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Drodzy naukowcy! Drodzy Koledzy!

Proponuję waszej uwadze międzynarodowe czasopismo "Współpraca europejska". To wyjątkowe wydawnictwo ma na celu zebranie pomysłów i wizji naukowców z całego świata!

Publikacja pierwszego numeru była możliwa dzięki wsparciu naszych najbliższych i najdroższych przyjaciół, bardzo szanowanych członków Rady Naukowej i wielkim staraniom redaktorów, którzy dokładając starań i nie szczędząc wysiłków, oddawali siebie i nadal to robią, aby czasopismo rozwijało się i było ciekawe dla naukowców do publikacji artykułów z różnych dziedzin nauki, i co najważniejsze, aby służyło jako podstawa do tworzenia nowej wiedzy.

Szczególne podziękowania składamy członkom Rady Naukowej Czasopisma, którzy z różnych krajów i kontynentów wspierają naukowe kierunki działalności Czasopisma i wzmacniają jego znaczenie.

Naukowcy z Brazylii, Gruzji, Indii, Iraku, Łotwy, Litwy, Kenii, Macedonii, Malty, Nigerii, Niemiec, Polski, Ukrainy i Szwajcarii wspierają nas i dają prawo Czasopismu nazywać się międzynarodowym.

Głównym celem powstania Czasopisma było stworzenie platformy umożliwiającej wymianę poglądów pomiędzy naukowcami, wprowadzenie go do międzynarodowych baz danych naukometrycznych, nad czym Redakcja publkacji codziennie pracuje i to przynosi swoje rezultaty.

Dziękujemy również autorom, którzy powierzyli nam swoje myśli i osiągnięcia naukowe, aby rozpocząć długą i owocną drogę w wielką przyszłość Czasopisma "Współpraca europejska".

Mam nadzieję, że nasza wspólna ciężka praca zostanie uwieńczona sukcesem, a zainteresowanie Czasopismem będzie coraz większe i wszystkie nasze cele zostaną osiągnięte.

Z wyrazami szacunku, wdzięczności i z nadzieją na dalszą współpracę

Prezes Zarządu Consilium Sp. z o.o.,
Przewodniczący Rady Naukowej Czasopisma "Współpraca europejska"

Dr. Oleksandr Melnychenko

Honourable scientists! Dear colleagues and friends!

I am glad to offer you International Collection of Scientific Papers *European cooperation*. The unique, registered in Europe edition is intended to collect ideas and perspective vision of researchers throughout the world!

The publication of the first issue has become possible because of the support of our closest and dearest friends, highly respected members of the Scientific Council, and titanic efforts of the editors, who, working without stint, have been devoting completely and continue to do it every day, that the Collection to be developed and interesting for publication of articles by scientists of various spheres. Moreover, the most important thing is the Collection to be served as a public foundation of creation of new knowledge.

We express special thanks to the members of the Scientific Council of the Collection, who are persons of different countries and continents, and maintain its scientific focus and reinforce its importance.

Scientists from Brazil, Georgia, India, Iraq, Latvia, Lithuania, Kenya, Macedonia, Malta, Nigeria, Germany, Poland, Ukraine and Switzerland support us and allow the Collection to be called international.

The main purpose of establishment of this edition is creation a platform for the exchange of ideas between scientists, its insertion into the international scientometric databases. The editors are proceeding their everyday work to achieve the Collection's main purpose, and it brings results.

Many thanks also to the authors who have entrusted us with their thoughts and scientific groundwork to start a long and fruitful way into, we hope, a great future of the Collection *European cooperation*.

I hope that our common hard work will be crowned with success, the interest to the Collection will be growing up every day, and our delivered goals will be achieved.

Yours faithfully, with gratitude and hope for further cooperation

Chairman of the Board at Consilium Sp. z o.o.,
Head of the Scientific Council of the Collection *European cooperation*

Dr. Oleksandr Melnychenko

Шановні науковці! Дорогі колеги, друзі!

Радий запропонувати вашій увазі Міжнародний Збірник наукових праць «Європейське співробітництво». Це унікальне зареєстроване в Європі видання покликане зібрати думки та перспективні бачення науковців з усього світу!

Вихід у світ цього першого номера став можливим завдяки підтримці наших найближчих та найдорожчих друзів, вельми поважних членів Наукової ради та титанічним зусиллям редакції, які, не шкодуючи сил, віддавали себе повністю і продовжують це робити щодня, аби Збірник розвивався і був цікавим для публікування статей науковцями у різних сферах, а найголовніше – щоб він слугував суспільству для створення нових знань.

Особливу подяку висловлюємо членам Наукової ради Збірника, які з різних країн та континентів підтримують його наукове спрямування та посилюють його значимість.

Науковці з Бразилії, Грузії, Індії, Іраку, Латвії, Литви, Кенії, Македонії, Мальти, Нігерії, Німеччини, Польщі, України та Швейцарії підтримують нас, що дозволяє Збірнику по праву називатись міжнародним.

Головною метою заснування цього видання було створення майданчика для обміну думками між науковцями, уведення його до міжнародних наукометричних баз, над чим редакція Збірника продовжує щодня працювати, і це приносить свої результати.

Велика подяка також авторам, які довірили нам свої думки та наукові напрацювання, аби розпочати довгий та плідний шлях у, сподіваємось, велике майбутнє Збірника «Європейське співробітництво».

Маю надію, що наша спільна наполеглива праця буде увінчана успіхом, інтерес до Збірника зростатиме щодня і поставлені нами цілі будуть досягнуті.

З повагою, подякою та сподіванням на подальшу плідну співпрацю

Голова Правління
Consilium Sp. z o.o.,
Голова Наукової Ради Збірника
«Європейське співробітництво»

Олександр Мельниченко

Уважаемые ученые! Дорогие коллеги, друзья!

Рад предложить вашему вниманию Международный Сборник научных трудов «Европейское сотрудничество». Это уникальное зарегистрированное в Европе издание призвано собрать мысли и перспективные видения ученых со всего мира!

Выход в свет этого первого номера стал возможным благодаря поддержке наших близких и дорогих друзей, уважаемых членов Научного совета и титаническим усилиям редакции, которые, не жалея сил, отдавали себя полностью и продолжают это делать каждый день, чтобы Сборник развивался и был интересным для публикации статей учеными в различных сферах, а самое главное – чтоб он служил обществу для создания новых знаний.

Особую благодарность выражаем членам Научного совета Сборника, которые из разных стран и континентов поддерживают его научное направление и усиливают его значимость.

Ученые из Бразилии, Грузии, Индии, Ирака, Латвии, Литвы, Кении, Македонии, Мальты, Нигерии, Германии, Польши, Украины и Швейцарии поддерживают нас, что позволяет Сборнику по праву называться международным.

Главной целью создания этого издания было создание площадки для обмена мнениями между учеными, введения его в международные наукометрические базы, над чем редакция Сборника продолжает ежедневно работать, и это приносит свои результаты.

Большое спасибо также авторам, которые доверили нам свои мысли и научные наработки, чтоб начать долгий и плодотворный путь в, надеемся, большое будущее Сборника «Европейское сотрудничество».

Надеюсь, что наш совместный настойчивый труд увенчается успехом, интерес к Сборнику будет ежедневно расти и поставленные нами цели достигнутся.

С уважением, благодарностью и надеждой на дальнейшее плодотворное сотрудничество

Председатель Правления
Consilium Sp. z o.o.,
Председатель Научного Совета Сборника
«Европейское сотрудничество»

Александр Мельниченко

Drodzy Autorzy i Czytelnicy!

Międzynarodowy Zbiór prac naukowych «Współpraca Europejska» (ISSN: 2449-7320) z rejestracją i wydaniem w Warszawie (Polska) publikowane jest co miesiąc w formie drukowanej, wraz z artykułami autorów w wersji elektronicznej – rozmieszczone na otwartej platformie wydawniczej OJS z linkiem http://we.clmconsulting.pl, co umożliwia stały dostęp do nich, ich indeksowanie i otwartość..

W skład Rady Naukowej Zbióru wchodzą naukowcy z różnych krajów, zapewniając wysoki poziom międzynarodowego recenzowania artykułów. Grupa docelowa Zbióru zawiera naukowców, doktorantów, aspirantów, naukowo-dydaktycznych pracowników z uczelni wyższych, praktyków organizacji, którzy mają możliwość publikowania artykułów w języku polskim, angielskim, ukraińskim i rosyjskim

Nagłówki tematyczne Zbióru: *Ekonomia, finanse, księgowość, audyt i analiza; Zarządzanie i Marketing; Nauki techniczne; Nowoczesne uniwersalne technologie informatyczne; Matematyczne modelowanie systemów i procesów; Społeczno-humanitarne studia*.

Redakcja codziennie ciężko pracuje na rzecz zwiększenie zainteresowania naukowców w opublikowaniu ich wyników w naszym Czasopiśmie, aby Czasopismo wszedło do najbardziej znanych i ważnych baz naukometrycznych: Google Scholar, ERIH (European Reference index of the Humanities), Thomson Reuters, Index Copernicus, EBSCOhost i inne.

Chciałbym również podkreślić, że Redakcja Czasopisma jest otwarta na współpracę z autorami i czytelnikami, których cenimy, bardzo szanujemy ich inteligentną pracę i mamy przyjemność zaprosić do publikowania artykułów w Międzynarodowym Zbióru prac naukowych «Współpraca Europejska».

Z poważaniem
Redaktor naczelny Zbióru
Zbigniew Wąsik

Dear Authors and Readers!

International Collection of scientific proceedings «European Cooperation» ISSN (2449-7320) with the registration and publication in Warsaw (Poland) is monthly published in print. In addition, articles of the authors are also posted on the electronic resource - open publishing platform OJS with link http://we.clmconsulting.pl, which enables permanent access to them, their indexing and openness.

