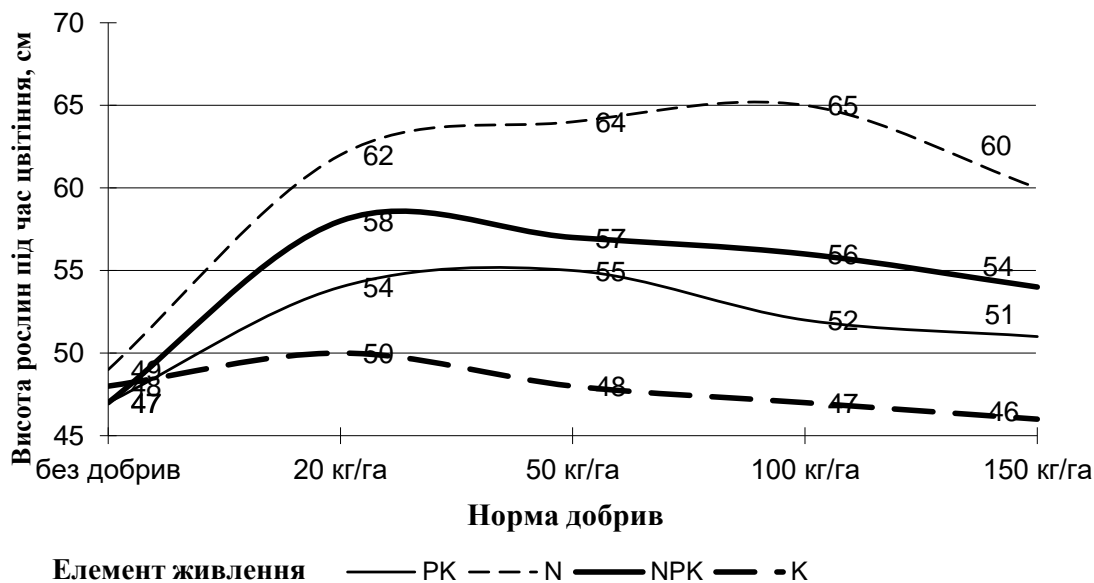


Рис. 2. Залежність внесення елементів живлення на висоту рослин ріпаку

Аналізуючи внесення мінеральних добрив, а саме азоту, фосфору та калію, їх окремого та сумісного використання можемо дійти до висновку, що збільшення норм мінерального добрива та тенденція ростових процесів мають параболічний характер, тобто збільшення норм добрив до 100 кг/га діючою речовини сприяє активним ростовим процесам, за яких висота рослин до фази цвітіння

досягала 65 см, з послідовним збільшенням внесення добрив, рослини реагували зворотною реакцією, тобто сповільняли ріст, в деяких випадках ріпак просто вилягав. Вилягання ріпаку має вкрай негативний вплив на формування та отримання повноцінного якісного врожаю, що як правило спричиняється активним внесенням елементу росту, азоту, а тому повинно бути на постійному контролі у відповідних працівників.

Основна мета вивчення важких металів в системі «грунт-рослина» це – пошук ефективних заходів, які запобігають або істотно знижують їх надходження в харчові ланцюги людини і сільськогосподарських тварин. Знання джерел забруднення ґрунтів важкими металами і поведінку металів в системі «грунт-рослина» дозволяє успішно боротися із забрудненням рослинницької продукції. Негати-

вні наслідки безконтрольного використання мінеральних добрив пов'язують з тим, що вони, крім поживних елементів в мінеральній формі N, P, K, також можуть мати у своєму складі значну кількість шкідливих домішок, важких металів, природних радіонуклідів [6]. Небезпечними токсикантами мінеральних добрив і вапняків є важкі метали (Cd, Cu, Pb, Ni, Zn, Mo, Co, Cr) та інші токсичні елементи (As, F, B) (табл. 2).

Таблиця 2

Вплив рівня мінерального живлення на вміст важких металів у насінні ріпаку

Удобрення	Вміст металів, мг/кг			
	Cu	Pb	Cd	Zn
Без добрив	7,0	0,3	0,22	37,3
НРК ₍₂₀₎	7,8	0,3	0,24	42,0
НРК ₍₅₀₎	8,1	0,3	0,25	44,2
НРК ₍₁₀₀₎	8,7	0,3	0,24	44,5
НРК ₍₁₅₀₎	8,8	0,3	0,26	44,8
ГДК	10	0,5	0,3	50

Провівши лабораторні дослідження на вміст важких металів в насінні ріпаку ПП «Черняхівська аграрна група» Черняхівського структурного підрозділу за використання різних норм добрив, маємо результати, які вказують на помірні показники вмісту шкідливих речовин. Так, перевищення ГДК (гранично допустимих концентрацій) важких металів в насінні не виявлено, проте в максимальній нормі використання добрив, досить чуттєве наближення до ГДК, а саме Cu до 8.8 та Cd до 0,26 мг/кг насіння, що вказує на досить високі їх показники. Оскільки, динамічні властивості ґрунтів змінюються протягом відносно короткого часу і на них впливають різні управлінські процедури (обробіток ґрунту, удобрення, меліорація тощо), тому в процесі їх використання потрібно це враховувати.

Висновки. Використання мінеральних добрив під час діяльності сільськогосподарських підприємств має важливе значення у формуванні врожаю. Проте, кількість внесення добрив повинна мати плановий розрахунковий характер. Надмірне застосування мінеральних добрив суттєво впливає на забруднення отриманої продукції та навколишнього середовища.

При виробничій діяльності аграрні підприємства повинні розробляти і вдосконалювати систему землекористування: порядок, умови і форми експлуатації землі. Ця система має бути адаптована до кліматичних умов регіону, рельєфу, типу ґрунту, рослинності.

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CHEMICAL SCIENCES

STUDY OF THE INFLUENCE OF THE NATURE OF ACTIVE COMPONENTS ON THE ACTIVITY OF REFORMING CATALYSTS

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Abstract

A number of Pt-Re gasoline reforming catalysts have been synthesized, differing from each other in chemical composition and preparation method. The synthesized catalysts exhibit fairly high activity under the studied conditions ($T = 480-500\text{ }^{\circ}\text{C}$, $V = 2.0\text{ h}^{-1}$, $P = 8\text{ atm}$ and $\text{H}_2/\text{feed} = 5.5$).

Keywords: catalytic reforming, activation, polymetallic oxide catalyst, aromatic hydrocarbons, gasoline fraction

Introduction Catalytic reforming is the most promising process for producing highly active gasoline and individual aromatic hydrocarbons.

The main direction for improving catalytic reforming is its intensification by increasing the depth and selectivity of aromatization of paraffin hydrocarbons contained in straight-run gasoline fractions. Increasing the depth and selectivity of aromatization of paraffin hydrocarbons can be achieved by using more efficient catalysts. Analysis of scientific and patent literature shows that reforming catalysts mainly contain Group VIII metals modified by additions of other elements [1-5].

Experimental method

For the process of reforming the gasoline fraction $85-180\text{ }^{\circ}\text{C}$, polymetallic oxide catalysts were synthesized, containing, in addition to platinum, rhenium, nickel, and cobalt, which significantly increase the stability of the catalyst. The objects of study were a number of synthesized oxide catalysts, which differed from each other both in the preparation method and in the chemical composition. The carrier was microspherical $\gamma\text{-Al}_2\text{O}_3$. The finished catalysts were thermostated at $150\text{ }^{\circ}\text{C}$ for 4 hours, calcined at $350\text{ }^{\circ}\text{C}$ for 4 hours and $500\text{ }^{\circ}\text{C}$ for 6 hours. The composition of the catalysts is given in table 1.

Table 1

Chemical composition of catalysts

Catalyst	Chemical composition of catalysts, % wt
KR-1	0.2 Re; 0.3 Pt / $\gamma\text{-Al}_2\text{O}_3$
KR-2	0.2 Re; 0.3 Co, 0.3 Pt / $\gamma\text{-Al}_2\text{O}_3$
KR-3	0.3 Re; 0.4 Ni, 1.0 La_2O_3 , 0.3 Pt / $\gamma\text{-Al}_2\text{O}_3$
KR-4	0.3 Re; 0.3 Pt; 0.8 Co / $\gamma\text{-Al}_2\text{O}_3$

The synthesized catalysts were tested in a flow-through installation under hydrogen pressure. 30 cm^3 of the catalyst under study was loaded into the reactor. Activation of the catalyst was carried out at $500\text{ }^{\circ}\text{C}$ in a stream of air, then reduction with hydrogen was carried out at a temperature of $480\text{ }^{\circ}\text{C}$. The experiments were carried out under the following conditions: $T = 480-510\text{ }^{\circ}\text{C}$, $V = 1.5-2\text{ h}^{-1}$, $\text{H}_2/\text{raw material} = 5.6-6$, hydrogen consumption -48 l/hour , $P_{\text{H}_2} = 8-12\text{ atm}$.

Testing of samples was carried out continuously for several hours with sampling every hour. The reaction products were analyzed on a chromatograph with a 50 m long capillary column filled with a liquid crystalline phase.

A fraction of straight-run gasoline $85-180\text{ }^{\circ}\text{C}$ was used as raw material.

Table 2

Composition of the initial gasoline fraction	
Indicators	Values
Density	0.7483
Refraction	1.4240
Compound %	
aromatics	6.6
naphthenes	27.7
paraffins	65.7

Results and Discussion

The studied catalysts exhibit fairly high dehydrogenating, isomerizing and dehydrocyclizing activity when reforming gasoline fractions at 85-180 °C. Thus, if the initial gasoline fraction contains 6.6 % of the mass of aromatic hydrocarbons, then after reforming its yield of aromatic hydrocarbons increases almost 10 times, the content of paraffin and naphthenic hydrocarbons decreases by 2 and 5 times, respectively. With increasing temperature of the experiment, the yield of aromatic hydrocarbons on the KR-2 catalyst increases, while in the case of the KR-4 catalyst, which differs from KR-1 in chemical composition, it reaches a maximum at a temperature of 490 °C, and the activity of the catalyst is much higher. To increase the stability of Pt-Re catalysts are promoted with elements of groups IV-VIII. For this purpose, we conducted a study of the effect of the amount of cobalt on the yield of aromatic hydrocarbons during reforming of the gasoline fraction 85-180 °C. The introduction of 0.3 % Co into the composition of this catalyst leads to an increase in the yield of aromatic hydrocarbons at 500 °C by approximately 2 %. With a further increase in the cobalt content in the catalyst composition to 0.8 %, the yield of aromatic hydrocarbons decreases and becomes less than in the case of the unpromoted KR-1 catalyst. At the same time, when comparing the dehydrogenating and dehydrocyclizing activities of the studied catalysts, it can be noted that Co-containing samples are characterized by greater

stability. For example, at 500 °C, the yield of aromatic hydrocarbons in three hours of continuous operation decreases on the synthesized catalysts KR-1, KR-2 and KR-4 in the following sequence: by 4.5 %, 2 % and 1 %. When testing the KR-3 catalyst, it was found that the introduction of a platinum catalyst instead of 0.4 Ni and 1% La₂O₃ does not have a significant effect on the reforming ability of the catalyst.

In order to establish the reproducibility of synthesis conditions, KR-3(II) was synthesized and its tests in the process of reforming a gasoline fraction of 85-180 °C showed complete reproducibility. On Pt-Re catalysts during operation, the yield of aromatic hydrocarbons decreases, i.e. the activity of these catalysts decreases. One of the reasons for the decrease in the activity of these catalysts is the sintering of Pt particles. There is information in the literature that sulfidation of Pt-Re catalysts with sulfur-containing substances slows down the sintering process of platinum and has a beneficial effect on the activity of the catalyst [1-5]. We prepared a catalyst sample sulfided with a mixture of 99.0 % H₂ + 1 % H₂S, which was tested in the process of reforming the gasoline fraction in a pilot plant under pressure. The obtained data are shown in table 3. As can be seen from the data presented, sulfidation of the KR-3(II) catalyst does not have a significant effect on its activity.

Table 3

The influence of sulfidation of the KR-3 catalyst on the reforming process of the gasoline fraction 85-180 °C.
Experimental conditions: P = 8 atm, H₂ / feedstock = 5.5, V = 2.0 h⁻¹

Sample	Experiment temperature, °C	Catalyst composition, mass%		
		paraffins	naphthenes	aromatics
KR-3	480	60.24	5.76	33.65
	490	62.5	8.41	29.14
	500	6.29	8.68	28.03
KR-3 (II) sulfided	480	62.9	5.6	31.3
	490	64.7	7.6	27.7
	500	68.1	6.9	25.0

Thus, the study showed that the introduction of elements III and VIII gr into the Pt-Re catalyst has a significant effect on its activity in reforming the gasoline fraction 85-180 °C.

Conclusions. Synthesized catalysts for reforming gasoline, differing from each other in chemical composition and preparation method, exhibit fairly high activity under the studied conditions and are not inferior to the reference catalyst. Thus, on the KR-2 catalyst at a

temperature of 490 °C and V = 2.0 h⁻¹, the yield of aromatic hydrocarbons is 56 %.

The effect of different amounts of cobalt in the catalyst on its activity was studied. The introduction of 0.03 % Co has a beneficial effect on the activity of the catalyst by 5 %. In order to establish the reproducibility of synthesis conditions, KR-3(II) was synthesized and its tests during the reforming process showed complete reproducibility.

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JURISPRUDENCE

INTERNATIONAL LEGAL REGULATION OF THE FIGHT AGAINST CYBERCRIME

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Abstract

This article examines certain problems of international legal regulation of the fight against crimes in the field of information technology. The purpose of this article is to analyze current international legal mechanisms to combat cybercrime. Cybercrimes, as well as crimes related to violations of information security, are mainly of an international nature due to the fact that they are carried out in the international information space using the global cross-border Internet. The article updates the issue of forming an international institutional mechanism in the field of combating cybercrimes.

Keywords: international law, international information law, crimes in the field of information technology, information and communication technologies, the Internet, information security, cybercrimes.