The members of the Scientific Council of the Collection are scientists from different countries, what is providing a high level of international review of articles. The target audience of the Collection is researchers, doctoral students, graduate students, research and educational personnel of higher educational institutions, practitioners of organizations, who have the ability to publish articles in Polish, English, Ukrainian and Russian.

Subject Sections of the Collection are: *Economics, Finances, Accounting, Analysis and Audit; Management and Marketing; Engineering; Modern Versatile Information Technologies; Mathematical Modeling of Systems and Processes; Humanities and Social Studios*.

The Editorial Team works hard every day to organize the interest of scientists to publish their researches in our Collection, to provide the Collection's inclusion to the most famous and important scientometric bases: Google Scholar, ERIH (European Reference index of the Humanities), Thomson Reuters, Index Copernicus, EBSCOhost etc.

It would be good to emphasize that the editors are open to cooperation with authors and readers, whom we appreciate, respect their highly intelligent work and would like to invite them to publish articles in the International Collection of scientific proceedings «European Cooperation».

Sincerely Yours
Chief editor of the Collection
Zbigniew Wąsik

SPIS TREŚCI

Społeczno-humanitarne studia

TABLE OF CONTENTS

Economics, Finances, Accounting, Analysis and Audit

Management and Marketing

Engineering

Modern Versatile Information Technologies

Mathematical Modeling of Systems and Processes

Humanities and Social Studios

ЗМІСТ

Економіка, фінанси, бухгалтерський облік, аналіз і аудит

Менеджмент та маркетинг

Технічні науки

Сучасні універсальні інформаційні технології

Математичне моделювання систем та процесів

Соціально-гуманітарні студії

СОДЕРЖАНИЕ

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OPTIMIZATION OF ANALYSIS PROCESS OF E-MONEY PAYMENTS EFFICIENCY

Abstract. This article is devoted to the study and justification of the choice of multiplicative method of forming integral (total) amount of time of customer service to determine the bandwidth of cash desks as more efficient and easy to use, based on the formation of multiplicative assessment function and advantages compared to the additive method. Methods of assessment of construction function – integral index of cash desks bandwidth while using electronic money as means of payment between the customer and the seller of the goods are grounded using specific approaches in analyzing the effectiveness of the electronic money settlement.

Using the toolkit based on the determination of the average value of a particular index in a common set of values for its parameters standardization and mathematical approach to the formation of valuation functions – integral index, which is based on the multiplier approach and the principle of "inversion" of the denominator, it becomes possible to obtain adequate results, which are characterized by clarity of their presentation both graphically and in tabular form.

Keywords: e-money, efficiency**,** multiplicative and additive method, bandwidth, cash desk.

Formulas: 8; fig.: 3; tabl.: 8; bibl.: 23

JEL Classification: B 49, C 52, C 61, C 87, E 51, P 44

Introduction. Analysis of the effectiveness of the project on the use of electronic money for settlements between people and sellers of goods and services should be based on scientifically-based analysis. Thus, investigating the activities of the issuer of legal tender (in Ukraine today – we are talking about banks), performance analysis can be based on a study of the yield of issuing electronic money and the organization of their circulation.

By studying the activity of other entities involved in their circulation, the analysis can be made based on reducing maintenance costs of cash payments after the introduction of electronic money, depending on the social impact that is associated with improvement of cashiers working conditions, etc. This toolkit was studied in our previously published papers [Melnychenko 2015].

In addition, we studied the methods based on queuing theory [Erlang 1909, Palm 1943, Sztrik 2012], which made it possible to assess the effectiveness of implementing electronic money payments in supermarket chains by reducing the amount of time spent at the box office to pay for goods or services and increase cash desks bandwidth by an easier and more rapid method of checkout – electronic money.

In our studies multiplicative method of forming integral (total) amount of time of customer service was used to determine the bandwidth of cash desks as more effective and convenient one to use. In this paper we demonstrate and justify the choices of using an approach that is based on the formation of multiplicative assessment features and advantages compared to additive method.

Literature review and the problem statement. Many works of specialists in various fields are devoted to modeling of economic processes through economic and mathematical methods [Dźwigoł 2000; Dźwigoł 2001; Dźwigoł 2002a; Dźwigoł 2002b; Dźwigoł 2003a; Dźwigoł 2003b; Dźwigoł 2004; Dźwigoł 2005; Dźwigoł 2009; Dźwigoł 2010; Kvilinskyi 2012]. Enumeration of each one does not make sense as many authors make their contribution to the development of this very scientific area. Just let us support the great delineation of tools for modeling economic processes by Litvinov A.L. [Litvinov 2003]: mathematical programming, queuing theory, inventory control, game theory. Listed sections make up applied mathematics, methods of which solve critical issues primarily of a practical nature. Each of them plays an important role and gets focused on in the scientific literature. Thus, in our work we stopped in applying methods of queuing theory, which seems logical given the object of our study – electronic money [Melnychenko 2015], which in fact are intended primarily for use in system maintenance [CGAP 2010, Steed 2010].

Features of the application of various methods of economic and mathematical modeling, mathematical approaches that can be used effectively in a particular subject plane (for the class of specific economic problems) and the nuances of their use depending on the purpose of the study, analysis of economic entities objectives and tasks for solution of which the simulations are carried out remain important in this case [Darroch, Speed 1983].

Thus, in our papers we stopped to study the efficiency of implementing electronic money payments by determining the capacity of cash departments and desks as well as its increase through the introduction of electronic money. We proposed to calculate this indicator on the basis of the work of cashiers in terms of asymmetry of data when indicators with different dimensions and different numerical values should be included in the integrated indicator. In this paper, we justify the choice of approach to normalize data for calculations.

Methods of normalization of the indicators are analyzed in the works of authors who also study the identification of problematic situations in banks and there are 4 of them in general [Trydid, Samorodov, Goykhman 2014], outlining in particular:

- average value of a particular index in a common set of its values;
- standard deviation of actual values;
- approach "better – worse";
- values of column–vector norms in determining the normalized values of indicators.

The authors distinguish such approaches to the calculation of integral indicators:

1. Additive approach – the sum of normalized values of indicators.
2. Multiplier approach – the multiplication of normalized values.
3. Determination of the Euclidean distances between the actual values of the indicators.

Note that normalized values of indicators that are measured and on which estimate function is based may be corrected for the weighted coefficients of corresponding importance if needed [Samorodov 2011; Samorodov, Trydid, Samorodov 2012].

In these works, the authors assess the adequacy of proposed methods based on theoretical data. We are taking these approaches and sharing views on the possibility of their use in the analysis of banking activities, make comparisons

of appropriateness and objectivity of using two of them, namely additive and multiplicative integral factor in analyzing the effectiveness of the electronic money settlements. As methodological approach used for normalization of the studied parameters, we choose one that is based on the definition of the average value of a particular index in a common set of its values.

The purpose of this paper is to study methods of the assessment function construction – the integral index, which characterizes the total time of customer service to determine the cash desks bandwidth when using electronic money as means of payment between the customer and the seller of goods and substantiate use of these methods in analyzing the effectiveness of the electronic money settlement.

Research results. So, as we noted in [Melnychenko 2015] practical cash desks bandwidth μ_{pract} should be calculated using the following relationship:

$$\mu_{pract} = \frac{NC}{TR(LQ, OP) + TP(AP, FP, AC, LQ, AL, OP) + TI(PI, OP)}, \quad (1)$$

where NC – the number of clients that "passed" through the cash desk;
TR(LQ, OP) – time required for customer service (taking applications for processing, document preparation, etc.);
LQ – level of cashier qualification;
OP – other parameters;
TP(AP,FP,AC,AL,CA,OP) – time for payment of the customer;
AP – amount paid;
FP – form of payment (cash or bank transfer);
AC – amount of cash – banknotes and coins that are transferred from the payer to the cashier and vice versa;
AL – cash desk automation level;
TI(PI,OP) – cashier idle time;
PI – the probability of receipt incoming.

Value of μ_{pract} will be calculated precisely because of the normalization of the data for one of the above algorithms. In [Melnychenko 2015] we used a multiplier approach to calculation of the integral index and the average value of a particular index in a common set of values for its normalization of values of indicators as the most appropriate for the task: evaluation of cash desks bandwidth. Below we justify the selection of this instrument.

Based on the data of one of the supermarkets in Poland table 1 shows the average productivity of cashiers for 3 days (except for values of indicators "Payment", "Quantity of cash", "Cash desks automation level", "The probability of receipt of the application for service" "Other factors" which are defined empirically). The survey sampling comprised 109 man–days, in which customers purchased goods worth a total of 1 531 226.29 PLN.

For greater clarity of our calculations in this article, we took the average values in the context of the studied days and will operate with three average ones instead of 109.

To give some explanation of the indicators listed in the table 1 and determined empirically:

1. Form of payment:

– cash, which includes the likelihood of the need to issue the residue back to the client, takes more time for a re–calculation and double–checking.;

– bank transfer, credit or debit card, electronic money that will not require the issuance of the residue back to the client.

We propose to determine the value of FP, it may take:

– FP = 1, if there is a need to use cash for the payment and to issue the residue back to the client;

– FP = 0,8 if payment is made by means of cash with consequences mentioned in p. 1 above, or a bank card with the need to enter a PIN or sign the receipt, as well as by means of e-money;

FP = 0,5 if payment is processed only by means of bank cards and e-money.

Table 1 – Performance of supermarket cashiers

Indicator	Average value	Average value per day		
		17.12.2014	**21.12.2014**	**22.12.2014**
Turnover, PLN	15 119,62	11 687,17	16 781,23	16 890,46
Form of payment	0,80	0,80	0,80	0,80
Quantity of cash	20,00	20,00	20,00	20,00
Cash desk automation level	0,80	0,80	0,80	0,80
The probability of receipt incoming	0,92	0,85	0,95	0,95
Scan time, hours	2:19:07	1:44:42	2:31:20	2:41:18
Payment time, hours	1:33:07	1:27:14	1:35:12	1:36:54
Other factors	1,00	1,00	1,00	1,00
Number of clients	130,00	131	130	129

Source: built on the basis of our own research

2. Amounts of cash. Clearly, any cash denomination is accepted as payment means, so it is probable that the customer can pay, for example, 500 monetary units as one banknote, maybe 10 banknotes fifty each, or 500 banknotes and/or coins and more. Also, when buying something cheap customer can pay with large denominations (100, 200, 500 monetary units).

The approximate average value of the amount of cash that the buyer is using equals to 20 pieces of banknotes and coins.

3. Cash desk automation level. The speed of the cashier when taking money and when issuing the rest for the client depends on setting up an information system in general as well as on the software which runs a particular cash desk, same for the availability of machines for counting banknotes and coins and on their class and specification.

The workstation level software for cashiers today can be considered as high, given that many of the functions are performed automatically. For example, bank cashiers do not need to calculate bank commission on payments received from customers or write the same type of documents or make accounting entries in the accounts. In supermarkets, in most cases, the cashier does not have to enter code for a specific good or make transactions with cards when paying manually. All these operations are carried out by automated

systems. However, there is still a need, for example, in calculation and issuance of the residue for clients, issuing checks, receipts, etc. Therefore, the cash desk automation level is defined at 0.8, which is considered a reduction factor due to a need of a cashier's manual work.

Other factors can, in particular, include: possible faults in cashiers equipment, rate of change checks by customers, delays associated with the provision of cash desk (cash, securities, etc.), etc. In our case, the index takes value of 1 (there are other factors) or 0 (other factors do not affect the cash desk bandwidth).

So, going directly to calculation of values of cash desk bandwidth integrated indicators, it should be noted that the definition of normalized values of performance appraisal will use the formula:

$$\mathrm{Ind}'^{(t)}_i = \frac{\mathrm{Ind}^{(t)}_i}{\overline{\mathrm{Ind}^{(t)}_i}}, \tag{2}$$

where $\mathrm{Ind}'^{(t)}_i$ – normalized values of indicators; $\mathrm{Ind}^{(t)}_i$ – actual values of indicators; $\overline{\mathrm{Ind}}^{(t)}_i = \frac{1}{T}\sum_{t=1}^{T}\mathrm{Ind}^{(t)}_i$ – average values for every analyzed time period; $i = \overline{1,n}$ – indicator number; n – quantity of indicators; $t = \overline{1,T}$ – time period number; T – quantity of time periods.

To calculate the numerical values of the equation denominator (1) we will use two approaches.

The first approach is based on the use of formulas:

$$\mu_{pract} = \frac{NC}{TR(LQ,OP)\cdot TP(AP,FP,AC,LQ,AL,OP)\cdot TI(PI,OP)} = \\ = \frac{NC}{I^{(t)}} = \frac{NC}{\prod_{i=1}^{7}\mathrm{Ind}'^{(t)}_i}, \tag{3}$$

$$\mu_{pract} = \frac{NC}{TR(LQ,OP)+TP(AP,FP,AC,LQ,AL,OP)+TI(PI,OP)} = \\ = \frac{NC}{I^{(t)}} = \frac{NC}{\sum_{i=1}^{7}\mathrm{Ind}'^{(t)}_i}, \tag{4}$$

That is, in the case of formula (3) we calculate multiplicative integral indicator to determine the numerical value of the equation denominator (1) including all of its components together, and using the formula (4) – additive integral indicator.

The second approach will consist in calculating the corresponding components of the denominator in the formula of (1) for each component: TR (time for customer service), TP (payment processing time) and TI (cashier idle time), using the same approach – multiplicative and additive integral indicators. That is, in this case, the following formula should be used:

$$\mu_{pract} = \frac{NC}{TR(LQ,OP) + TP(AP,FP,AC,LQ,AL,OP) + TI(PI,OP)} = \\ = \frac{NC}{I_1^{(t)} + I_2^{(t)} + I_3^{(t)}} = \frac{NC}{\prod_{i=1}^{2} Ind_i'^{(t)} + \prod_{i=1}^{6} Ind_i'^{(t)} + \prod_{i=1}^{2} Ind_i'^{(t)}}, \quad (5)$$

$$\mu_{pract} = \frac{NC}{TR(LQ,OP) + TP(AP,FP,AC,LQ,AL,OP) + TI(PI,OP)} = \\ = \frac{NC}{I_1^{(t)} + I_2^{(t)} + I_3^{(t)}} = \frac{NC}{\sum_{i=1}^{2} Ind_i'^{(t)} + \sum_{i=1}^{6} Ind_i'^{(t)} + \sum_{i=1}^{2} Ind_i'^{(t)}}, \quad (6)$$

First, we will demonstrate the adequacy of the results that may be obtained using formulas (3) – (6) for conventional data close to real one (table 2).

We propose to simulate a situation where the results of the same cash desk workflow are constant for all three days selected (table 3).

Table 2 –Input data (identical) to verify the adequacy of the proposed models

Indicator	**Average value**	**Average value per day**		
		17.12.2014	**21.12.2014**	**22.12.2014**
Turnover, PLN	16 781,23	16 781,23	16 781,23	16 781,23
Form of payment	0,80	0,80	0,80	0,80
Quantity of cash	20,00	20,00	20,00	20,00
Cash desk automation level	0,80	0,80	0,80	0,80
The probability of receipt incoming	0,95	0,95	0,95	0,95
Scan time, hours	1:44:42	1:44:42	1:44:42	1:44:42
Payment time, hours	1:27:14	1:27:14	1:27:14	1:27:14
Other factors	1,00	1,00	1,00	1,00
Number of clients	130,00	130	130	130

Source: built on the basis of our own research

Table 3 – Modeling of indicator $\mu_{pract}^{(t)}$ for the same input data of cash desk

Indicator name	**Integral criteria type**	**Formula used for calculation**	**Average value per day**		
			17.12.2014	**21.12.2014**	**22.12.2014**
Value $\mu_{pract}^{(t)}$	Multiplicative	(3)	1	1	1
	Additive	(4)	0,125	0,125	0,125
	Multiplicative	(5)	0,33333333	0,3333333	0,3333333
	Additive	(6)	0,08333333	0,0833333	0,0833333

Source: built on the basis of our own research

Table 3 shows the calculations obtained using formulas (3) – (6) for the input data from table 2, and it is clear that the calculation of values of indicator μ_{pract} by formulas (3) – (6) we obtained the same qualitative values.

Let's complicate the task, and model the situation in which we get one worst period characterized accordingly by a worst (minimum) indicator value of $\mu_{pract}^{(t)}$ cash desk bandwidth. Input data is mentioned in table 4.

Table 4 – Input data (different) to verify adequacy of the proposed models

Indicator	**Average value**	**Average value per day**		
		17.12.2014	**21.12.2014**	**22.12.2014**
Turnover, PLN	16 781,23	16 781,23	16 781,23	16 781,23
Form of payment	0,80	0,80	0,80	0,80
Quantity of cash	20,00	20,00	20,00	20,00
Cash desk automation level	0,80	0,80	0,80	0,80
The probability of receipt incoming	0,95	0,95	0,95	0,95
Scan time, hours	2:04:42	2:44:42	1:44:42	1:44:42
Payment time, hours	1:47:14	2:27:14	1:27:14	1:27:14
Other factors	1,00	1,00	1,00	1,00
Number of clients	130,00	130	130	130

Source: built on the basis of our own research

Table 4 shows that the scan time and payment time for the first time period are different from the corresponding values for the other studied periods. The values of every other parameters are the same.

Table 5 contains calculations obtained after using formulas (3)–(6) for input dates of table 4.

Table 5 – Modeling indicator $\mu_{pract}^{(t)}$ for different input of cash desk

Indica-tor name	**Integral criteria type**	**Formula used for calcula-tion**	**Average value per day**		
			17.12.2014	**21.12.2014**	**22.12.2014**
Value $\mu_{pract}^{(t)}$	Multiplicative	(3)	1,81342771	0,68302440	0,68302440
	Additive	(4)	0,13359230	0,11876086	0,11876086
	Multiplicative	(5)	0,47553745	0,2545726	0,2545726
	Additive	(6)	0,09115003	0,0778782	0,0778782

Source: built on the basis of our own research

Table 5 shows that carrying out calculations of indicator values $\mu_{pract}^{(t)}$ gives same qualitative results. However, if we analyze their relevance, we see that the results do not correspond with reality. The results should have indicated the lowest cash desk bandwidth as of 17.12.2014, since that day scanning time was

equal to 2:44:42, while payment time was 2:27:14, both being worst results compared to other days, accordingly it would adversely affect the value of $\mu_{pract}^{(t)}$.

Here, the root cause lies in the essence of integrated criteria used for denominator calculation in (3) – (6), namely being the accumulation of values in a situation of "more is better". However, realizing the fact that the maximum cash desk bandwidth:

$$\mu_{max} = \frac{NC}{TR_{min} + TP_{min} + TI_{min}}, \quad (7)$$

is a functional, in which the denominator is reduced in absolute terms, we should revert its value.

In this case we will have for the general indicator $\mu_{pract}^{(t)}$, the following formula:

$$\mu_{max} = \frac{NC}{(TR + TP + TI)^{-1}} = NC \cdot (TR + TP + TI). \quad (8)$$

When using the formula (8) the result should not be understood as the number of customers over the same period of time but as the time required for servicing a certain number of customers.

Using formula (8) for data from table 5, we get the following results (see table 6).

Table 6 shows the results adequacy, thus we should consider formula (8) being a proper one.