The progressive development of ICT and globalization processes, together with positive processes, also include certain problems in the field of information security, in particular on the Internet. The Internet is one of the most significant and breakthrough achievements at the global level in the information sphere. In the modern world, the Internet makes it possible for individuals, society and states to exchange a wide variety of information online (in real time), including audio and video recordings. The Internet is not only a means of communication, but also a medium where people enter into various types of legal relationships.

At the same time, the emergence of information cyberspace also carries very significant threats. The widespread use of computer technologies in everyday life and the creation of global computer networks based on them, as an integral part of modern international financial and banking activities, creates preconditions that facilitate the commission of criminal acts, and often such crimes remain unpunished. The spread of computer viruses and child pornography, fraud with plastic payment cards, theft of funds from bank accounts, computer terrorism - this is not a complete list of such crimes, which have received the common name "cybercrime".

Despite existing international agreements in the field of informatization, international law on many issues does not keep up with the challenges that arise as a result of the use of information and communication technologies. Many experts point to such gaps in international information law [1]. The dynamic spread of cybercrime in the modern world creates the need to analyze existing and develop new international legal mechanisms for regulating the fight against cybercrime.

Obviously, the problem of using ICT for criminal and terrorist purposes is especially expressed due to the fact that information plays an important role in the functional activities of various important strategic objects in the different fields. Therefore, one of the most important problems of ensuring information security is

the fight against cybercrimes, the main goal of which is to carry out illegal information influence on various systems of government or financial management, or public consciousness, etc.

Information as a product of human consciousness is immaterial and can only exist within a material medium. It is necessary to distinguish between relations regarding information, information carrier and information available on a material medium. Based on the definition of the main features of the concept of "information," we believe that information is an intangible object, perceived by human consciousness, representing information about phenomena occurring in society and nature, and the process of transmitting specific information or facts to any subject [2].

The "cybercrime" includes any crime that is committed in the information environment and can be carried out from anywhere in the world using the Internet and, accordingly, a feature of the commission of cybercrimes is their transborder nature. The cross-border nature of cybercrime creates unique opportunities for criminals to commit their illegal actions. In addition, the constant development of ICT and emerging technologies such as artificial intelligence or 5G will contribute to a further high growth in opportunities for crimes in cyberspace.

One of the important conditions for an effective response to international computer crimes is the creation of an international system and a common international policy to combat cybercrimes. This issue is included in the agenda of a variety of influential international organizations and forums such as the UN, Council of Europe, EU, SCO and CIS.

The significance of cyberspace and the possibility of threats have been recognized by the UN and the international community, but to date it has not been possible to reach a single agreement on cybercrime. Within the framework of the UN in 1985 the document "Study on Security Concepts" [3] was published, and in the chapter of this document "Problems and Threats in In-

ternational Security” information threats were not mentioned. But the widespread use of the Internet, and at the same time the emergence of new threats in the cyber sphere, gave impetus to the development of resolutions in the field of preventing the use of information technologies for purposes incompatible with the objectives of ensuring international stability and security. The UN recognized the importance of ICT in 2000 in the Report of the High-Level Panel of Experts on Information and Communications Technology. The problem of cybercrime became the subject of discussion in a specially created working group of the 10th UN Congress on Crime Prevention and Punishment of Offenders, held in April 2000 [4].

In 2002, the UN adopted resolution 57/295, called “Use of information and communication technologies for development” [5]. The resolution confirmed the desire to develop a unified strategy in the field of ICT. It should be noted that on December 27, 2019, the UN General Assembly adopted a resolution on combating cybercrime entitled “Countering the use of information and communication technologies for criminal purposes” [6]. According to the document was established a special open-ended intergovernmental committee of experts representing all regions to develop an international convention on combating the use of ICTs for criminal purposes. The authors of the resolution emphasized the need for improved coordination and cooperation between states in combating the use of ICTs, including by responding to requests from developing countries for technical assistance in improving their national legislation and regulations.

Within the framework of the World Summit on the Information Society (WSIS), held under the auspices of the UN in Geneva in 2003 and in Tunis in 2005, the problems of combating cyberterrorism were identified. At the second stage of the WSIS in Tunisia in November 2005, two final documents were adopted: political (“Tunisian Commitment”) and legal (“Tunisian Agenda for the Information Society”). In paragraph 15 of the Tunisian Commitment, states officially recognize “the need to effectively counter the problems and threats arising from the use of ICTs for purposes that are incompatible with the objectives of maintaining international stability and security and may have a negative impact on the integrity of infrastructure within individual states to the detriment of their safety. It is necessary to prevent the abuse of information resources and technologies for criminal and terrorist purposes and respect human rights” [8].

The Tunis Agenda for the Information Society [7] identified the importance of prosecuting cybercrime, including cybercrimes committed within the jurisdiction of one country but having consequences in another, and called on governments, in collaboration with other stakeholders, to develop the necessary legislation to enable investigation and criminal prosecution of cybercrime, referring to existing international instruments (UNGA resolutions 55/63 and 56/121 on combating the criminal use of information technologies). Also, in paragraph 42 of the Tunisia Program, states confirmed that measures taken to ensure the stability and security of the Internet, to combat cybercrime and counter spam,

must ensure protection and compliance with the provisions on privacy and freedom of speech, which are contained in the Universal Declaration of Human Rights.

It is necessary to emphasize the role of the international agreement “Okinawa Charter for the Global Information Society” adopted in 2000 in the fight against cybercrime. The Okinawa Charter for the Global Information Society specifically states: “The efforts of the international community aimed at developing the global information society must be accompanied by concerted efforts to create a safe and crime-free cyberspace” [9].

Within the framework of the Council of Europe, the development of an international legal framework has been carried out for more than 30 years. From 1985 to 1989, the Separate Committee of Experts on Computer Crimes of the Council of Europe worked on the problem of computer crimes. Based on the results of the committee’s work, the Council of Europe adopted recommendation No. 11(89)9 of September 13, 1989, the content of which is largely similar to the document of the OECD committee discussed above. The document offered only lists of actions that constitute cybercrimes, but did not define the general concept of a crime in the cyber sphere. The first significant international agreement adopted within the Council of Europe is the Convention on Computer Crime, which was adopted in Budapest on November 23, 2001 and entered into force on July 1, 2004[10]. The document was drawn up by the Council of Europe in Strasbourg (France), with the active participation of the Council of Europe observer states of Canada, Japan, the Philippines, South Africa, and the USA [11].

It should be noted that the main direction of the Convention is to activate the fight against cybercrime, which stipulates intensive cooperation between law enforcement agencies of different states, and provides law enforcement agencies of the participating states with broad powers. At the same time, many experts believe that the broad powers granted to law enforcement agencies may cause some difficulties for states with liberal legislation to join the Convention.

On January 28, 2003, in Strasbourg (France), the Additional Protocol to the Convention on Computer Crime was adopted to criminalize offenses related to racism and xenophobia committed through computer systems, which entered into force on March 1, 2006.[12] According to Article 2 of the Additional Protocol, racist and xenophobic material means any written material, any image or any other representation of ideas or theories that promotes, promotes or incites hatred, discrimination or violence against any person or group of persons, if as a pretext factors based on race, color, national or ethnic origin, and religion are used.

On May 15, 2022, the Second Additional Protocol to the Cybercrime Convention, concerning enhanced cooperation and disclosure of electronic evidence, was adopted in Strasbourg (France).[13] The Second Additional Protocol to the Cybercrime Convention provides a legal framework for the disclosure of domain name registration information and for direct cooperation with service providers regarding subscriber information, effective means of obtaining subscriber information and traffic data, immediate cooperation in emergency situations, mutual assistance tools, as well as guarantees for the protection of personal data.

Within the CIS, the first international agreement in the fight against cybercrime is the Agreement on Cooperation of Member States of the Commonwealth of Independent States in the Combating Crimes in the Sphere of Computer Information, adopted on June 1, 2001 in Minsk. The agreement defined concepts such as “computer crime,” “computer information,” “malware,” and “illegal access.” This agreement ceased to apply on the date of entry into force of the Agreement on Cooperation of the Member States of the Commonwealth of Independent States in the Combating Crimes in the Field of Information Technology dated September 28, 2018, which was concluded in Dushanbe [14]. The purpose of the agreement is cooperation between the participating countries in order to ensure an effective fight against crimes in the field of information technology, and the desire to create a legal basis for cooperation between law enforcement agencies of the Parties in the fight against crimes in the field of information technology. The document defines such concepts as malicious program “information technology”, “information system”, “computer information”, “unauthorized access to information”.

Since 2006, within the SCO there has been a group of experts from member states of the Organization for International Information Security, which is a permanent body of the SCO and works to coordinate relevant ministries and departments. In turn, the foundation for cooperation between the SCO countries in the field of information security is the intergovernmental Agreement on cooperation in the field of ensuring international information security, signed on June 16, 2009 [15]. In November 2020, a Joint Statement of the Heads of SCO Member States on cooperation in the field of ensuring international information security was adopted. In 2021, following the results of the SCO anniversary summit in Dushanbe, a Plan for interaction between the SCO countries on ensuring international information security for 2022-2023, developed with the active participation of Uzbekistan, was signed. Currently, all SCO countries, without exception, are implementing national strategic and conceptual documents aimed at developing a digital society, transferring public administration, the financial and economic sector to a digital format.

In our opinion, in order to eliminate numerous international legal conflicts caused by the cross-border nature of cybercrimes, it is necessary to develop a universal international agreement in the fight against cybercrimes, containing provisions regarding the relationship and priority between international and national principles and norms, especially regarding liability for cybercrimes. It follows from this that the development of a Single International Agreement within the UN will have to contribute not only to the effective coordination of the actions of states in the fight against cybercrimes, but also to the formation of an international institutional mechanism in the field of interstate cooperation to combat cybercrimes.

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*LLM /Master of International Business Law/**GN Group / Vazgen Sargsyan 2, Yerevan, Armenia/*[DOI: 10.5281/zenodo.8414816](https://doi.org/10.5281/zenodo.8414816)**Abstract**

A history of corporate governance (CG) research demonstrates that it has been essentially devoted to Anglo-Saxon large corporations. Thus, the study of CG systems was conducted within a particular national institutional context of formal rules and informal rules. It, therefore, led to the promotion of mechanisms such as the board of directors as well as managers' markets and takeovers. The opposition between the disciplinary and cognitive functions of governance that support the presentation of the different micro theories, could also, in the continuum, identify the analysis of national systems of corporate governance (NSCG). This dichotomy would result, in the presentation of disciplinary analysis of the NSCG that presume that the essential influencing factor of efficiency – often measured according to the productive perspective by the growth of the national economy – is based on the protection of the interest of the different contributors of production factors, with precedence given, under the influence of the shareholder view, to financial investors. [4]

Keywords: Corporate governance, corporate law, international business law

The analysis supporting the disciplinary perspective based upon the appropriation of organizational rents and the protection of the financial investor's rights are of financial origin. They begin with the hypothesis that the financial system plays a central role in explaining economic growth and prosperity. The influence of the system in relation to information and transaction costs is exercised through five functions:

- Risk management: the facilitation of the trading, hedging, diversification, and pooling of the risk;
- Allocation of resources;
- The monitoring of managers and control of corporations;
- The mobilization of savings; and
- The facilitation of the exchange of goods and services. [4, p.17]

Within a financial perspective, efficiency depends on the protection of the financial investor's rights against attempts at expropriation by the managers and dominating shareholders. When contrasting the US corporate government system with the European Union one it essential to outline that in all the Member States under consideration, there are significant legal controls on the activities of the directors and managers, which are intended to ensure that officers act within their powers, and conduct their business efficiently. Such controls vary in detail and in the sanctions provided for in case of the breach. [2, p.18]

One aspect of the consideration of the role of corporate governance is that the ownership structures of European and US companies even historically is very difficult. The primary difference is that the European companies in general do not display the same diversity of share ownership as US companies do. But, surely, there are more other differences among them. [4, p.20]

Discussions relating to the corporate law in the United States are discussed very often, but are rarely understood. Mainly the reason for is that it is not regarded as a part of the federal law and, therefore, to say that there is any concrete government agency to enforce it actively, is not so. In general, corporations can be formed when one or more investors transfer their assets

into a specific separate account (i.e. the corporation) and, therefore, in exchange the investors are granted a divisible common interest (i.e. shares) on that account. The consequence of those two concurrent operations is the "separation" of share ownership from both corporate ownership and corporate control of those assets. Surely, corporate law contains certain provisions that regulate corporate constitutions as well. Those particular provisions aim to deal with corporation's preparations for the exercise of control as well as monitoring over the corporation's accounts, i.e. arrangements for putting forward and into effect specific decisions concerning the disposition of all corporate assets. [4, p.20] Corporate directors, who are the shareholders' elected representatives, delegate authority to corporate officers the obligation to manage corporate affairs in the ordinary course of business. At any rate, there are included also some provisions that touch personal liabilities of directors and officers for actions committed in their corporation's name and for its account. [2, p.21] Basically, corporate directors as well as officers can become personally liable in case of failing to perform their duties with "due care" and "loyalty" on behalf of the corporation. [4, p.71]

Under the corporate law, the control of corporations by shareholders is limited simply with the election of directors and auditors – often nominated by the Chief-executive officers (CEOs), and relying on the following provision of corporate law, directors, typically limit their role with selecting CEOs and after with supervising their performance and productivity. The only additional element to shareholders' and directors' control is that they make decisions on matters outside the scope of the ordinary course of business of the corporation, i.e. changes that may occur in terms of the corporation's operating business, mergers, acquisitions, divestments as well as the payment of dividends. In respect of those kinds of situations, shareholders and directors, basically, make their decisions relying upon the proposals or professional suggestions initiated by their CEOs. In any event, neither shareholders nor directors in the United States have any authority to take

any measures in the corporation's dealings with third parties. All these types of activities are actualized by the CEOs. More to this point, no one but only they can sign documents and generally act in the corporation's name. In other words, they are deemed to be like "legal representatives" of the corporation. Notwithstanding, it is to be noted that the CEOs may delegate to other corporate officers the power to make and also actualize certain decisions. [4, p.75]

Corporate officers have an obligation to report to their corporation's directors and shareholders' representatives. This duty is based upon the concept of separation of corporate ownership and corporate control. "While corporations might incur liability to individuals and other corporations under the law of general obligation or contract law for their CEOs to act in their corporations' names and for their accounts, CEOs do not incur any liability to other individuals or corporations in terms of three those acts." [2, p.30] At long last, the CEOs and other officers can be considered lawfully responsible by the United States government and even subject to criminal sanctions in case they break a government regulation when carrying out their obligations on behalf of organization. More clearly stated, corporate officers are subject to two types of performance standards, generally called as "fiduciary duties" which are, the "duty of care" and the "duty of loyalty". [4, p.75]

By receiving the appointment, every single officer is bound to the "duty of loyalty" in all commitments he undertakes on behalf of corporations: i.e. the officers will avoid "conflicts-of-interest" between their corporations' interests and their own ones. It is of high importance to act upon this duty because in case the tort to that occurs, depending on the essence of the consequences, the officer may be subject up to criminal sanctions.