Table 6 – Modeling of $\mu_{pract}^{(t)}$, for different input data with inversion

Indicator name	Integral criteria type	Formula used for calculation	Average value per day		
			17.12.2014	21.12.2014	22.12.2014
Value $\mu_{pract}^{(t)}$	Multiplicative	(3)	0,55144188	1,46407653	1,46407653
	Additive	(4)	7,48546130	8,42028196	8,42028196
	Multiplicative	(5)	2,10288377	3,9281531	3,9281531
	Additive	(6)	10,9709226	12,840564	12,840564

Source: built on the basis of our own research

The next stage of the study is the determination of a specific approach that most appropriately reflects the results in solving economic problems of this class.

Let us analyze graphical form of results obtained in table 6 (Fig. 1, 2).

From fig. 1, 2 and the data from table 6 it is obvious that the results differ quantitatively with the same quality. Therefore, in this case we should firstly decide which formulas to choose for calculation of . We propose to stop at this point in formulas (5) and (6) due to the fact that they completely describe the structure of time-consuming, with each cost of time function calculated separately as part of the denominator of the formula (1) (check formula (7) as well).

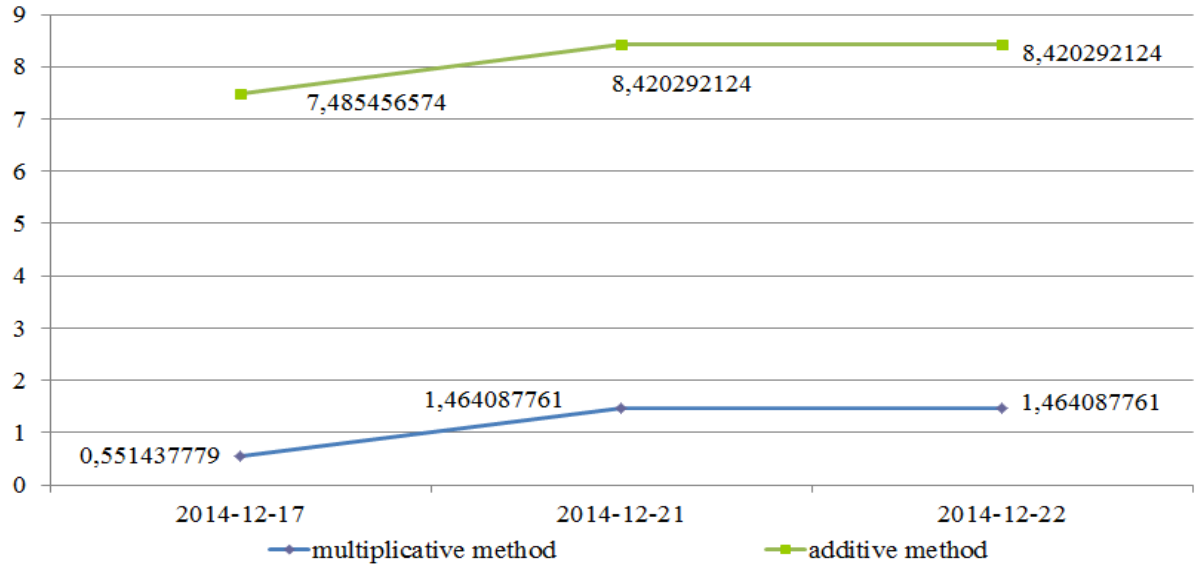

Figure 1 – Graphical interpretation of $\mu_{pract}^{(t)}$, calculated by formulas (3)–(4) with an inversion used

Source: built on the basis of our own research

Regarding grounded recommendations of using a particular approach to an integral parameter construction (additive or multiplicative), you should explore the relative change of values of $\mu_{pract}^{(t)}$. Relative change in this case is important for visualization of the results. Note that we explore only three time periods and thus it is graphically identifiable on which date we have better results of $\mu_{pract}^{(t)}$. With the growing number of periods analyzed results will inevitably match in quality, but visually they will be difficult to analyze.

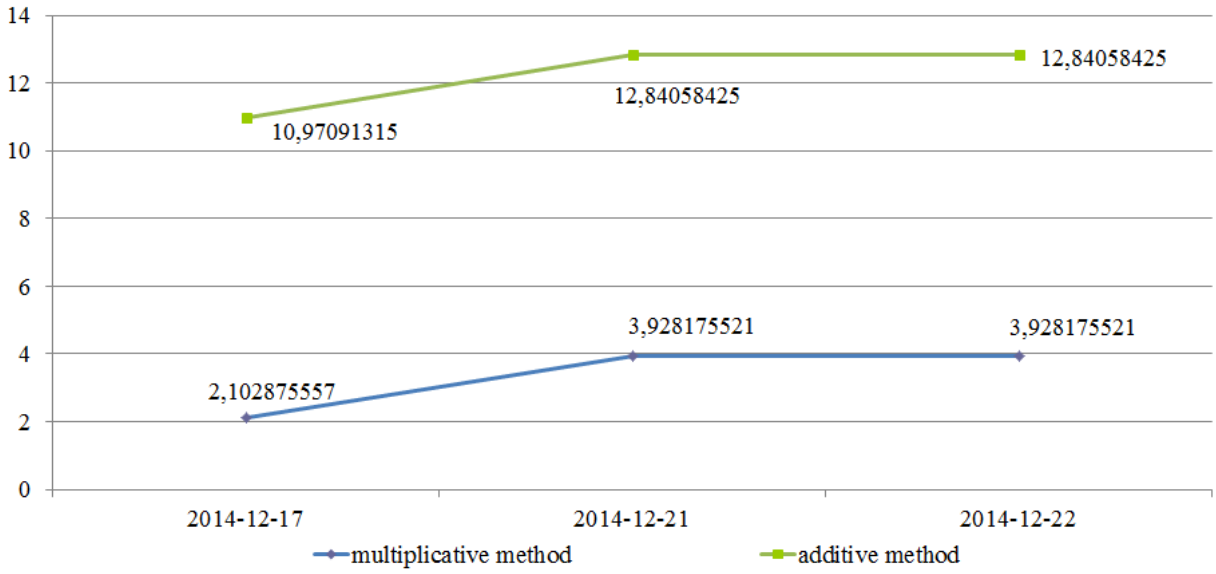

Figure 2 – Graphical interpretation of $\mu_{pract}^{(t)}$, calculated by formulas (5)–(6) with an inversion used

Source: built on the basis of our own research

Lets analyse relative changes of $\mu_{pract}^{(t)}$, based on formulas (5) and (6) according to (8). Results are shown in table 7.

Table 7 – Relative changes of $\mu_{pract}^{(t)}$

Indicator name	Integral criteria type	Formula used for calculation	Average value per day		
			17.12.2014	21.12.2014	22.12.2014
Value $\mu_{pract}^{(t)}$	Multiplicative	(5)	–	86,7983916	0
	Additive	(6)	–	17,0417876	0

Source: built on the basis of our own research

Table 7 shows that quantitatively the relative change in value of the index $\mu_{pract}^{(t)}$ is bigger while using multiplicative approach to integrated parameter construction. Using this approach will allow to obtain results that can be analyzed in a more convenient way by increasing the number of analyzed periods.

So we reasonably chose a tool the use of which is not only possible when analyzing the efficiency of payments by electronic money, but also allows you to get adequate results which are characterized by clarity of their presentation both graphically and in tabular form.

Using the selected tool based on the determination of the average value of a particular indicator in a common set of values for its standardization parameters (formula (2)), as well as mathematical approach to the formation of the assessment function – integral index, based on multiplicative approach (formula (5)), and denominator inversion (formula (8)), we will calculate value of practical cash desk bandwidth $\mu_{pract}^{(t)}$ using table 1 – real data. Results are shown in table 8.

Table 8 – Calculation of $\mu_{pract}^{(t)}$ for real data

Name of indicator	Integral criteria type	Formula used for calculation	Average value per day		
			17.12.2014	21.12.2014	22.12.2014
Indicator $\mu_{pract}^{(t)}$	Multiplicative	(5)	3,4682047	2,9333085	2,7693844
Relative changes of $\mu_{pract}^{(t)}$			–	– 15,422854	– 5,5883715

Source: built on the basis of our own research

Graphical interpretation of calculation of $\mu_{pract}^{(t)}$ for real data is shown on fig. 3.

Table 8 and figure 3 show that best results of cash desk bandwidth were obtained on 17.12.2014.

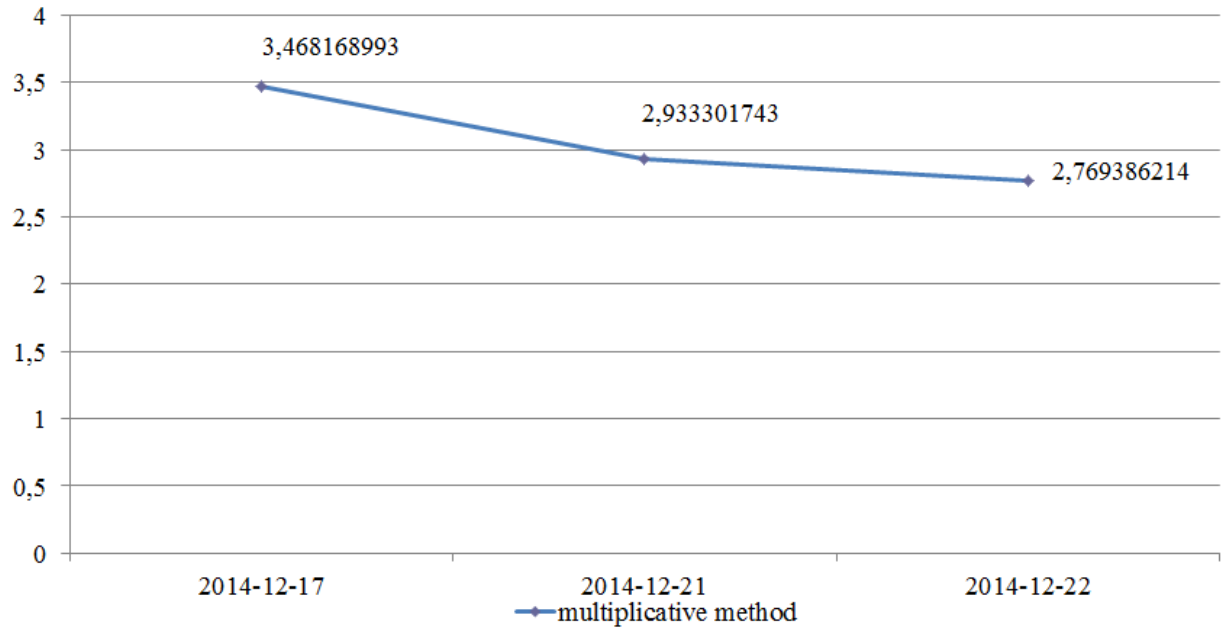

Figure 3 – Graphical form of $\mu_{pract}^{(t)}$, using formula (5) and inversion

Source: built on the basis of our own research

Obtained maximum is primarily characterized by minimal time to scan and process the payment, despite the fact that turnover during this day is minimal compared to other time periods studied.