By accepting the appointment, they are bound also to "duty of care" the application of which to officers' decisions is subject to the "*business judgment*" rule. Accordingly, courts apply the duty of care on the basis of the facts that are reasonably open to officers at the time that they are making and/or implementing their decisions, but not on such basis of facts as that the officers could not have known, even if they had been showing conscientiousness. [2, p.30]

It is to be outlined the fact that directors also are subject to demonstrate the same performance of standards that are applicable to officers. In other words, directors, as well have to apply the "duty of care" and "duty of loyalty" when perform their obligations in corporation. Notwithstanding, there is an essential difference. The applied standards to corporate officers are "professional" standards in contrast to those applicable to directors which are lower, "unprofessional" ones. By restating this thesis, corporate officers are obliged to demonstrate the care and loyalty of corporate officers, while directors are expected to demonstrate ones of a reasonable person. [4, p.81]

Various models got from the European legislation that accommodate employee stakeholder-ship are portrayed here, as the Proprietary Interest Model, the Management – Labor Consultative Model, which will

incorporate within its rubric a consideration of worker participation on boards of directors, and finally the Trade Union model building on existing trade union structures and consequently regulation thereof. [6]

One of the fundamental provisions in this set of rights is the protection which is given to employees from dismissal without cause. Additionally, certain grounds for dismissal will be outlawed completely. Thus the employer will have to present some reasons for dismissals and basically, go through a standard set of warning procedures before dismissal occurs in the first instance. All EU member states have this type of legislation as part of their employment law. More essentially, in the context of concerns that CG writers express, particularly in the United States, about accountability of management regarding decisions to close plants, European labor legislation also protects the worker in redundancy situations by mandating certain payments and certain consultative procedures. In comparison with the US, its "employment-at-will" doctrine has evolved from a strong commitment to the contractual concepts of equal bargaining power and freedom of contract. It has been maintained in many states, due to the strong arguments made in favor of this approach, particularly in the academic sector [9]. Additionally, it has been argued when the state intervene in such matters, distorts and weaken the dynamics of private bargaining. More to the point, it has been debated that the employees have the capacity to protect themselves through bargaining and that there will be a tradeoff between such states mandated rights and other benefits. [6, p.20-21]

Germany

The most essential feature of the German ownership system, which has equivalents elsewhere, most notably in Japan, is the role of the banking sector. Particularly, the role of institutional investors is limited if compared with the role incurred by banks that exercise a dominant influence disproportionate to their actual ownership. The background for this dominance is based upon the fact that German banks are the beneficiaries of a kind of "proxy system" whereby shareholders delegate voting to the bank through which their brokerage business is conducted. Also the voting system and process in Germany has entire differences from what exists in "Anglo-American" model. In Germany there is no proxy system whereby management exercises the shareholders' voting power, and they vote their own shares or shares are voted by institutions, basically banks, as "custodians" for their shares. [2, p.28-29]

In Germany, all corporations as well as limited liability companies employing over fifty employees are operated by the two tier-board system. Employees, in their turn, are represented on the supervisory board; the number of labor representatives depends on, specifically, the number of employees. The management board of the two-tier system is appointed usually for a five-year term and is controlled in terms of ability to dismiss by the supervisory board. However, the management can only be dismissed prematurely for cause. This is viewed as being one factor in the unpopularity of hostile takeovers as a form of management control. Secondly, the meetings of shareholders have a distinct

role in the large German corporation in contrast to the Anglo-American models. [2, p.28-29] The power of shareholders' meeting is limited to decisions regarding approval of accounts, distribution of half of the annual balance sheet profits, election of half the members of the supervisory board and decisions concerning specific structural changes. [4, p.81]

"The powers of management in a German private company are divided between the manager and the general meeting, in accordance with the provisions of the *GmbH Gesetz*, and the articles of the company. When a private company has a few members who are also managers, the shareholders may be able to take decisions falling within the powers of the managers and the general meeting whenever they meet." [3, p. 265]

The double board system has long been an essential feature of German law relating to the public company. The main meaning is that the management board is entrusted with the function for managing the company, whilst the supervisory board has a controlling task. Members of the management board are appointed by the supervisory board for renewable periods that do not exceed five years term. The essential role of the supervisory board also includes the preparation of annual financial statements. [3, p.269]

France

In France [10, p.7] the basic Company Law Code in operation at present was enacted in 1966. French Company Law allows for a one or two-tier management board. Labor representation is mandated for state enterprises but not for private enterprises. If a *Societe Anonyme* employs more than fifty a "works council" must be established whose members are elected exactly by the employees. Afterwards, the works council is entitled to send two of its members to meetings of either the management or supervisory board as non-voting observers. Notwithstanding, it is ordinary for companies with works councils to have preliminary board meetings without the representatives of the works council. This inherent challenge in co-determination arising from essential differences between employee and management constituencies has been recognized as a difficulty with employee representation. [2, p.29]

A French SARL is managed by managers put under the control of shareholders. The managers must be natural persons but not members of the company or French citizens. It is to be noted that the first managers are appointed by the articles, and then, all subsequent appointments are made by resolutions passed by the members in general meeting. The managers may act on behalf of the company in all circumstances, but must not do such acts that the law reserves to the members, or which are contrary to the company's articles outside the scope of managing the business which it carries on. [3, p.269]

The members' power to dismiss managers is one of high importance, because no more than six months after the end of the fiscal year they have to approve the company's accounts, which consist of the manager's reports, inventories of assets, balance sheet. The managers need to send to each of shareholders no less than fifteen days prior to the annual general meeting a duplicate of the company's trading account, profit and loss

account, balance sheet and managers' report for the proceeding financial year, together with the report of auditor on the accounts and any group accounts, as well as the text resolutions to be proposed at the meeting.

"Directors, managing directors, and the executive officers of public companies adopting the traditional single board system as well as members of the executive supervisory boards of such companies employing the double board system are subject to a number of statutory controls which have features in common. The purpose of the strict rules that govern agreements between such persons and their company is to avoid a conflict between the personal interests of the persons concerned and their duties to the company." [3, p.270]

In case where the company has a traditional structure, and the agreement is with the managing director, one of the directors, or executive officers, or the holder of shares carrying more than ten per cent of the voting rights, it must receive the prior approval of the board of directors before execution. If it is directly between a member of the supervisory or executive board and the company, or between a person possessing more than ten percent of the voting rights and the company, before execution there the general meeting must approve it. The same situation is where such persons are indirectly interested in a contract with the company.

Position of shareholders: The shareholders in general meeting are treated as being the supreme body of the company. However, shareholders' meeting may not usurp the powers belonging to the chairman or executive board. The annual meeting falls within the former category, as does a meeting called to pass an ordinary resolution. [2, p.31] Shareholders may act either individually or collectively, and thus they may exercise specific rights. Particularly, individual shareholders have rights to obtain access to particular documents in case it is necessary. Shareholders that hold five percent or more of the company's capital and shareholders' association, also have rights in terms of submit questions to the chairman of the board of the directors or the executive board about one or more management transaction. [3, p.272]

United Kingdom

It is now recognized generally that although there is no question of the total approximation or harmonization of the company law of the Member States, a considerable body of European Company Law has been brought into existence. [1]

The division of powers between the general meeting and the board is in principle a matter for the articles. The position may be contrasted that in the United States and many other European countries, where certain functions are treated as managerial ones, must be entrusted to the board. [1] Fiduciary duties are owed to British companies by the directors which are not much closely paralleled in other European jurisdictions, apart from the Republic of Ireland. It is accepted that the interests of the company include those of present and future shareholders and when the companies are insolvent or on the brink of the insolvency, the interests of the creditors. "If directors use the power conferred by the articles for a purpose other than that for which it was conferred, their conduct may be impugned, and they

may not avail themselves of the defense that they honestly believed that what they did was in the interests of the company. The present rule is applicable even when the directors derive no profit from the transaction, and believe themselves to be acting bona fide in the interests of the company.” [3]

One important corporate control is placed on directors and shadow directors. Directors or shadow directors may be liable for fraudulent and/or wrongful trading. [12] It makes such persons personally liable to contribute to the assets of a company which has gone into indirect liquidation if at some time before the commencement of the liquidation, they knew or ought to have concluded that there was no responsible prospect that the company would avoid going into insolvent liquidation. [1, p.109]

Directors also incur liability if they are responsible for negligently managing corporate affairs. The earlier decision on the required standard of care and skill tended to impose a subjective criterion based upon the degree of care and skill they might be expected of a person of the director's knowledge and experience. However, an objective standard of care and skill is now required of directors employed under a service contract. The same is true of non-executive directors, who do not have such a contract. [3, p.268]

The formal rules about holding general meetings often prove to be ignored in the case of the private companies, and the stipulations of section 336 of the Act which provide that there should be annual general meeting in public companies, do not apply to private companies. In principle, if the directors are responsible for the breach of duty, the general meeting has to decide whether to take actions against them, and a minority shareholder cannot normally bring an action on the company's behalf if the members in general meeting choose not to do so.

“Vote-less” shares may be less common than they formerly were in the United Kingdom: shares may, nonetheless, have various voting rights attached to them, and shareholders' voting and other agreements are commonplace in private and joint companies. In private companies, the directors often hold the majority of shares, and the general meeting, may prove to be an ineffective control over their activities, this may be the case in certain public companies as well. [2]

Conclusion

The European companies in general do not display the same diversity of share ownership as US companies do. However, this is not true for the United Kingdom and to a lesser extent, Ireland, where companies which are quoted on the London or Dublin stock exchange display characteristics similar to US quoted companies in terms of ownership. Interestingly these countries share a common law heritage with the US. Overall, the public equity markets are not in general the primary source of capital for many Europeans companies. In Europe a trend towards privatization has added to the “phenomenal growth” of equity markets in a number of OECD countries in Europe. This has been further fueled by “a growing process of disintermediation in the financial markets, shifting savings from the banking sector to equity (and bond) markets.” [7] On the other hand, growth

in institutional shareholding has probably led to a decrease in diversity of share ownership in the US, with latest figures showing that “less than 100 large non-bank financial institutions hold approximately 20% of the top 20 more liquid markets in the world. Despite evidence of convergence, it must be emphasized however, that figures for stock exchange turnover show a marked difference between the level of stock exchange activity in Europe overall (32,500m Euro for 1998) and the US (13bn Euro for 1998).” [8]

Three hypotheses are presented here. Firstly, it is now accepted that the various ownership structure of continental European companies compared with the ownership structure of US companies, determines how monitoring of management takes place. “If to accept the capital markets theory of management accountability, which is put forward in relation to US companies, it is clear that in view of the fact that European companies are not the subject to the same sort of activity on the equity markets this theory will not readily apply in the European context. Thus these markets could not be described as a forum in which management performance could be assessed. Similarly, most European companies do not operate in a market which allows or indeed permits an active take-over culture of the sort which dominated US corporate culture, particularly in the 1980s.” [2, p.108]

A second hypothesis is that various types of ownership structures have had a significant impact on the acceptability of including other constituencies as stakeholders. The argument is that ownership structures of European companies have facilitated a more tightly controlled method of CG system, that permits, for instance, close monitoring by creditors as stakeholders. This, in turn, has allowed for a more open acceptance of some level of monitoring by other stakeholders such as employees.

And finally, it is debated that the more tightly or closely held ownership of European companies has, in a political sense, facilitated a corporate culture which is more open to the influence of centralized planning by government authorities, whether this is at national level or at EU level. [2, p.110] Present governance structures in European companies have a significant impact on the acceptability of the type of planning evidenced by EU policy documents.

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MEDICAL SCIENCES

EVALUATION OF THE ORAL HEALTH KNOWLEDGE ACCORDING TO THE REGIONS

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Abstract

Health is the universal human necessity for every group of society. For assessment of the general health condition it is significant to assess the oral cavity health. No less important is to assess the level of knowledge. Accordingly, the goal of our research was to evaluate the level of knowledge. The research was held in Tbilisi dental clinics. The material was collected based on the questionnaires, drawn up by us. The knowledge level about the oral cavity issues is low among the patients. In standard variation the level is lower than the medium one. In different patient groups there were different levels of knowledge. Statistically significant difference was observed among the employed and unemployed men/women. As a result of our research we have found, that the knowledge level, concerning the oral cavity hygiene and the oral diseases, was comparatively high among the men and employed patient groups.

Keywords: oral health, knowledge level, health determinant, awareness.

Introduction

Health is an universal human need that applies to all levels of the social hierarchy. The oral health status is important for the assessment of the general health condition. Assessment of the level of knowledge is of equally importance.

The aim of the present research was to evaluate the extent of oral health knowledge. The research was conducted in the dental clinics of Tbilisi and Rustavi, the material was collected using the survey-questionnaires, designed and prepared by us.

The level of oral health knowledge among patients is low, falling below the average standard across the entire spectrum of variation. The level of knowledge appeared to be different among the patient groups; statistically significant differences were observed between the employed and unemployed individuals, as well as females and males.

The study revealed that the level of knowledge about both oral hygiene and oral diseases is relatively high among the males as well as the employed patient group.

The aim of the present research is to explore and assess the extent of oral health knowledge among the population of Tbilisi and Rustavi.

Materials and Methods:

Selection Methodology: the persons involved in the research were selected among the patients of the dental Clinics in Tbilisi and Rustavi.

The research inclusion criteria encompassed:

- Patient age: 17 years and above;
- First visit to the clinic;

- Ability to speak, write and read Georgian.

Upon meeting the research inclusion criteria, patients were provided with a questionnaire. (Amornphimoltham P, et al., 2011). The distinctive aspect of this process was that the patients independently completed the questionnaire without any assistance. This approach also served as a benefit during the pilot phase. On one hand, it prevented from bias at filling in, and on the other hand, it gave the opportunity to reveal the difficulties that may arise in the process of implementing this type of research.

Based on this, a special approach has been developed: as it is known, dental and soft tissue diseases are leading among oral diseases, in particular, caries, its complications and periodontal diseases. (E. Borovsky. et al., 2010), Both nosologies can be prevented and managed effectively. Through examination of the oral cavity, it is possible to identify the precise location and distribution of the defect. (E. Borovsky. et al., 2010) The survey carried out on the selected sample was based on the questionnaire specifically designed for this purpose. The questionnaire was based on the international experience existed in global practice of researching this specific issue. The questionnaire, as a research tool, was developed encompassing all necessary aspects to effectively measure the phenomenon under study and to achieve the goals and objectives of the research. (Announcement: NIDCR Supplement to the Journal of Public Health Dentistry on Behavioral and Social Intervention Research Essentials, 2014). The survey questionnaire was of mixed type, including closed-ended and open-ended questions. The responses

received for the questionnaire survey were assessed using a points-based system and 2 main gradations were given: 1 point for each correct answer and 0 point for incorrect answer, respectively. (Aida J, et al.,2014)

The level of knowledge was assessed in 3 categories:

- ▶ No knowledge 0-3 points;
- ▶ Average knowledge 4-10 points;
- ▶ Proficient Knowledge 11-20 points.

Here, it should be noted that incorrectly circled answers, that is, not non-circled, but wrongly circled answers were classified as "incorrect" knowledge and were assigned "0" point. Hence, the possible versions were interpreted as "Proficient knowledge", "Average knowledge" and "No knowledge", including erroneous knowledge in the last category.

▶ The data collected through the survey were entered into the database and subjected to statistical processing, using descriptive statistics.

▶ The mean and standard deviations were calculated, the comparison between the groups was carried out through correlation coefficients and χ^2 test, after calculating the coefficients, the p value was recorded.

▶ During the research, 3600 questionnaires were handed out in the districts of Tbilisi and Rustavi, according to which the number of patients was distributed as follows:

- ▶ Krtsanisi - 1440 primary patients;
- ▶ Vake - 120 primary patients;
- ▶ Saburtalo - 720 primary patients;
- ▶ Rustavi - 1320 primary patients.

437 patients refused to participate in the study, and the questionnaire filled by 612 patients was incomplete, and these patients and their data were withdrawn from the research. Ultimately, 2551 survey-questionnaires were fully completed and the data derived from them were incorporated into the database. The structure of the interviewed patients presented here was based on the characteristics investigated in the groups of women and men. These characteristics encompassed employment, education and social status.

The female patients, interviewed according to the employment status, were distributed as follows: out of 1816 interviewed women 307 were employed in the state structures, 580 - in the private sector, 420 were self-employed, 137 had their own business, 314 - housewives, and 58 - unemployed, respectively.

Distribution of the male patients, interviewed according to their employment status: 87 out of 735 interviewed men were employed in the state structures, 210 - in the private sector, 170 were self-employed, 250 had their own business, and 18 were unemployed, respectively.

Distribution of the patients interviewed according to their educational status:

Among the women interviewed:

1. Completed secondary education – 618;
2. Incomplete secondary education – none;
3. Completed higher education - 598;
4. Incomplete higher education - 138;
5. Vocational and technical education - 432;
6. Scientific degree - 27;

7. Master's degree – 3.

Among the men interviewed:

1. Completed secondary education – 187;
2. Incomplete secondary education – none;
3. Completed higher education – 318;
4. Incomplete higher education – 13;
5. Vocational and technical education – 214;
6. Scientific degree – 1.

Distribution of the patients interviewed according to social status:

1. Married - 998 women and 408 men;
2. Single - 422 women and 218 men;
3. Divorced - 128 women and 94 men;
4. Civil marriage - 249 women and 13 men
5. Widowed - 19 women and 2 men.

The Results:

Following the characterization of the study population, the next step involved evaluating their knowledge level regarding oral health. The survey results showed the followings:

- 0-3 points - 677 women and 180 men
- 4-10 points - 733 women and 274 men
- 11-20 points - 406 women and 281 men

According to the results of the research, 34% of the interviewed patients had no knowledge about the oral health, 39% demonstrated average knowledge, and only 27% of the interviewed patients were acquainted about the oral health (have knowledge).

Consequently, the surveyed patients were predominantly composed of individuals who either had no knowledge about oral health or possessed an average knowledge. Only a small percentage of the respondents have knowledge about the oral health.

The fact that the percentage of oral health knowledge was higher among interviewed men in comparison to women piqued particular interest. To verify our practical assumption, statistical analysis on the acquired data has been conducted. The resultant findings were as follows:

Statistical Analysis of Materials:

Data processing using χ^2 -test showed that the respondents with 0-3 points - "no knowledge" were more reliably identified in the group of women compared to men.

$$\chi^2 = 38,367$$

$$p < 0.0001$$

There was no significant distinction observed between the groups when analyzing the data of respondents with 4-10 points - "average knowledge"

$$\chi^2 = 2.0836$$

$$p = \text{NNS (non-significant - unreliable)}$$

Similar to that of the groups of women and men, the knowledge levels were categorized and presented according to employment, education, and social status.

The data for respondents scoring between 11-20 points - "knowledge," showed a statistically significant difference between the groups of women and men, and women's sample displayed lower knowledge levels.

$$\chi^2 = 72,599$$

p<0.001

Consequently, following the analysis of data extracted from the questionnaires of interviewed patients (Arantes R, et al., 2010), the following information has been obtained: the interviewees generally demonstrated a low level of oral health awareness, the patients either don't have or have an average and insufficient knowledge. Among the respondents, the level of knowledge is reliably higher among men compared to women. This important fragment of the research would be of little value without the second equally crucial part, complementing and completing our research on informing population about oral health and highlighting its significance.

During the research process, after assessing the awareness of the population and gauging their level of knowledge, disparities in oral health were identified among the groups of interviewed patients.

After studying oral health in patients with varying levels of knowledge (high and low), the following findings have been revealed:

Oral health was measured by DMFT (decayed, missing, and filled teeth) (E. Borovsky. et al., 2010), gingivitis (M. Iveriel, et al., 2012) and periodontal indices: (M. Mamaladze, et al., 2011.)

Measured by DMFT index

- ▶ Low level was found in 1302 patients (51.0%),
- ▶ Medium level - 321 patients (12.6%),
- ▶ Satisfactory - 928 patients (36.4%).

To assess the oral health status, the following criteria were used - the correlation between the DMFT index categories and the knowledge assessed by questionnaire scores. This research revealed a strong and statistically significant inverse correlation between the DMFT index and the questionnaire scores - $r = -0.8150$, $p < 0.001$.

The correlation between the gingivitis index and the level of knowledge assessed by questionnaire scores has been measured. This research showed that the gingivitis index has a reliable inverse correlation with the latter - $r = -0.5913$, $p < 0.001$

The correlation between the periodontal index and the level of knowledge assessed by questionnaire scores has been measured. This research also showed that the gingivitis index has a reliable inverse correlation with the latter - $r = -0.2963$, $p < 0.001$

Obtained Results and Discussion

Based on the research findings, it can be affirmed that there is a statistically significant association between the oral health status and the level of knowledge

within the interviewed group. Moreover, analyzing the groups categorized by knowledge level (poor, average, and good), it became evident that the patient groups with poor and average knowledge exhibited poor oral health, and this correlation proved to be statistically reliable.

The level of knowledge among the patients surveyed regarding oral health issues is low.

A total of 34% have no knowledge about the oral cavity, while 39% possess an average level of knowledge. Only 27% of the respondents have information about oral health status, with lower awareness observed among women compared to men.

There is a statistically significant association between oral health status and the knowledge level; In the groups of individuals with poor and average knowledge, oral health tends to be poor, while in those with good knowledge, the relationship between the oral health state and the level of knowledge was not statistically reliable. This implies that poor knowledge is evidently a contributing factor to poor health.

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ON THE QUESTION OF OBESITY IN CHILDREN AND ADOLESCENTS

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The new WHO European Regional Obesity Report 2022, published on 3 May by the WHO Regional Office for Europe, reveals that overweight and obesity rates have reached epidemic proportions across the Region and are still escalating, with none of the 53 Member States of the Region currently on track to meet the WHO Global Noncommunicable Disease (NCD) target of halting the rise of obesity by 2025.

The report launched at a press event on 3 May and presented at the European Congress on Obesity, reveals that in the European Region, 59% of adults and almost 1 in 3 children (29% of boys and 27% of girls) are overweight or living with obesity. Obesity prevalence for adults in the European Region is higher than in any other WHO region except for the Americas.

Overweight and obesity are among the leading causes of death and disability in the European Region, with recent estimates suggesting they cause more than 1.2 million deaths annually, corresponding to more than 13% of total mortality in the Region [1,4].

Obesity increases the risk for many NCDs, including cancers, cardiovascular diseases, type 2 diabetes mellitus and chronic respiratory diseases. For example, obesity is considered a cause of at least 13 different types of cancer, and is likely to be directly responsible for at least 200 000 new cancer cases annually across the Region, with this figure set to rise further in the coming years. Overweight and obesity are also the leading risk factor for disability, causing 7% of total years lived with disability in the Region.

Keywords: obesity in children and adolescents, rational nutrition, menu

Obesity is a disease – not only a risk factor.

Over the past few decades, there has been a tendency towards a rapid increase in the number of obese children and adolescents worldwide [5]. The number of obese children and adolescents aged 5 to 19 years increased from 11 million in 1975 to 124 million in 2016, and 213 million were overweight in 2016 [3,4].

Over the past few decades, there has been a trend towards a rapid increase in the number of children and adolescents with obesity around the world. The number of obese children and adolescents aged 5 to 19 has increased almost 20-fold since 1975. To find better solutions to this problem, quality data is needed [2,5].

The WHO European Office for the Prevention and Control of Noncommunicable Diseases (NCD Office) is organizing a webinar to present a new Childhood Obesity Surveillance Initiative (COSI) report. Its findings are based on the latest WHO data gathered in 2018–2020 in 33 countries. In total, almost 411 000 children aged 6–9 years were measured. Starting this 2023 year, Azerbaijan also joins in reporting on this issue.

This initiative is made possible through a vital collaboration between WHO/Europe and research and public health institutions across the European Region.

To contribute to the fight against this problem, we conducted a study. The purpose of these studies was to

compile a menu for school-age children, taking into account not only age, energy costs, but climatic living conditions and national characteristics of cuisine.

The research was conducted based on personal data from schoolchildren in three districts of the city of Baku. The obtained data were statistically processed by the Tietjen-Moore and Student's T-test methods and were found to be reliable.

Our research was based on the principles of rational nutrition. Rational nutrition is a balanced diet, compiled taking into account gender, age, health status, lifestyle, the nature of work and professional activity of a person, and the climatic conditions of his residence.

What does a balanced diet include?

➤ Lean meat (beef, mutton, rabbit) no more than 2 times a week. A single serving in finished form is 60-80 g.

➤ Poultry 5 times a week. A single serving in finished form is 60-80 g.

➤ Fish/seafood 2-3 servings per week. A single serving in finished form is 60-80 g.

➤ Eggs, depending on concomitant diseases, from 3 to 6 yolks per week. Protein every day.

➤ Olive or other vegetable oil - with each main meal, 2 times a day. Single serving 5-8 g.

➤ Vegetables 3-4 times a day. Raw, stew, in soup, etc.

➤ Fruits/dried fruits 1-2 times a day. Fruit up to 200 g or 50 g of dried fruit.

➤ Bread/cereals/side dishes 3-4 rubles/day. One serving of bread 30-40 g, ready-made side dish - 80 g. Choose buckwheat, brown/wild rice, durum wheat pasta, quinoa, bulgur and other healthy complex carbohydrates.

➤ Legumes 1 serving per week. Single serving in finished form - 80 g.

➤ Unroasted nuts 1 serving per day. Single serving no more than 25 g.

The nutrition of a schoolchild, both at 7 years old and at 12 years old, should be correct and balanced. In order to maximally supply the body with all the necessary substances, several nuances should be taken into account. Throughout the day, the child should receive the amount of calories that the body expends. Food should be varied. In addition, the diet is balanced. It is imperative to take into account the individual characteristics of the body. Animal protein entering the body should be at least 50% of the total amount. There are 3 times more carbohydrates than proteins and fats. The maximum amount of fast carbohydrates (sweets, cakes) for each day is 15% of the total amount. Be sure to develop a diet to eat regularly. Mandatory consumption of potatoes and cereals. Several times a calendar week, fish should be present on the child's table. Red meat is present in the diet at least 2 times. You should dilute your food with legumes several times. Your child should eat fruits and vegetables every day. Milk-based products should be present every day. It is advisable to add food additives as rarely as possible. For schoolchildren, especially primary school children, sweets should not replace normal food. Products that should be strictly dosed or excluded as much as possible: white bread, if it is not made from durum wheat, and sugar, which contribute to rapid weight gain. Exclude any products with industrial food additives, palm oil, margarine, fruits, out-of-season vegetables, soda, caffeine (as well as products based on it), ketchup, mayonnaise, store-bought sauce. Avoid highly spicy or sour foods; food products in fast food outlets; sausages, especially raw smoked ones. Exclude mushrooms of unknown origin; packaged juices; lollipops, chewing gum, as well as any discounted products whose expiration date is running out.