Conclusions. Research of methods for constructing the assessment function – integral index, which characterizes the total time of customer service to determine the cash desk bandwidth using electronic money as means of payment between the customer and the seller of goods made the justification of the use of specific approaches in analyzing the effectiveness of the electronic money settlements possible.

Using tools based on the determination of the average value of a particular indicator in a common set of values for its standardization parameters (formula (2)), as well as mathematical approach to the assessment functions formation – integral index, which is based on the multiplier approach (formula (5)), using the denominator inversion (formula (8)), gives adequate results, which are characterized by clarity of their presentation both graphically and in tabular form.

References

CGAP (2010). *Nonbank E-Money Issuers: Regulatory Approaches to Protecting Customer Funds.* Retrieved from http://www.cgap.org/sites/default/files/CGAP-Focus-Note-Nonbank-E-Money-Issuers-Regulatory-Approaches-to-Protecting-Customer-Funds-Jul-2010.pdf.

Darroch, J. N., Speed T. P. (1983). Additive and Multiplicative Models and Interaction. *The Annals of Statistics, Vol. 11, No. 3.*, 724-738.

Dźwigoł, H. (2000). Budgeting – cost management system. In J. Chuangxin & Y. Shijian (Eds.), *Technology innovation and to put it in practice, papers on the technology in coal industry* (pp. 490-493). Xuzhou, China: China University of Mining and Technology Press

Dźwigoł, H. (2001). Nowoczesne podejście do zarządzania przedsiębiorstwem w warunkach koniecznej restrukturyzacji. *Wiadomości Górnicze*, 10, 395-399. [in Polish].

Dźwigoł, H. (2002). Zarządzanie projektami w górnictwie węgla kamiennego. *Przegląd Organizacji,* 1, 20-22.
Dźwigoł (2002), *Usprawnienie systemu zarządzania kopalniami węgla kamiennego poprzez zarządzanie projektami*. *Wiadomości Górnicze,* 1, 2-5.
Dźwigoł, H. (2003b). Controlling jako instrument wspomagający zarządzanie przedsiębiorstwem w procesie zmian. *Wiadomości Górnicze,* 11, 488-495.
Dźwigoł, H. (2003a). Zarządzanie procesami marketingu i sprzedaży. Organizacja rynku. *Wiadomości Górnicze*, 5, 212-215.
Dźwigoł, H. (2004). Zmiana jako warunek restrukturyzacji przedsiębiorstwa. *Wiadomości Górnicze,* 4, 171-172.
Dźwigoł, H. (2005). Projektowanie modelu organizacyjnego przedsiębiorstwa przyszłości. In J. Pyka (Ed.), *Nowoczesność przemysłu i usług. Współczesne koncepcje i metody zarządzania przedsiębiorstwami* (pp. 239-249). Katowice: Towarzystwo Naukowe Organizacji i Kierownictwa. [in Polish].
Dźwigoł, H. (2009). Model restrukturyzacji organizacyjnej przedsiębiorstwa górniczego. *Organizacja i Zarządzanie: Kwartalnik Naukowy, 2*(6), 25-43. [in Polish].
Dźwigoł, H. (2010). *Podejście systemowe w procesie restrukturyzacji przedsiębiorstwa*. Gliwice: Wydawnictwo Politechniki Śląskiej. [in Polish].
Erlang, A. (1909). The theory of probabilities and telephone conversations. *Nyt Tidsskrift for Matematik B, Vol. 20*, 33 – 39.
Kvilinskyi, O.S. (2012). Formuvannia dodatkovykh perevah funktsionuvannia ta rozvytku malykh pidpryiemstv [Formation of Additional Benefits of Operation and Development of Small Enterprises]. *Economy of Industry, 3-4*(59-60), 140-147. [in Ukrainian].
Litvinov, A. L. (2003). *Komp'iuternoe modelirovanie v ekonomike*. Belhorod: BelHU.
Melnychenko, O. V. (2015). *Teoriia, metodolohiia ta praktika obliku, analizu i auditu elektronnih hroshei v bankah*. Zhitomir: ZhDTU.
Melnychenko, O. (2015). Zastosuvannya metodiv teorii masovoho obslugovuvannia v ekonomichnomu analizi operatsii z elektronnimi hroshima. *Problemi ekonomiki*, *1*, 198-207.
Palm, C. (1943). Intensitätsschwankungen im Fernsprechverkehr, *Ericsson Technics, 44*.
Samorodov, B. V. (2011). Alternativniy pidhid do analizu nadiynosti banku yak etapu upravlinnya finansovim rozvitkom. *Innovatsiyna ekonomika : Vseukr. nauk.–virob. zhurnal, 7(26)*, 238-240.
Samorodov, B., Trydid, O. & Samorodov, V. (2012). Osoblivosti matematichnoi obrobki danih pri vikoristanni ekspertnih pidhodiv dlia viznachennya reytinhiv bankiv. *Visnik Natsionalnoho banku Ukraini, 1*, 18-21.
Steed, A. (2010). The business of e-money. *The Daily Telegraph Supplement, 7 September 2010.* Retrieved from http://www.envoyservices.com/pressr/business_of_e-money.pdf.
Sztrik, J. (2012). *Basic Queueing Theory.* University of Debrecen, Faculty of Informatics.
Trydid, O. M., Samorodov, B. V. & Goykhman, M. I. (2014). Identifikatsiya problemnih situatsiy v bankivskiy diyalnosti z urahuvannyam asimetrii danih. *Chasopis ekonomichnih reform, 3(15)*, 63-76.

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RELEVANT ASPECTS OF MANAGEMENT OF BANKS INVESTMENT ACTIVITIES ON SECURITIES MARKET

Abstract. In the article the determining terms of origin of market vagueness are considered in investmanagement on securities market, the structuring of these terms is conducted depending on their predictability and relevance, and also there are discovered the separate directions of process perfection of noted management taking into account an informative aspect. There are considered the basic approaches about the reasonability determination of bank entry on securities market, the priorities of investment bank activity at securities market are determined with the use of securities of fixed and unfixed income, the possible variants of risk origin of investment bank activity at securities market are grounded, the introduction terms of securities implementation are determined after basic classification signs and also the features of their use in the process of realization of investment bank activity at securities market, the logical analysis scheme is developed in reasonability determination of bank exit to securities market in accordance with consideration of terms of securities introduction.

Keywords: securities market, investment activity, market uncertainty conditions, predictability, risk.
Formulas: 0; fig.: 2; tabl.: 0; bibl.: 19
JEL Classification: G 11, G 21, G 24, G 31

Introduction. As a key tasks of the current research the generalization of

conditions of the market uncertainty appearance in the management of banks investment activities on securities market, the structuring of such conditions in dependence on predictability of the information environment, the practicability of bank entry on securities market and the determination of basic advantages and shortages of the realization of investment operations with securities in modern conditions are selected.

Literature review and the problem statement. The practicability of research of the task of analysis the market uncertainty conditions within the management of banks investment activities on securities market and structuring of these conditions is important for improvement the risk management of the investment activity. This importance is confirmed by domestic scientists' research, among which Vasyurenko O. [Vasyurenko, Musienko, Maslova 2015, Vasyurenko, Podchesova 2008], Vitlinskiy V. [Vitlinskyy, Velykoivanenko, 2004], Markovskiy [Markovskiy 2009], Williams [Williams 1938]. The substantial contribution in development of theoretical approaches for banks investment activities on securities market is made by next famous scientists-economists: Vasilyeva [Vasilyeva 2007], Luciv [Lutsiv 2001], Mayorova [Mayorova 2013], Peresada [Peresada, Mayorova 2005]. They have developed the methodological base of the management of banks investment activities on securities market.

The purpose of this article is developing and grounding of the theoretical and methodological aspects of management of banks investment activities on securities market in the scope of an effective realization of the market uncertainty conditions, that are as the basic indicator of the economic process changeability, and considering the practicability of bank entry on securities market accordingly to the conditions of securities implementation.

Research results. An uncertainty in the area of management of banks investment activities on securities market – is the reason of appropriate risks appearance within the processes of forming and using the resource potential, that provide for necessity of consideration the market uncertainty conditions, and also demands to form the proper management solutions with the aim to prevent the risk situations appearance which can perform the important threat to the bank activity in the securities market condition [Sharpe, Gordon, Bailey 1999].