When building a child's routine, attention is paid to the shift when he attends school. For the first shift: you should have breakfast from 7-8. Light snack in the educational institution from 10-11. Lunch, no matter where, from 13-14. Dinner from 19-20. For the second shift: breakfast from 8-9. Lunch - at home before school from 12-13. Light snack in the educational institution from 16-17. Dinner from 19-20. About 55-65% of daily calories come from the first two meals - breakfast and lunch. Dinner, at the latest two hours before bedtime. Throughout the day, regardless of main meals, it is allowed to eat fruits or fresh vegetables. Snacks are best made from homemade products.

Before you make a plan, you need to understand the correct menu design. Breakfast should consist of 250-350g of main dishes, for example, porridge, omelet, and cheeses. Drinks can include tea, cocoa, and freshly squeezed juices. Approximate quantity 150-

250ml. Lunch consists of a vegetable salad or other snack up to 100g, soup 250-350ml, main courses 250-300g, drinks 150-250ml. A snack or afternoon snack can consist of dairy products or fruit, homemade cakes are good. Pastries and fruits up to 100-150g, milk drinks or dried fruit compote up to 250ml. Dinner should include up to 350g of solid food and up to 250ml of drinks. Daily bread consumption: durum wheat up to 150-200g, rye up to 100g. It is necessary to monitor the child's condition, and take into account the lifestyle. For example, an active child or one who plays sports will consume more food than a passive one and this will not affect his general condition. It is necessary to teach a child to eat normally from an early age, and it is better if this is a common habit for the whole family. Therefore, in connection with the above, we can draw the following conclusions:

➤ Nutrition should be balanced individually in accordance with the energy expenditure of each child
2. Nutrition should be balanced; complete and varied (include proteins, fats, and carbohydrates in accordance with the nutritional formula).

➤ Particular attention should be paid to the protein component of food. Immunoglobulins (immune system proteins) are formed from amino acids.

➤ It is better to eat at home according to your diet.

➤ It is advisable to take additional vitamins and minerals not randomly, but only if there is a specifically laboratory-determined deficiency when prescribed by a doctor.

➤ Avoid overeating. The finished portion should not exceed 200-300 g (depending on the age of the child and the amount of energy expended).

➤ Monitor your drinking regime. Drink approximately 1-1.5 liters of water per day.

➤ Strictly limit your intake of sugary carbonated drinks.

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PEDAGOGICAL SCIENCES

THE USE OF ENGLISH FOR SPECIFIC PURPOSES BY LECTURERS/SPECIALISTS OF DIFFERENT FIELDS OF STUDY- A CASE STUDY

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Abstract

General English is being taught with great success around the world from an early age. As this trend continues, students will leave primary and nine-year education with the traditional general English curriculum already completed, and regardless of how competent they have become in the language, they will not want to repeat the same things in high schools or even university systems – their English studies will need a purpose. English for Specific Purposes is being used and needed more and more by students, who find it indispensable in order to succeed in their future profession.

The importance of ESP has increased over the years. However, a new trend is being noticed recently; the use of ESP by lecturers of other subjects (other than English teachers).

A study was designed to test the level of ESP usage by specialists and professors of two different universities, University of Tirana and Polytechnic University of Tirana. The study was conducted to highlight their knowledge of ESP (even though they are not ESP lecturers), the circumstances in which these specialists have to use ESP, the reasons and the frequency students are given ESP materials to assimilate best and to enlarge more their knowledge and information about other subjects.

Keywords: ESP, general English, knowledge, profession, students, specialists, lecturers

1. Literature Review

Baldauf and Jernudd (1983) think that the increasing importance of English has inevitably developed in superiority over other languages, so that more than 90% of literature in some scientific fields is printed in English and also most books and the most prestigious and popular journals in various fields are in English. Countless students and academics around the world need to gain fluency in English-language academic discourse conferences to understand their disciplines, secure their careers, or successfully research their learning.

According to Orr (2010:213), science and engineering schools are constantly looking for better ways to improve the English language skills of their students, but English for Special Purposes (ESP) specialists, who have the right knowledge, skills and interests to contribute strongly in this direction, unfortunately do not have enough materials.

Harding (2007:6) has listed some of the factors that have influenced the increasing importance of ESP:

- Increased learning and professional qualification around the world. Students want their studies to lead them to something useful. Economy and trade want to employ people with professional skills.
- Globalization continues to spread and has openly chosen the English language as the language of communication, because English as the language of international communication is spreading faster and faster.

This language is influencing even people who thought they wouldn't need English before. We are not talking only about politicians, businessmen, academic professors, who need to communicate with their international colleagues and clients, but also about hotel receptionists, nurses, etc.

Belcher (2004:166) identifies the pragmatism of ESP, that is, the commitment to be responsive to the academic needs of the target language and the employability needs of students, as a central force in the given field. In this way, reading literature tends to focus on how it will be learned.

From this point of view, Bruce (2011:140) analyzes this situation in the following terms:

Reading is sometimes taught on its own as a separate skill, sometimes together with writing, and sometimes as a component of a study program.

Flowerdew and Peacock (2001:8), as well as Jordan (1997:1) write that English for academic purposes is usually defined as the teaching of English in order to contribute to and support students' studies or research aspects of that language.

Hyland (2008:113) reminds us that: "Needs analysis is like any other classroom practice because it involves decisions based on educators' interests, values, and beliefs about teaching, learning, and language."

According to Bocanegra - Valle (2010), this great dependence on "specialty" is the key feature that emphasizes the differences between teachers of English as a foreign language, English as a second language and as implementers of ESP as finders of materials.

Jack C. Richards and Thomas. S. C. Farrel (2005:3) identifies two broad types of goals within the field of teacher education, which are training and development.

2. Material and method

In order to concretize the importance of English for specific purposes, not only by ESP lecturers, but also by lecturers/specialists of different fields of study, a study was conducted about ESP use in different faculties of two universities (Polytechnic University of Tirana and University of Tirana, Albania).

A total of 106 lecturers participated in the study, including 57 lecturers from PUT (academic staff in the Faculty of Civil Engineering, Faculty of Architecture and Urban Planning, Faculty of Mathematical Engineering and Physical Engineering) and 49 lecturers from UT (academic staff at the Faculty of Economics, Faculty of Natural Sciences and Faculty of Social Sciences).

The survey consisted of 4 questions, each with four given alternatives, in which the lecturers had to circle only one alternative, the one used the most. In two of the questions included, the lecturers could add an answer based on personal experience under the alternative "other".

The purpose of this study was to highlight:

- Foreign language acquired during university studies by lecturers/specialists of various fields of study.
- The frequency of using ESP by lecturers/specialists of different fields of study.
- Acquisition of the lessons of other subjects by students, based on ESP materials given by lecturers of other subjects.
- The most frequent cases when lecturers or specialists from different fields must use ESP.

3. Foreign language acquired during university studies by lecturers/specialists of various fields of study

In order to highlight the foreign language that the surveyed academic staff has acquired during university studies, the chart is presented as follows:

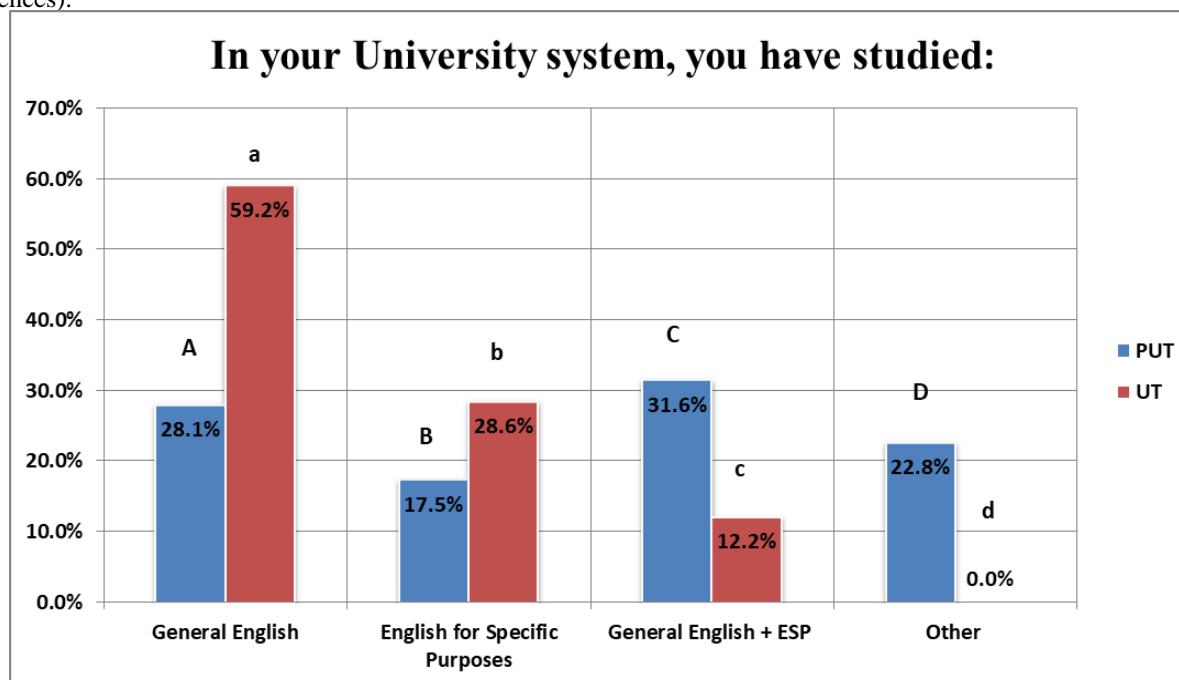


Chart 1. Foreign language acquired during University Studies

Results and discussions

The data show that the majority of UT lecturers have acquired the general English language in the auditoriums of their university system (59.2% compared to 28.1% of PUT lecturers). It is noted that, in general, PUT lecturers have a variety of selections, in which the combination of general and specific English dominates (31.6%), compared to 12.2% of UT lecturers. Regarding the specific English language, it is noted that we have a selection of UT lecturers surveyed of 28.6%, compared to 17.5% of PUT lecturers. This apparent difference in favor of UT lecturers is well explained because a significant number of PUT lecturers circled the alternative "other" in which they added that they have acquired another foreign language or studied in counterpart universities abroad (22.8%). No answer has

been given by UT lecturers here. This is also explained by the fact that PUT students had the right to choose one of five foreign languages (English, French, Italian, German, Russian, from 5 years now Russian is replaced by Japanese) while at UT, only the English language is offered as a subject.

4. The frequency of using English for specific purposes by lecturers/specialists of different fields of study

Nowadays English language has taken large proportions in use. Yes, and what's more, English for specific purposes is gaining more and more importance. But the question naturally arises: "How often do lecturers of courses in different fields of study use ESP?"

Below is the chart with the corresponding results:

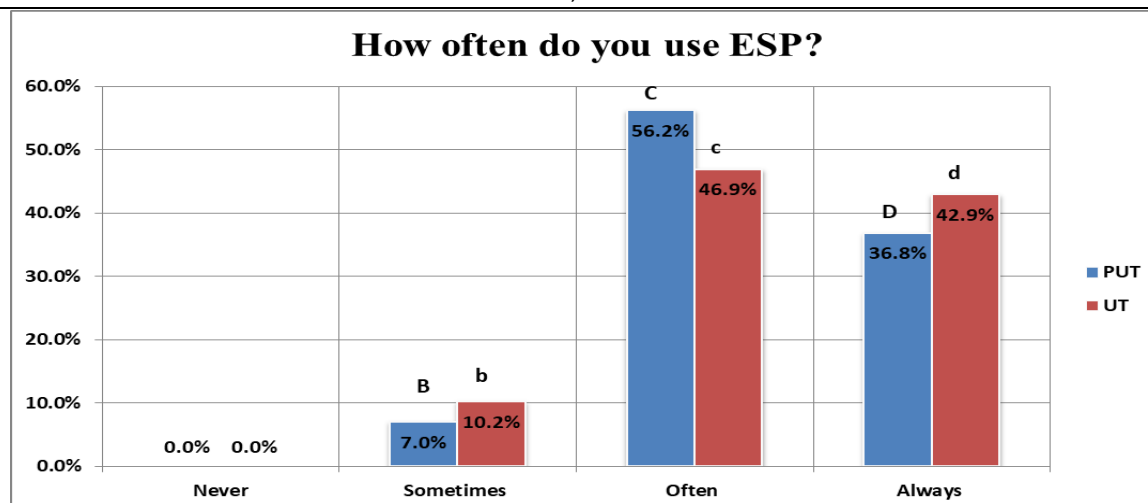


Chart 2. The frequency of using English for specific purposes by lecturers/specialists of different fields of study

Results and discussions

The survey highlighted once again the necessity of acquiring ESP. The lecturers of the two universities are unanimous in their choice, because they have to use English for specific purposes "often" or "always". A low percentage of lecturers have selected the alternative "sometimes" (PUT-7.0%; UP-10.2%). None of the 106 surveyed lecturers chose the "never" option. This shows that even though the academic staff has mastered subjects in the Albanian language, their preparation cannot be conceived without the use of ESP. Thus, it is clear that the difficulty of lecturers who have not studied English for specific purposes is much greater.

5. Acquisition of the lessons in other subjects by students, based on ESP materials

English for specific purposes, apart from the fact that it enables students to expand specific terminology and knowledge in the field of study, also helps them to have better opportunities to prepare more easily in other Albanian subjects. Most of the time, lecturers of these subjects suggest materials for students that should be assimilated in English and reproduced in their native language.