An appearance of the different market uncertainty conditions in management of banks investment activities on securities market can be divided in aspect of their predictability. First of all, it is reasonable to select the group of market uncertainty conditions which appear because of different situations, but such that it is able to predict. As an example of predictability of the particular market uncertainty conditions appearance in management of banks investment activities on securities market can be the situations of determination the actions of potential competitors on pre-defined segments of the banking market. The possibility of such conditions prediction lies in determination the consequences from competitors' actions on banking market and ability to achieve the effectiveness in management of banks investment activities on securities market. Under the considering the actions of potential competitors it is important to define the time interval during which these actions will have maximal influence on the current bank activity.

As other example of predictability of the particular market uncertainty conditions appearance in management of banks investment activities on securities market can be the situation with changing the applicable legislation in the context of performing the appropriate banking directions or following the regulations in investment activity realization.

For consideration and determination the market uncertainty conditions, development of which can be predicted, as usual the probabilistic and statistical methods of their evaluation are used. Also the set of approaches for solving the optimization tasks that are based on Gurvitz, Sevidg, Vald, Laplas, Bayes criterions [Vitlinskyy, Velykoivanenko 2004, Labsker 2000, Markovskiy 2009, Sio 2000] etc. Thus, in completion as particular directions, which are pointed at improvement the management of banks investment activities on securities market in the market uncertainty conditions appearance, it is possible to define the development of the scenarios of management of banks investment activities on securities market. This will allow to minimize the negative influence at appearance of the situation with predicted market uncertainty conditions appearance. At this such scenarios should have as economic leverages of holding the influence of negative aftereffect of the predicted market uncertainty conditions appearance, as actions that are aimed at bank interests lobby. Particularly, at changing the economic standards of banks activity it is appropriate to implement the flexible transient period for determination the new standards or implementation such periods on the basis of positions of different banks groups.

If talk about using from the side of current bank the economic leverages of holding the influence of negative aftereffect of the predicted market uncertainty conditions appearance, then it is necessary to note that they can be divided in causation to the situations of market uncertainty conditions appearance. At this, in the context of banking economic standards varying, such leverages should provide for prediction value of the banking standards changing. But if talk about applying the economic leverages from the side of minimizing the negative influence because of predictability of the potential competitors actions, then it is necessary to note only importance using of that leverages which are adequate to potential competitors' leverages at least.

It is very difficult to predict the development of market uncertainty also at mass deposits withdrawal of retail customers, which are directed at decreasing of current and potential bank resource bases. That straight influences on condition of management of banks investment activities on securities market [Arnold 2010]. At the same time the difficult predicted and unpredictable conditions of market uncertainty development can perform real set of influences on bank activity.

From the other side, if talk about the directions of improvement of the management of banks investment activities on securities market in the conditions of noted appearance of market uncertainty, then it is necessary to note, that the majority of probable actions firstly are defined by banking regulator.

Equally with the division of conditions of appearance and development of the market uncertainty in management of banks investment activities on securities market in accordance with their predictability it is necessary to consider the uncertainty taking into account the saturation of the proper information management system. In this case it is possible to mark out the uncertainty in the context of as inefficiency of informational support, as of presence of the excessive information at management of banks investment activities on securities market.

If talk about the market uncertainty conditions that are obtained because of the received excessive information at management of banks investment activities on securities market, in this case it is appropriate to focus the attention

on fact that such conditions can be taken into account only if current information is reduced or the most priority data from it presence set is selected.

In this context, for selecting the most priority data from it presence set, having the aim to reduce an excessive information, it is possible also to use the methods of expert evaluations, which allow at the objective- subjective level to determine the appropriate management decisions.

At the same time under the solving of strategic tasks within the management of banks investment activities on securities market there should be realized the coordination at generalization of the obtained information with bank departments, which are responsible or risk management. Thus, strategic decision making within the management of banks investment activities on securities market should be coordinated between different bank management structures independently of its volume of activity [Coval, Shumway 2001]. An also the general vision of basic directions of the management of banks investment activities on securities market at the uncertainty conditions can be presented as a scheme (Figure 1).

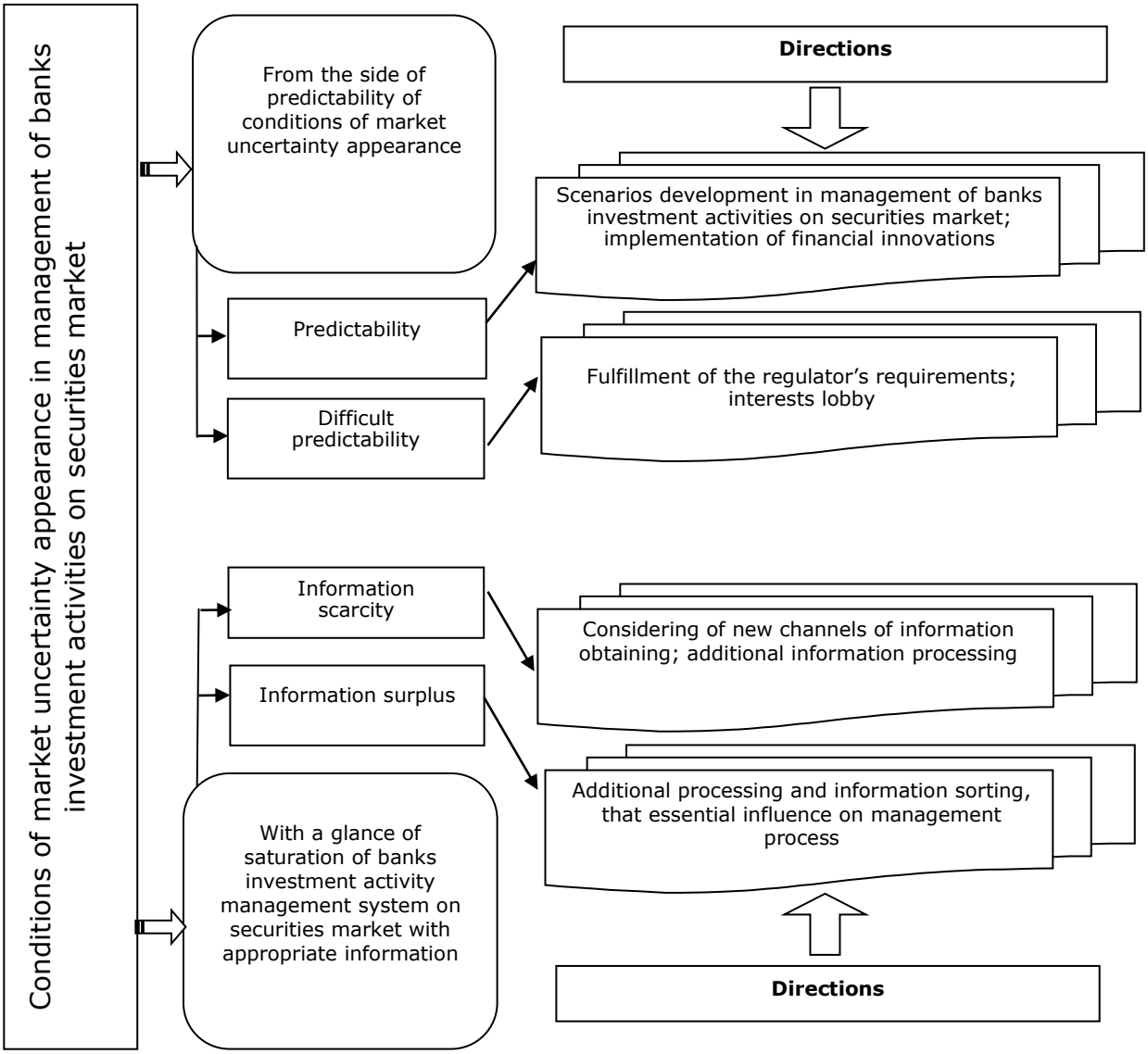

Figure 1 – Basic directions of the management of banks investment activities on securities market in the conditions of appearance of market uncertainty

Source: authors' own development

From the data at fig. 1 it is follow that the basic directions of the management of banks investment activities on securities market, in the context of taking into account the conditions of appearance of market uncertainty, are based on integration the methods of obtained information processing and on applying the necessary leverages of achieving the stable positive effect within noted management. In completion it allows to improve and increase the horizons of management of banks investment activities on securities market and grounds the considering of practicability of bank entry on the securities marked at large. Considering of such approach is based on 1) taking into account the risky actions with securities; 2) taking into account the expected securities income at a point of bank entry on the securities marked; 3) evaluation the varying of expected securities income with the lapse of time.

It is also necessary to note that the main difference between considering of practicability of bank entry on the securities marked with fixed and unfixed income lies in taking into account the risky actions first of all with unfixed profit securities. The validity of such division is based on next facts. If the security has fixed income, then bank can compare the risk value and income value in the context of performing the investment activity on the securities marked with selected tool and do this more objective. At this as determining is the value of the expected income and its varying during the time. These parameters are the basic indicators for determination the practicability of bank entry on the securities marked.

In the case if security has unfixed income, then this increases the risky actions in the context of performing the bank investment activity on the securities marked with such tool. Thus, the question about the practicability of bank entry on the securities marked mostly depends on value of security risk indicator that is determined in accordance to the issuer class of such security, its rating or issuer's security rating [Polozhennya 2012]. So, if the risk volume of the current security in the moment of bank entry on securities market is unacceptable, then the practicability of performing the bank investment activity on securities market in such direction is also unacceptable.

As to the taking into account the expected income and its varying under the determination of practicability of performing the bank investment activity on securities market with securities which have unfixed income, in this case it is necessary to pay attention to next conditions.

Firstly, at considering the possibility to bank entry on securities market it is necessary to compare the profitability of current security with the profitability of possible using of other tools.

If the current market profitability of proposed security at the moment of entry on securities market is greater or equals to the current profitability of possible using of another tools, then this entry is practicability. If other, then the practicability of bank entry on securities market with the corresponding type of securities is insufficient and is determined as management disposition to risk, as predicted evaluation of varying of expected profitability of applied security type during the time.