Below is the chart that shows whether the lecturers of the Albanian subjects give students the task to read ESP materials:

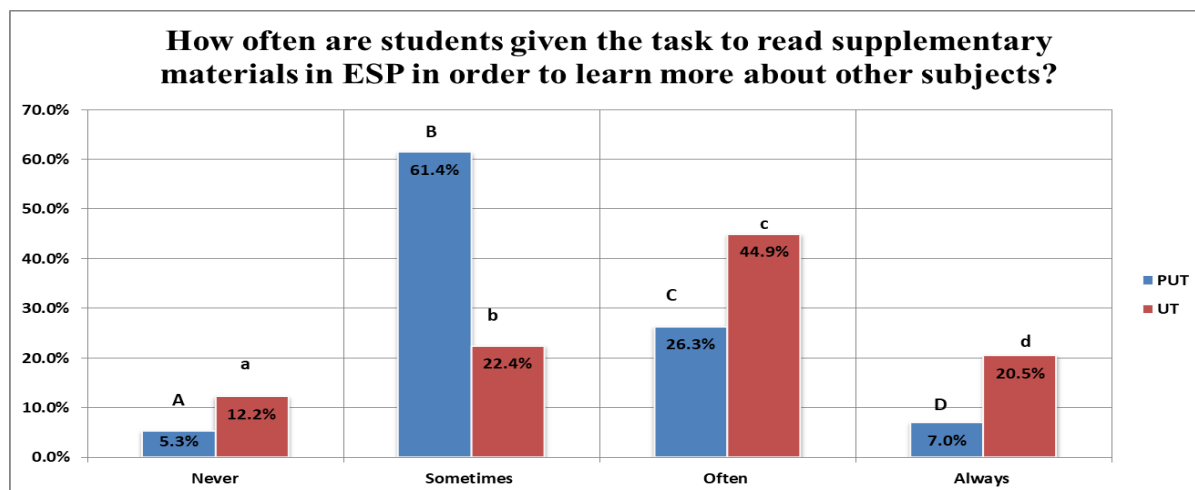


Chart 3. Students' acquisition of the Albanian subjects, based on ESP materials.

Results and discussions

In order to better meet the needs of the students and to better assimilate the knowledge and information given in the textbook of their subject, almost every lecturer uses supplementary materials which are used not only for their own preparation, but also for the students. These materials are mostly provided in English.

Nunan (1992:98) points out that experienced teachers find certain sort of materials more useful than others. It's important that the materials are authentic and this authenticity should relate to the text sources.

From the results of the chart, it was found out that lecturers of the two universities not only suggest students read materials in ESP, but many of them also consider it as a separate task. It is noticed that UT lecturers (22.4% - sometimes; 44.9% - often; 20.5% - always), apply this teaching method much more, which helps a lot in the acquisition of subjects in the field of study, compared to the lecturers of PUT (61.4% - sometimes; 26.3% - often; 7.0% - always). This is also explained by the fact that most UT lecturers were lecturers of social subjects, and the possibility of browsing and finding ESP materials in the field of study is much bigger.

At the same time, it is noticed that the number of UT lecturers who never give students the task of finding ESP materials to better assimilate the lessons of the relevant subject of the field of study is bigger compared to those of PUT (never UT-12.2%; PUT-5.3%).

Even if PUT lecturers do not ask students to read supplementary materials in English during the semester or academic year that covers their course, at the end of the course they must definitely suggest such materials, because PUT students are obliged to submit a course work in every subject.

6. The most frequent cases when lecturers or specialists from different fields must use ESP

Lecturers or specialists of different fields of study, as was ascertained from the chart above, *often* use ESP and many of them *always* use it. To highlight the cases in which they have to deal with ESP the most, four alternatives were given, one of which leaves room for lecturers to give any other alternative based on personal experience.

The chart below shows the corresponding results:

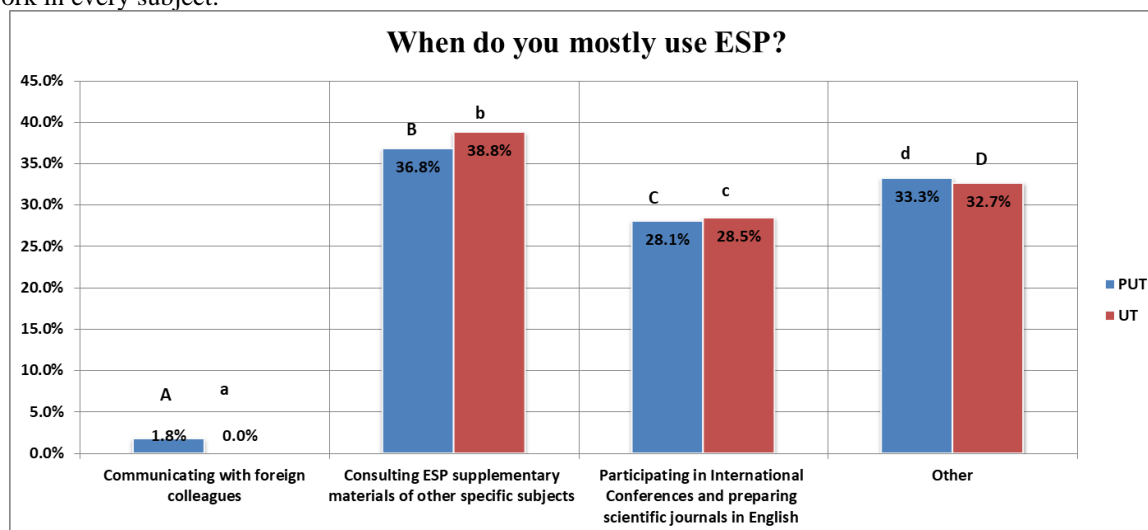


Chart 4. The most frequent cases when lecturers or specialists of different fields have to use ESP

Results and discussions

Unlike the other charts, it was almost unanimity observed the selection of alternatives given by the lecturers of the two universities. They use ESP mostly in their daily work to consult supplementary materials of the subject they cover (PUT-36.8%; UT-38.8%). Being in the dilemma of choosing between the suggested alternatives, the lecturers have chosen the other alternative (PUT-33.3%; UT- 32.7%), where they have also specified the case of use. It was highlighted that 32.7% of UT lecturers use ESP both for consulting materials, but also for participating in international conferences and preparing scientific articles in English, combined with the first alternative, i.e. communicating with foreign colleagues. While from 33.3% of PUT lecturers (19 lecturers in total), 13 lecturers have selected the first three alternatives, 1 lecturer the first and the second and 5 others the second and the third. The selection of the second alternative is mostly explained by the fact that to be a good lecturer, a systematic preparation must be carried out, while participation in conferences or publications and meetings with counterpart colleagues is not so frequent for the majority of lecturers.

PUT lecturers must also collaborate with foreign colleagues, and this is also reflected in the selection of the first alternative or the first alternative combined with other alternatives.

7. Conclusions

The use of ESP by lecturers/specialists of different fields of study of Albanian subjects is inevitable and necessary, regardless of the fact whether or not these lecturers have studied English for specific purposes as

a different subject during the educational system in their university.

The necessity of using ESP by lecturers is reflected in different situations, both in the consultation of supplementary materials that they cover, in participation in international conferences and in publications, as well as in communication with foreign counterpart colleagues. These lecturers not only use ESP for personal preparation, but also to enrich students with additional information related to the relevant lessons of the subjects of their field of study, and as a result students will feel more self-confident in the near future when they start their profession.

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POLITICAL SCIENCES

DIGITAL REFERENDUM - EFFECTIVE MODELING OF PUBLIC ADMINISTRATION IN GEORGIA

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Abstract

State management in its content is a complex and at the same time dynamic process. The second half of the 20th century can be considered the initial period of management transformation and establishment of governance structures.

Governance based on democratic principles is based on a number of fundamental principles, the correct implementation of which is the most important prerequisite for the establishment of democratic institutions. One such important democratic process is the referendum.

In Europe, the practice of referendum is most established in Switzerland, which is governed by a system of direct democracy. Accordingly, in order to solve problematic issues, citizens in Switzerland take part in both regional and national referendums, which are undoubtedly democratic in content and respond to the fundamental principles of modern public administration.

In Georgia, where there is little experience of holding a referendum, the implementation of a digital referendum is the latest challenge, which will be an important step on the way of the country's European integration. The involvement of citizens in the solution of important issues for the state allows the so-called the possibility of communication between society and government. It eliminates "black holes" and ensures the reduction of conflicts between them. Of course, all the positive results of the referendum depend on how fairly and objectively it will be conducted.

Thus, one of the important challenges of the digitalization of the public administration of Georgia is the digital referendum, the implementation and development of which is an effective step on the way of the state development of Georgia and as a result ensures the acceleration of the country's institutional and European integration processes.

Keywords: Public management, Digital Transformation of Management, Referendum, Digital Referendum.

Introduction

The institution of direct democracy has recently attracted more attention from around the globe. The most popular form of direct democracy is a referendum, which entails a nationwide vote of the populace to pass legislation or settle problems of public concern. It is evident that the active integration of Internet technologies into the voting system is intended to increase electoral activity and draw citizens into politics given the high hopes placed on immediate (i.e., direct) democracy in the areas of local self-government and the growth of civil society. In the age of information technology, the emergence and implementation of electronic voting seems to be a rather natural thing. Elections are not the only time that electronic voting is employed; this technology has not bypassed the institution of referendums. The lower organization expenses and quicker outcomes are the key benefits of electronic referendums. (Alekseev, R.A., 2015). In today's world, electronic referendum systems are rapidly developing. For the first time, the issue of organizing referendums in electronic form was raised in the USA as early as 1974 by Peter Parkinson.

Before we discuss the digital referendum, it is necessary to consider the main directions for using innovative technologies in public administration.

Since there is a growing trend to replace traditional public-legal instruments used in the administration process with artificial intelligence, which is still not legally regulated, the implementation of public administration using continuously updated innovative technologies essentially changes the future of a crucial state function—public administration. As a result, it's important to inform current leaders about potential futures for public administration design in addition to making full use of the tools of e-government available now (Alekseev, R.A., 2020).

The development of e-government is characterized by two types of effects, in particular, modernization is always related to progress, and in this sense, it has a positive impact on the public to ensure the implementation of the principles of accessibility, economy, and efficiency of public services. However, the innovative modernization of governance may even have a negative effect, due to questions surrounding the dubiousness of protecting the public interest in the said process, or even the ambiguities in the context of the protection

of human dignity, equal treatment, and the inviolability of private life when governing through artificial intelligence (TaganaSvili, N., 2022).

The need to protect the public interest as well as the rights of each member of society derives from the fundamental principles of the legal state. It is these requirements that must be respected in the process of implementing public administration through innovative technologies, and accordingly, the ideological and functional compliance of the "public administration of the future" with the classical understanding of the legal state should be established.

Before the creation of a unified approach to electronic services in Georgia, state agencies provided more or less information to citizens and business entities about the services they offered. In most cases, receiving services required a site visit, often from one agency to another, so it was difficult for citizens to choose the relevant agency and service. (Toni, G.L.A. van der Meer., 2014).

A digital state, the main goal of which is definitely a subject of discussion: implementation of direct power of the people in the country; creation of a mechanism for interaction between citizens and the legislative branch; ensuring control over the actions of the executive branch, ensuring public control over the adoption of all national decisions, improving the electoral system.

The main components of the digital state are: Petitions; Discussions; Referendums; Elections and Testing.

Referendum:

- Any citizen has the right to vote in nationwide electronic referendums using the functionality provided by the system;
- All bills that have passed 3 readings in parliament and signed by the head of state are submitted to nationwide electronic referendums;
- Issues prepared by local authorities are submitted to regional or local referendums;
- To eliminate possible falsification of votes, technologies such as blockchain can be used - after voting, each citizen receives a hash of his vote, a hash of a block of votes and a hash of the entire vote, which makes it possible to verify the correctness of the recording of each vote and the reliability of the results of the entire vote;
- The number of referendums is not limited, they can be held daily, several referendums per day (Kopanev, G., 2019).

When pursuing an open access policy, an important condition for the introduction of new institutional forms is the publicity of decision-making and the open nature of expressing one's attitude to urban policy issues. The majority barrier serves as a key element in the publicity of proposed new practices; the approval of the majority is decisive in the process of institutionalization.

Literature review

When pursuing an open access policy, an important condition for the introduction of new institutional forms is the publicity of decision-making and the

open nature of expressing one's attitudes towards urban policy issues.

"The E-Governance and Leadership Handbook" discusses in depth the issues surrounding e-Governance in Georgia and highlights the challenges that must be addressed in the future through the introduction of both effective legal instruments and strong enforcement approaches.

E-government is the will of the state to use modern information and communication tools to make the government itself and the services provided by it more efficient, flexible, and easily accessible. E-governance includes:

- Easy access to government information;
- Involvement of citizens through direct communication with civil servants;
- Openness of the government by presenting its activities as transparently as possible;
- Interactivity, which opens borders for different urban and rural residents and gives them equal opportunity to access government services online, saving them time and money (Gabisonia, Z., 2021).

John McCarthy noted that the issue was our redefining of procedures as early as 1956 when he introduced the idea of "artificial intelligence," developed by Prof. Which computing techniques could be deemed clever was a mystery to us. Only a portion of the mechanisms underlying intelligence are understood by us. As a result, from the perspective of computer science, the term "intelligence" should only be used to refer to computational abilities that may be applied to achieving global objectives. However, this description is only appropriate for the 1950s of the 20th century. In science, there are three stages of artificial intelligence growth (generation) because of how much its scope has grown in recent years. Three categories of artificial intelligence can be distinguished based on their phases of development: narrow artificial intelligence, general artificial intelligence, and super artificial intelligence (McCarthy, John., 2007).

Ilsu Cho's article "Digital Democracy and Citizenship as a Form of Democratic Political System in the Information Age," presented at the 52nd ISSS Annual Meeting in 2008, also raises the issue of electronic referendums. In the opinion of the author of the article, mass computerization of the population implies the opportunity for every citizen to use more political information, as well as to have more communication channels that will allow him to convey his ideas to representatives of various socio-political organizations or to his fellow citizens (Cho, Ilsoo., 2019).

A fairly large-scale study was conducted by the International Foundation for Electoral Systems (IFES) in 2012. The scientific article by Jordy Barrett I. Estif, Ben Goldsmith and John Turner is devoted to the prospects for the development and conduct of referendums - "International experience of electronic voting. Norwegian Electronic Voting Project", in which much attention is paid to the experience of electronic voting in different countries, as well as the Norwegian approach to such a voting system. Jordi Barrett I. Estif, a professor of constitutional law in Catalonia, has been in-

involved in a wide range of research projects on electronic voting in many countries around the world that actively use online referendum technology in their electoral practices (Sanoff, H., 2000).