Secondly, is the predicted evaluation is positive in the context of increasing the expected profitability of applied security type during the time, then the bank entry on securities market with such security is practicability.

And the last situation, when the predicted evaluation is negative in the same context, then the bank entry on securities market with such security is not practicability. As the method of determination the expected profitability of applied type of security can be used the regression procedures, methods of expert evaluations, approaches of the theory of games etc.

Thereby, the determination of practicability of bank entry on securities market in accordance to criterion of possibility and necessity of using the current securities type should be performed according to the author's logical scheme (Figure 2).

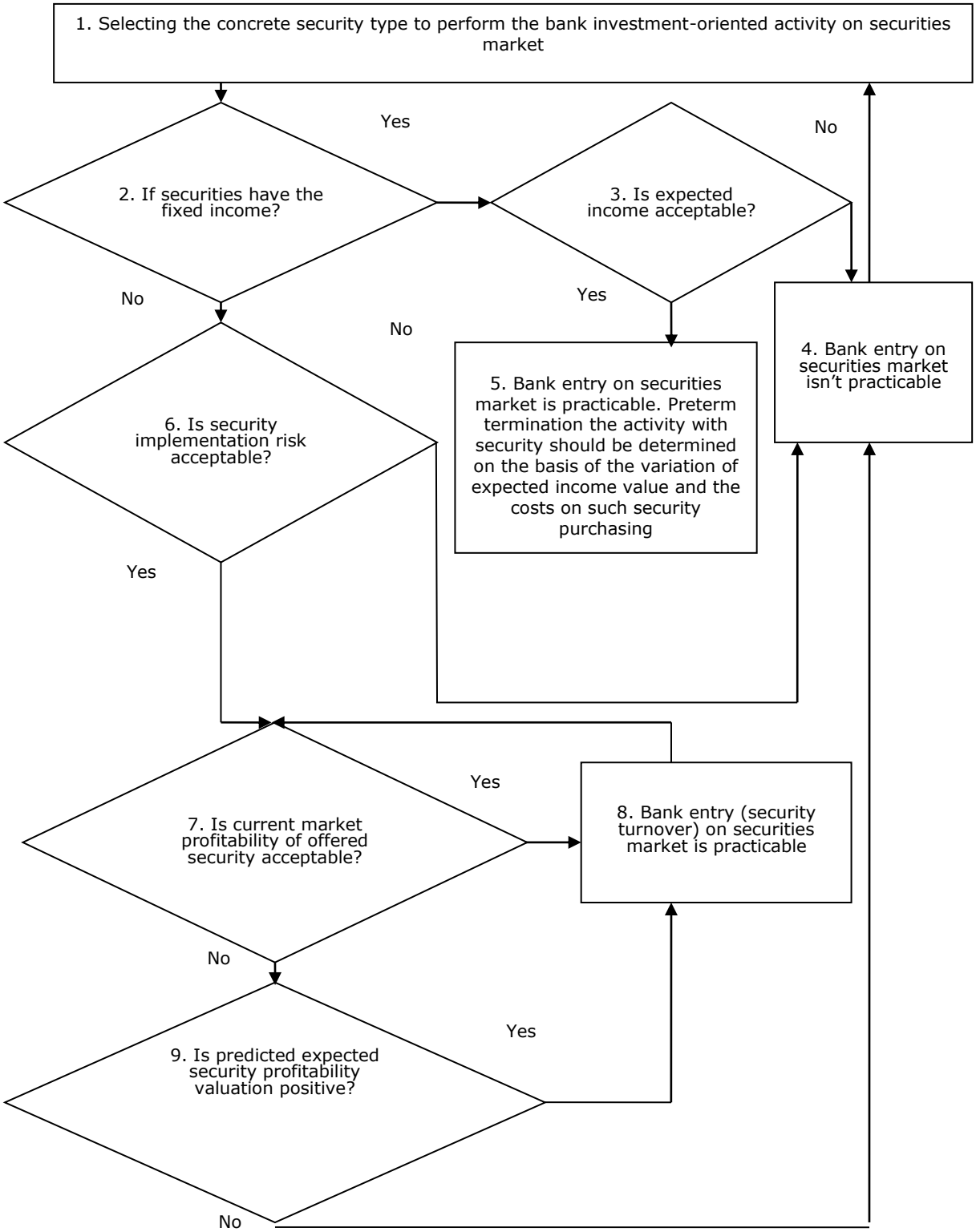

Figure 2 – Methodical approach to determination the practicability of bank entry on securities market accordingly to considering the securities implementation conditions

Source: authors' own development

From the data at fig. 2 it is clear that proposed logical scheme of determination analysis of practicability of bank entry on securities market in accordance to considering the conditions of implementation the security determines not only the practicability of performing the bank investment activity on securities market with selected type of security, but also the conditions of termination of such activity.

At the same time this scheme has no the conditions of termination of bank investment activity on securities market with selected type of security in accordance to prescribed term of security turnover, that is apparent.

So, the given on fig. 2 scheme it is necessary to consider with taking into account the selected horizon (term of security turnover) of performing the bank investment activity on securities market. Also it can be noted that offered approach takes into account next conditions of security implementation: type of security by the content of obtained income (fixed and unfixed): term of security turnover; implementation risk; evaluation of current security profitability; evaluation of security profitability varying which depends on time.

In the same time the analysis of determination the practicability of bank entry on securities market, indeed, supposes the considering of qualitative criterions of performing the bank investment activity on security market.

This is because that fact, that the main criterion of considering the acceptability of the securities implementation conditions (though, as the base of determination of such acceptability are various quantity calculations), is the taking into account the current activity of different bank and varying of conditions of their investment activities on securities market.

Other approach to determination the practicability of bank entry on securities market can be base only on quantitative comparing of the obtained results.

Then in this case as the indicator of practicability of performing the bank investment activity on securities market is, for example, irrelevant variation of the structure of current bank securities portfolio. That structure, particularly, is determined by bounds of such variation which generalized in accordance to concrete quantitative indicators. That is, for example, the value of variation of the bank securities portfolio by each element of such structure should not exceed the concrete numerical value.

At this such generalization of quantitative characteristics subordinates, first of all, to bank requirements and possibilities to perform its banking activity at large.

But it is necessary to note that the current approach determines as practicability as possibility of performing of bank investment activity on securities market and under the determination of securities implementation conditions. Thereby, considering of using different securities is the base of practicability of bank entry on securities market. Also at this at generalization of qualitative comparing of obtained results on the basis of optimization management within bank investment activity on securities marked should be taking into account the own bank propositions for securities portfolio changing.

Conclusions. A generalization of the emergence conditions of market uncertainty in the management of bank investment activity on securities market and consideration of the saturation of the information management system contributed us to the disclosure of certain directions of such management process improvement.

The definitions of the main directions of management of banks investment

activities on securities market in respect of considering the emergence of market uncertainty that are made by authors are based on a combination of methods of received information processing and applying the necessary leverage to obtain stable positive effect in such management.

In banks' activity this allows to improve and to expand the horizons of management not only of investment potential, but also management of the Bank as a whole.

The banking sector functioning within the securities market is one of the priority directions of modern banking management that, firstly, due to the importance of solving the optimization task in forming the securities portfolio and determination of banks investment activity with taking into account the financial aspects of its implementation in modern conditions.

The developed approach for determination the appropriateness of bank entry on securities market in accordance with the conditions of introduction of securities provides the optimization process of using the various securities types as the basics of investment activity reasonable. However, in summarizing the quantitative comparison of the results obtained on the basis of optimization management of banks investment activities on securities market, it is appropriate to account the situational investment needs of the bank on the restructuring of the securities portfolio, which is a perspective direction for further research in this direction.

References

Arnold, G. (2010). *Investing: the definitive companion to investment and the financial markets. 2nd ed. Financial Times.* New Jersey: Prentice–Hall.

Coval, J. & Shumway, T. (2001). Expected Option Returns. *Journal of Finance*, *vol. 56, 3*, 983-1009.

Investment Management Services. (2012). *Comptroller's Handbook*. Retrieved from http://www.occ.treas.gov/publications/publications-by-type/comptrollers-handbook/invmgt.pdf

Labsker, L. G. (2000). O nekotoroy obshchey sheme formirovaniya kriteriev optimalnosti v igrah s prirodoy. *Vestnik Finansovoi akademiy*, *2*, 71-78.

Lutsiv, B. L. (2001). Bankivska diyalnist' u sferi investitsiy. *Ternopil: Ekonomichna dumka, Kart-blansh*.

Mayorova, T. V. (2013). *Investitsiiniy protses i finansovo-kreditni vazheli yoho aktivizatsii v Ukraini.* Kyiv: KNEU.

Markovskiy, O. V. (2009). Kontseptsiya modeliuvannya sistemi rizik-menedzhmentu komertsiynoho banku. *Derzhava ta rehioni. Seriya: Ekonomika ta pidpriyemnitstvo, 6*, 123-125.

Miśkiewicz, R. (2012). Zróżnicowanie struktur organizacyjnych ze względu na układ pionów scalonych na przykładzie przedsiębiorstw hutniczych [Diversification of Organizational Structures due to the Layout of Integrated Divisions on the Example of Steel Companies]. *Hutnik, Wiadomości Hutnicze, 79*(10), 760-766. [in Polish].

Miśkiewicz, R. (2009). Wykorzystanie podobieństwa struktur organizacyjnych w procesie przekształcania organizacji przedsiębiorstw [The Utilization of Organizations Structure Similarity in a Process of Company Organization Transformation Process]. *Zeszyty Naukowe Małopolskiej Wyższej Szkoły Ekonomicznej w Tarnowie, 1*(12), 77-87. [in Polish]

Miśkiewicz, R. (2007). Taksonomia jako narzędzie ocen struktur organizacyjnych przedsiębiorstw hutniczych [Taxonomic as a Tool in Estimation of

Organizational Structures for Metallurgical Companies]. *Hutnik, Wiadomości Hutnicze, 74*(3), 151-154. [in Polish]

Peresada, A. A. & Mayorova, T. V. (2005). *Upravlinnya bankivskimi investitsiyami.* Kyiv: KNEU.