The purpose of our article is to determine what means the public sector offers to citizens to get involved in the decision-making process and initiation, what other alternatives the population has to express their opinion online, and to what extent the community itself uses this opportunity to communicate with government agencies and civil servants, to share their ideas.

The European Union has greatly contributed to Georgia's accomplishments, which are the result of a lot of hard work. According to the United Nations University, Georgia is a country at the nexus of the West and the East that, based on the Soviet experience, is a country on the verge of government collapse. In light of the 2030 UN Sustainable Development Goals for innovative, equitable, and sustainable growth (SDG 9), smart cities and communities (SDG 11), and strong and resilient institutions (SDG 16), UNU-EGOV continues to support these initiatives as part of the partnership with Georgia's Data Exchange Agency (DEA) (United Nations University. 2019).

Conclusion

The dynamic penetration of information technologies into everyday life is a challenge for building a specific communication infrastructure that ensures the interaction of city authorities with citizens through information technology and the Internet. Electronic referendums are one of the tools for implementing the publicity of city politics.

Public administration is becoming a sphere where everyone finds their own civic identity. The concept of participation in the implementation of deliberative policies implies not only the formal right to be heard, but also guarantees that the interests of citizens will be taken into account when making decisions and implemented through democratic institutions.

Main findings:

- The problem is that civil servants (especially at the municipal level) do not have a vision of how the public management process can be made better thanks to digital technologies.
- Many people in Georgia still do not have information about the services that can be obtained without leaving home, without spending extra money and time;
- The current version of the General Administrative Code of Georgia (GAC) does not recognize the definition of service (including e-service);
- The new strategy of Digital Georgia has not been updated, in this part it is important for agencies to develop relevant action plans independently;
- In terms of ensuring cyber security and personal data protection, it is necessary to continue to find appropriate funds and train citizens in this direction;
- We face many other challenges in terms of digitalization of services, low public awareness of digital services, especially for older people who may not

have the necessary skills (low e-literacy) to work with technologies.

- Insufficient access to internet infrastructure is also a problem. Researches prove that among the neighboring and Eastern Partnership countries, citizens of Georgia (63%) and Ukraine have the lowest access to the Internet.

Recommendations:

- The government of Georgia should take into account all the recommendations given to it by the European Council in the e-mail. in the direction of justice;
- Administrative bodies should show more initiative to place all electronic services on the citizens' portal;
- The "Digital Georgia 2014-2018" strategy should be updated, which includes a number of issues of e-referendum and e-elections;
- It should become mandatory for all agencies to independently develop a long-term "digitalization" action plan.

The use of electronic, multifunctional digital governance is essential to achieve simple, ethical, accountable, responsible and transparent governance.

Georgia should start actively and rationally advocating e-government initiatives, working tirelessly for flexible, sustainable, innovative and democratic public administration, which is necessary for effective and result-oriented governance based on participation.

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TECHNICAL SCIENCES

A NEW METHOD OF FUEL COMBUSTION. KUZNETSOV'S FMG SYSTEM.

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Abstract

The article discusses a new fuel combustion method developed in Russia and patented as the "Kuznetsov free gas motion (FGM) system". It provides a comparison with the traditional "forced gas motion (FGM) system" that has been used worldwide for many centuries. It is noted that the FGM system has significant drawbacks in terms of ecology and fuel combustion efficiency.

The Kuznetsov FGM system implements a fundamentally new approach to organizing the combustion process, based on the separation of gases by degree of heating and the multiple use of combustion products (CO₂ and H₂O) as additional fuel. This increases energy efficiency and minimizes harmful emissions into the atmosphere.

The article emphasizes the need for the global energy sector to transition to the Kuznetsov FGM system as a more environmentally friendly and rational alternative to the traditional FGM fuel combustion method.

Keywords: Free gas motion (FGM) system, Forced gas motion (FGM) system, Fuel combustion method, Energy efficiency, Environmental friendliness, Basic material.

The "forced gas motion" (FGM) system, the method of burning fuel has been studied and used by mankind for many millennia. Its disadvantages are dirty and inefficient combustion, creating an environmental problem, the greenhouse effect.

Therefore, the new "free gas motion (FGM) Kuznetsov system" is difficult for scientists, manufacturers of heat generators and stove makers who make stoves of the old system to comprehend. We interfere with them, it is difficult to reconfigure the equipment, production. In the USA and the European Union there are no experts in the "FGM system" who can give a positive conclusion on it. This hinders its integration into world energy, as well as the mentioned countries.

In 1777, the French scientist A. Lavoisier created an oxygen theory of combustion. He described the oxidation-reduction combustion reaction. These are countercurrent parallel chemical reactions occurring simultaneously. However, no one has been able to create conditions for its flow.

In Russia, I have patented 2 invention patents: No. 2055272 of 02/27/1996 and No. 2553748 of 05/22/2015, which created the conditions for its flow. The first patent, "the furnace and the hood are united into a single space." Practically, a "dry seam" was made between the furnace and the hood (a gap 2-3 cm wide), providing heat exchange between them. Heat exchange occurs similarly if you open the door to the street in winter. This made it possible to divide the gases in the furnace according to the degree of heating. In the combustion process, the amount of air required for combustion must be supplied to the furnace in each time period. In the FGM system, if you supply less, there will be incomplete combustion and particle emissions into the flue, polluting the air. If more air is supplied, the hot CO₂ and H₂O gases, the product of the combustion reaction, are diluted with cold air and the efficiency of the stove is reduced. For this reason, when testing FGM

stoves, the results of the first and last 5 minutes are not taken into account. But this is self-deception.

In the FGM system, plenty of air is supplied at any time period. The amount of oxygen required for the combustion reaction is involved. There is a separation of gases according to the degree of heating. Ballast gases with an increased nitrogen content leave the flue. Warm air comes out of the flue with a properly constructed stove/boiler/heat generator. This has been confirmed in many countries around the world where we have held seminars.

The hot gases, the product of the combustion reaction, enter the upper part of the hood and will not come out of the hood until they give up their heat. In the grate area, fuel gasification. Hydrocarbons rise through the center of the furnace. When exposed to oxygen, CO₂ and H₂O are obtained, the product of the combustion reaction. In this case, stoves/boilers are obtained with an efficiency approximately 30% higher than FGM stoves/boilers. They do not meet the requirements for combustion purity. Drawings of such stoves are posted on my website, <http://stove.ru/products>. These drawings are used in many countries around the world, including North America, http://www.stovemaster.com/html_en/designsyshistory.html

In the FGM system, according to the second patent, we supply secondary air to the oxidation zone. In this case, the spent hot CO₂ and H₂O gases descend along the walls, towards the hydrocarbon.

A new method of burning fuel, the FGM Kuznetsov system.

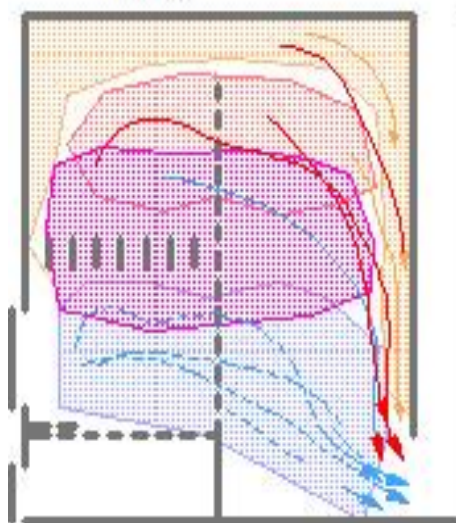
I did this. The essence of combustion in the FGM system is that the blown combustion reactions CO₂ and H₂O do not go into the flue, but are reduced to fuel, 2CO and water gas, which are again oxidized (burned) to CO₂ and H₂O. This continues as long as fuel burns in the furnace. The fuel is wood with a high content of volatiles.

Stoves of the new FGM system (free gas motion), built in accordance with my

Russian Federation invention patents: No. 2055272 of 02/27/1996 and No. 2553748 of 05/22/2015, METHOD OF BURNING FUEL.

Please note the abbreviations FGM is forced gas motion, and FGM is free gas motion

Fig.3



Here is the English translation with FGM for forced gas motion and FGM for free gas motion:

In their combustion chamber combined with the convective system, the flow of the gas stream generated during the fuel combustion occurs due to the heat exchange processes with equal air supply and draft.

The new method of burning fuel, the "FGM System", differs fundamentally from the "FGM system". For many centuries they have studied and applied it. Therefore, the new system is difficult for scientists, manufacturers of heat generators and stove makers who make stoves of the old system to comprehend. We interfere with them, it is difficult to reconfigure the equipment, production. In the USA and the European Union there are no experts in the "FGM system" who can give a positive conclusion about it. This hinders its integration into world energy, as well as the mentioned countries. In many countries there are our students, including the USA, and people making stoves according to our free FGM system drawings on my website. They also cannot be considered experts.

We are happy to share with you information about the new fuel combustion system known as the "Kuznetsov FGM", which was developed and patented in Russia. This innovative technology solves the problems of ecology and combustion efficiency that accompany the traditional "FGM System".

Currently, many countries spend huge resources on the FGM system, but it does not solve issues related to environmental friendliness and fuel combustion efficiency. Problems such as air pollution and the greenhouse effect remain relevant, despite significant financial costs.

The "Kuznetsov FGM" system offers a revolutionary solution that allows overcoming these problems. It is based on the conversion of CO₂ and H₂O gases formed during combustion into fuel, which is then burned again. Thus, we not only eliminate the emission

of harmful gases into the atmosphere, but also obtain additional fuel for use.

The introduction of the FGM system opens up new prospects for improving fuel combustion efficiency and reducing negative environmental impacts. This innovative solution will significantly reduce the environmental problems we face today, while using available resources more efficiently.

We urge you to consider the Kuznetsov FGM system as an alternative to the FGM system. It not only solves the problems of ecology and combustion efficiency, but is also a more cost-effective solution in the long term. The transition to the new system will help optimize costs, reduce environmental pollution, and create a more sustainable and environmentally responsible future energy system.

Nature of the earth is created by the Supreme Mind, everything in it is balanced, self-regulating and optimal. A human is himself a particle of nature and created by it. Therefore, a person is not given to create something more perfect. He must identify the laws of nature, study and follow them. In all our activities, we try to follow this principle.

The system of free gas motion - the Kuznetsov FGM System. (It should be noted that this name is reflected in the documents of the MINISTRY OF ENERGY of the RUSSIAN FEDERATION). It provides unlimited opportunities to build environmentally friendly and efficient heat generators for various functional purposes and capacities.

The essence of the combustion process is that already in the FGM Kuznetsov system furnace, there is a separation of gases by degree of heating, into heat carriers (CO₂, H₂O) and ballast gases (my RF patent 2055272). The heat of the hot gases is not lost. The hot gases are directed to the hood, where they give up heat, descend down along the walls of the hood and exit through the flue. Energy efficiency of stoves increases, however carbon dioxide CO₂ is released into

the atmosphere. In stoves with rotations, FGM system, hot gases together with ballast gases immediately exit through the flue.

Translate to English and also note the abbreviations FGM is Free Gas Motion and FGM is Forced Gas Motion.

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2. About a new method of fuel combustion -

http://eng.stove.ru/stati/o_novom_sposobe_sjiganiya_topliva_

APPLICATION OF AN AGENT APPROACH TO SIMULATION MODELING OF THE PROCESS OF EPIDEMIC SPREAD

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Abstract

One of the important applications of simulation modeling methods is forecasting the spread of epidemic diseases. System-dynamic and agent-based approaches are used in this area. The goal of agent-based modeling is to obtain an understanding of these global rules, the general behavior of the system, based on assumptions about the individual, private behavior of its individual active objects and the interaction of these objects in the system. System-dynamic and agent-based models of the spread of epidemic diseases have complementary properties, and therefore, the task of jointly using these classes of models to predict the dynamics of epidemic systems is relevant and requires a comprehensive comparison of their characteristics and properties.

Keywords: System-dynamic, Agent-based, Anylogic, Simulation modeling, Epidemic diseases.

System dynamics and agent-based modeling are two powerful tools used for forecasting the spread of epidemic diseases. Both approaches offer unique advantages and can be used in combination to provide comprehensive insights into the dynamics of disease transmission. System dynamics is a modeling approach that focuses on understanding the behavior of complex systems over time. It uses mathematical equations to represent the interactions and feedback loops between different components of the system. In the context of epidemic forecasting, system dynamics models can capture the dynamics of disease transmission by considering factors such as population size, birth and death rates, infection rates, recovery rates, and the impact of interventions or policies [1].

System dynamics models provide a holistic view of the disease spread by considering the interactions between different variables and their impact on the overall system behavior. These models can be used to simulate a range of scenarios and assess the effectiveness of various control strategies.

On the other hand, agent-based modeling focuses on representing the behavior and interactions of individual agents within a system. In the context of epidemic forecasting, agents can represent individuals or

groups of individuals with specific attributes and behaviors. Each agent follows a set of rules and can interact with other agents based on predefined conditions. By simulating the interactions between agents, agent-based models can capture the complex dynamics of disease transmission, including spatial heterogeneity, social networks, and individual-level behaviors [2].

Agent-based models offer a more detailed and granular representation of the system, allowing for the exploration of individual-level variations and the impact of localized interventions. These models can also capture the emergence of collective behaviors and patterns that may influence the spread of epidemics. By simulating a large number of agents, researchers can generate statistically significant results and gain insights into the potential outcomes of different intervention strategies. Combining system dynamics and agent-based modeling can provide a comprehensive and integrated approach to forecasting the spread of epidemic diseases [3, 4].

As an example, we considered two implementations of a simple SEIR model of the spread of an epidemic disease - influenza, in the Anylogic simulation environment. Figure 1 shows the structure of the system-dynamic SEIR model of influenza spread [5].

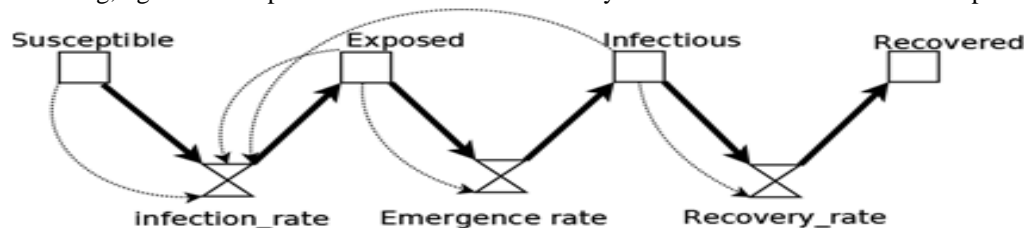


Figure 1. Structure of a system-dynamic model of epidemic spread

The SEIR model is a commonly used mathematical model for studying the spread of infectious diseases. It divides the population into four compartments: Susceptible (S), Exposed (E), Infected (I), and Recovered

(R). The model tracks the transitions between these compartments over time, providing insights into the dynamics of an epidemic. The parameters in the SEIR model are given in the Table 1.

Table 1

Description of model parameters	
Parameters	Description
Susceptible (S)	This compartment represents individuals who are susceptible to the disease and have not yet been infected.
Exposed (E)	This compartment represents individuals who have been exposed to the disease but are not yet infectious (in the incubation period).
Infected (I)	This compartment represents individuals who are infected and infectious.
Recovered (R)	This compartment represents individuals who have recovered from the disease and have developed immunity.
Infection_rate (β)	The proportion of infectious patients per unit of time among infected people
Emergence rate (μ)	The proportion of infected people per unit of time among susceptible people
N	Total number of people
c	The coefficient of human contact
e	The coefficient of contact with an infected person
i	The coefficient of contact with an infectious person
v	Probability of infection in the E-period
α	Probability of infection in the I-period
τ	Average Incubation Time
T	Average duration of illness

The dynamics of the model, the structure of which is presented in Figure 1, is described by the following system of algebraic-differential equations [6, 7]:

$$\begin{aligned} \frac{d(S)}{dt} &= -\beta; \quad \frac{d(E)}{dt} = \beta - \mu; \quad \frac{d(I)}{dt} = \mu - \alpha; \quad \frac{d(R)}{dt} = \alpha; \\ \beta &= \frac{N \times c \times (E \times e \times v + I \times i)}{S}; \quad \mu = \frac{E}{\tau}; \quad \alpha = \frac{I}{T}; \end{aligned} \quad (1)$$

Initial values of the experiment parameters: $N = 1000$; $S = N - 1$; $E = 1$; $c = 5$; $e = 0.8$; $i = 0.25$; $v = 0.05$; $\alpha = 0.06$; $\tau = 15$; $T = 15$. At the beginning of the experiment, one person is infected. If a susceptible (S) person encounters an infected person (E), then he becomes infected with probability α . A person goes from the infected state (E) to the infectious state (I) after time τ , and after time T he goes to the healthy state (R) [8, 9]. The graph for the agent-based SEIR model of influenza is shown in Figure 2.

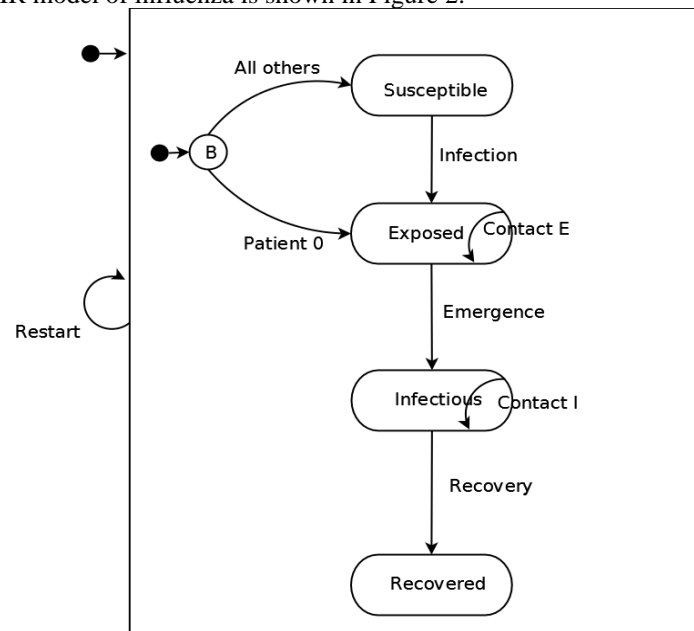


Figure 2. Transition graph for the agent-based SEIR model of influenza spread

Figures 3 and 4 show the results of the experiment.

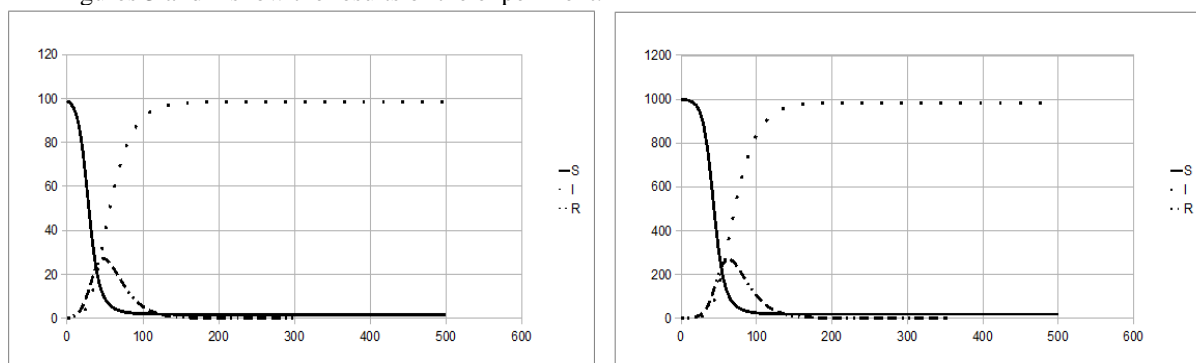


Figure 3. Results of the experiment with the SD model

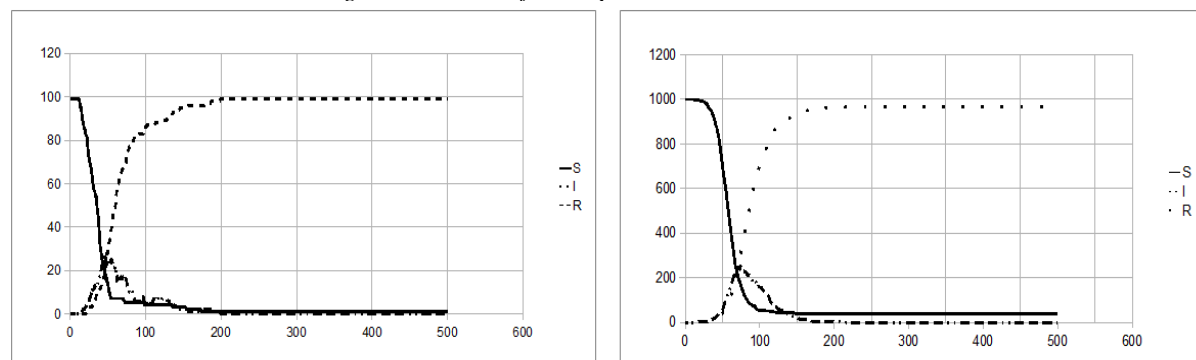


Figure 4. Results of an experiment with an agent-based model

Thus, a comparative analysis of the static and dynamic characteristics of two implementations of the SEIR model of the spread of an epidemic disease - influenza - showed that with an increase in the number of agents, the behavior of the agent model approaches a similar system-dynamic one. However, at the same time, the requirements for computing power to support experiments with the model increase, which makes developments in the field of high-performance implementations of agent-based simulation models relevant.

Thus, system dynamics is an excellent tool for implementing simulation models for the spread of an epidemic disease. The model takes into account the process of removing infected subjects from a computer system. It is based on the assumption that during an epidemic, a certain number of infected subjects either get rid of the malware.

By isolating infected entities (excluding susceptible hosts from the network while the malware is spreading) and using more effective means of recovering infected entities, the infection curve can be flattened (resulting in a smaller peak in the number of infected individuals), and the latter method can also shorten the duration of the outbreak.

In summary, both system dynamics and agent-based modeling offer valuable tools for forecasting the spread of epidemic diseases. These approaches provide complementary insights into the dynamics of disease transmission and can be used in combination to enhance our understanding of the spread of epidemics and inform effective control strategies.

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PROBLEMS OF USING NEW ELECTRICAL INSULATING SYSTEMS AND ELECTRICAL MATERIALS IN POWER TRANSFORMERS**Safiyev E.S.***docent, Azerbaijan State Oil and Industry University
Baku, Azerbaijan*[DOI: 10.5281/zenodo.8414878](https://doi.org/10.5281/zenodo.8414878)**Abstract**

The article discusses the issue of introducing new electrical insulating systems and electrical materials in power transformers. Particular attention is paid to the use of such solid electrical insulating materials as NOMEX and TRANSTERM, as well as elegaz insulation. The prospects of using superconducting and magnetic materials in transformers are reflected.

Keywords: power transformer, electrical materials, dry transformer, oil transformer, dielectric material

Despite the fact that the manufacturing technology of power transformers has not changed for a long time, scientists and specialists are trying to improve it and are confident that by introducing modern electrical materials they can improve the properties of transformers. But the introduction of new materials into production is perceived ambiguously by transformer manufacturers. This is due to technical and economic considerations. Currently, in developed countries, transformers with solid cast insulation are used and they are gradually replacing oil-insulated transformers produced since the beginning of the last century. The use of NOMEX insulation is considered a major development in electrical insulation technology. NOMEX is a synthetic aromatic material with high dielectric, chemical and mechanical properties. It is used to make paper, cardboard, insulating parts of various configurations and special profiles. NOMEX is non-toxic, resistant to radiation, fire, acids, alkalis, moisture, insects, mold, etc. But this insulation has some disadvantages compared to solid cast insulation. During operation of transformers, NOMEX insulation is destroyed under the influence of dynamic forces arising in the transformer windings, the windings are deformed and bent.

Dry-type transformers use an insulating impregnating system based on mica materials with high pressure and deep vacuum. This insulation is called TRANSTERM. Fiberglass is also used in this insulation along with mica. This makes it possible to create a reliable reinforcement structure and resistance to partial discharges, pulse voltages, and brings the coefficient of linear expansion of the insulation closer to the transformer winding wire. Transformers with TRANSTERM insulation can operate at temperatures from - 65°C to + 55°C. Some performance characteristics are superior to cast resin transformers. Service life 30 years. They also have high environmental properties and fire resistance. When comparing oil transformers and dry transformers, the advantages of the latter in terms of fire resistance and environmental friendliness are clearly noticeable. It is clear that solid dielectric transformers (cast resin, NOMEX, etc.) will gradually replace oil transformers. But such a replacement is still possible in closed electrical substations, because Dry-type transformers are not designed to operate outdoors. Another advantage of cast insulation is its rigid connection to the windings, thereby resisting electrodynamic

forces and maintaining its shape. An analogue of oil transformers operating in the open air are gas-insulated transformers. SF₆ gas is a more efficient dielectric than air and nitrogen. In addition, it is non-flammable and inert. Having high thermal conductivity, SF₆ gas in transformers can be used as a refrigerant, which is its advantage.

Despite the fact that SF₆ gas has been used as a gaseous dielectric for a long time, currently it is most often used in complete distribution devices. SF₆ transformers are more resistant to fire and explosion than oil transformers. In addition, when using SF₆ gas, the weight of some elements is reduced, the current-carrying parts of transformers are effectively cooled, which makes it possible to produce a more compact transformer with light weight.

According to some experts, in the near future traditional cellulose insulation and mineral oils will be used in transformers. They still remain effective and reliable materials. Despite the fact that SF₆ transformers are small in volume and weight, they are very expensive in price, so the need for them is small. But in the future the need for them will increase. The main characteristics that determine the quality of transformer insulation are thermal stability and fire resistance. The first property affects the design solution, weight and volume of the transformer, and the second affects its implementation area. Therefore, in each specific case, during operation it is necessary to focus on optimal technical and economic indicators. If the transformer will be operated indoors, then non-flammable insulation must be used. In open areas or on overhead line supports, oil-immersed transformers should be used until the best new insulation option is installed. Therefore, in the near future it is impossible to abandon oil transformers.

Many European countries, when choosing a dielectric material from the point of view of environmental safety, refuse to use oil transformers. In Russia and some other countries there is no such restriction. Along with this, increasing the production of dry transformers with monolithic insulation and their use in distribution networks is considered very necessary. But in high-voltage lines (110-500 kV) there is still no alternative to oil transformers. Their efficiency is greater than that of dry transformers. Currently, Japan prefers the pro-

duction and implementation of gas-insulated transformers. In Russia, gas-insulated transformers of type TE-4000/35 are being prepared for testing. Such transformers are characterized by their small size, fire resistance, etc. The technology of replacing old oil transformers with SF₆ transformers is very difficult. But when creating new modern digital substations, it is advisable to use SF₆ transformers.

Saving electricity in power transformers is associated with reducing losses. Nowadays, oil transformers with losses of 30% at no-load and 20% at short circuit and a group of efficient dry transformers with cast insulation have been created. In addition, modern transformers are equipped with telemetric devices for possible remote control of oil level, temperature and pressure. In the near future, transformers with a magnetic core made of amorphous steel with a nanocrystalline structure will be produced. The use of amorphous steel will reduce no-load losses by up to 75%. Recently, it has become possible to produce amorphous steel strips with large dimensions for power transformers. But due to their high cost, their implementation is delayed. Scientists are working tirelessly to create high-temperature superconductors and cryoconductors. The use of these materials in transformer windings will greatly improve the performance of transformers.

Conclusions.

1. Oil-filled power transformers are gradually being replaced by dry-type cast resin transformers. At the same time, along with economic feasibility, it is also necessary to take into account the environmental and fire safety of transformers.

2. The production and implementation of gas-insulated transformers is a relevant and promising area of electrical engineering.

3. Application of modern magnetic, high-temperature superconducting and cryoconducting materials in transformers will greatly increase its performance.

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