Polozhennya pro poryadok formuvannya ta vikoristannya bankami Ukraini rezerviv dlya vidshkoduvannya mozhlivih vtrat za aktivnimi bankivskimi operatsiyami, zatverdzhene Postanovoyu Pravlinnya Natsionalnoho banku Ukraini vid 25.01.2012 № 23. Retrieved from http: // zakon.rada.gov.ua

Sharpe, W., Gordon J., A. & Bailey, J. (1999). *Investments. International edition.* New Jersey: Prentice–Hall International.

Sio, K. K. (2000). *Upravlencheskaya ekonomika.* Moskwa: INFRA-M.

Vasilyeva, T. A. (2007). *Bankivs'ke investuvannya na rinku innovatsii*. Sumi: SumDU.

Vasyurenko, O. V., Mysienko, O. M. & Maslova A. Yu. (2015). *Resursna skladova v upravlinni kreditno-investitsiinoyu diyalnistyu bankiv*. Dnipropetrovsk: Forest.

Vasyurenko, O. & Podchesova V. (2008). Tsina kreditnih resursiv yak klyuchova skladova sistemi upravlinnya kreditnim rizikom. *Bankivska sprava*, *1*, 28-34.

Vitlinskyy, V. V. & Velykoivanenko, G. I. (2004). *Rizikolohiya v ekonomitsi ta pidpriyemnitstvi.* Kyiv: KNEU.

Williams, J. B. (1938). *Theory of Investment Value.* Cambridge: Harvard University Press.

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ASSESSMENT OF THE INFLUENCE CRISIS OF 2008-2009 ON THE BANKING SYSTEM OF UKRAINE

Abstract. In the article analyzes the market environment of banks in Ukraine. Basic indicators (parameters) of the banking system as a whole and in the context of bank groups. The problems of the domestic banking system in the pre-crisis period, crisis and post-crisis periods disclosed shortcomings of economic policy, which was conducted by the authorities and its negative consequences for the economy as a whole. Determined several options to reform the banking system: 1) allow troubled banks to fail, leaving the strong players in the market, 2) temporarily nationalize failing banks in order to preserve the number of banks to maintain competition between them and to prevent monopolization of the market. It was found that during the 2014-2015 crisis is even worse for the consequences than the crisis of 2008-2009.

Keywords: crisis, troubled banks, bad debts, capitalization, liquidity, temporary nationalization and liquidation of banks.

Formulas: 0; fig.: 1; tabl.: 4; bibl.: 19

JEL Classification: G 01, G 21, G 28, G 33

Introduction. The banking system plays a key role in the economics. Therefore, its stability is crucial, given the function of financial intermediation, propulsion payment flows, meet the needs of customers in financial services, efficient allocation of credit and maintaining financial discipline among borrowers. The various crises that arise within the country and in international financial markets, adversely affect the functioning of banks and worsen the economics.

Literature review and the problem statement. Today, a large number of economists, academics, analysts concerned about the impact assessment of the influence crisis on the banks and they make suggestions and recommendations which would enable to mitigate negative effects. This is confirmed by scientists' research, among which Baranovskyi O.I. [Baranovskyi 2009], Kuznetsova A.Y. [Kuznetsova, Julay 2012], Pustoviyt R.F. [Pustoviyt 2009], Smovzhenko T. S. [Smovzhenko, Slavyuk 2010]. Among foreign scientists – Ayadi R. [Ayadi, Arbak, Pieter de Groen, Llewellyn 2011], Chossudovsky M. [Chossudovsky, Marshall 2010], Dewatripont M. [Dewatripont, Rochet, Tirole 2010], Dullien S. [Dullien, Kotte, Márquez, Priewe 2010], Nanto

D.K. [Nanto 2009], Shpunar P.D. [Shpunar 2012], Shrivastava P. [Shrivastava, Statler 2011], Spence M. [Spence, Blanchard, Romer 2012].

The purpose of this article - to assess the impact of the global financial crisis 2008 on banking institutions, to determine the factors that strengthened its manifestation in Ukraine and determine the consequences for the banking system as a whole.

Research results. The crisis of 2008-2009 in Ukraine occurred, primarily through the incomplete economic reforms, their controversial failures in the implementation of economic policies, the actual lack of development strategy of economic complex of the country, but not because of volatility in global financial markets. Although the latter played a role in increasing the deployment of the crisis.

In addition, inconsistent and flawed economic policies pursued in the pre-crisis period provoked chronic accumulation of macroeconomic imbalances (fiscal deficit, balance of payments, uncontrolled growth of short-term debt of the banking and corporate sectors), which also contributed to the economic and financial crisis in Ukraine . These trends stimulated unstable world prices for raw materials and period of excess liquidity in global capital markets.

Ukraine's banking system has been characterized by some problems and shortcomings before the crisis of 2008. That is why only shift the blame on globalization "domino effect" is not necessary. The problem must be sought in the middle of the country: "why there were no adequate adaptation measures in case of deterioration of the banking system?", "why supervisors and regulatory policies conducted too soft on banks?" and so on. A striking example of a country that has successfully coped with the crisis with minimal cost is Poland. So, according to Director of Financial System National Bank of Poland Piotr D. Shpunara "... we had a successful starting point (the right time for the crisis) - we only had to mitigate the uncertainty and lack of confidence that resulted from problems of parent banks. The infusion of liquidity Polish zloty and foreign currency (swap) were sufficient to calm the market. Making the banks to credit during the economic slowdown - a task complicated than may seem ... Our problem was significant loan losses, uncertainty about the valuation of assets, lack of experienced professionals in banks. What we did - recapitalized banks, but we forced them to restructure loans to corporations that were viable. Makes banks and enterprises to learn, instead of just giving them money to cover losses" [Shpunar 2012].

As for Ukraine, the banking system was not ready to confront the negative impact of the crisis, which led to the deterioration of the financial market. To assess the impact of the crisis there is a need to analyze the market environment functioning domestic banks in the pre-crisis period and the period of overcoming the consequences of the banking crisis of 2008-2009.

As of 01.01.2008 the license for banking operations in Ukraine had 175 banks (including 47 banks with foreign capital share in foreign capital of the banking system was 35%) and as of 01.01.2014 - 180 banks (PJSC "Rodovid Bank" had curative bank license), including 49 banks with foreign capital share in the capital of the banking system was 34%). Analysis of the number of operating banks and of foreign capital in the banking market shows little impact of the 2008 crisis on the positive trends of the system. However, the deteriorating macroeconomic condition during the years 2014-2015, the events in the East, the unstable political situation, inadequate economic policies have adversely affected the banking sector. In this regard, as at 04.01.2015, the number of

banks with a banking license decreased to 148, including 46 banks with foreign capital share in the capital of the banking system was 30.5%. This downward trend in banking institutions continues, and the number of troubled banks grows. As at 22.04.2015: 41 bank is in liquidation [The official site of the National Bank of Ukraine]. It should be noted that the problems associated with the liquidation of banks in Ukraine. And, above all, due to the imperfection of the legislation under which the process is quite lengthy. In our opinion, when questions about bankruptcy appears , you need to liquidate the bank as soon as possible - as long as "real" assets, do not keep temporary administration for a long time, since the probability of such a situation "revive" the bank is negligible, and trust to customers banking system - falls quite rapidly. Practice shows that in Ukraine, liquidation of banks could last for years. We believe that in the case of very important amendments to the legal acts which would allow to accelerate the process.

Speaking about the downward trend of banks in Ukraine raises the question: "what to do with problem banks: let them fail or temporarily nationalize?". The reality today show that troubled banks are large number in Ukraine, and it is not only banks IV group (banks in Ukraine are divided into 4 groups according to total assets, I group includes banks with the largest volume of assets, and the IV group - the lowest), but I group [The official site of the National Bank of Ukraine]. Among scientists, economists, there are two opinions on this issue. Some believe that Ukraine has enough to leave about 50 banks, those that are stable and problematic banks - let fail. This will form the banking system with strong players. In our opinion, it is necessary to call disadvantage of this process - the monopolization of the market, because competition between banks will not, and the lack of competition - hence the lack of progress, while not the market will dictate the terms for banks, and vice versa. Another point of view is the fact that banks did not reduce the number and leave about 150 for encourage competition. In this connection it is necessary to nationalize troubled banks, that state first for a small price buys problem bank, and after improving his condition again selling shareholders. Of course, the state did not win, but allows you to maintain the trust of the population to the banking system. In our view, the second view is more rational than the first. Although it should be taken into account and the following: the shareholders of many small banks in Ukraine are those persons who in addition, have also their own business, that is actually creating a bank for its own purposes. And when such a bank there is a deterioration, we must remember: the state has to rescue the bank, not the owners.

Further analysis of the banking system is carried positions of competitiveness indicators that are related to the ratios between the major indicators of banking activity and GDP (Fig. 1).

From Figure 1 shows that the share of assets, credits, liabilities and equity of banks in Ukraine GDP is insignificant. Compared with the economically developed countries of Western Europe, for example in the UK, France, Germany, the proportion of total assets is 300% to 400% of GDP. Instead, the value of such indicators is similar to post-socialist countries of Eastern Europe. After overcoming the first effects of the crisis, a decrease in the share of assets and liabilities to GDP. This is explained limitation of banks implementing business strategy aimed at rapid growth performance and increase market share, and the simultaneous growth of GDP. This decrease is insignificant proportion of shareholders' equity to GDP, indicating that the capitalization of banks in 2011-

2013 as one of the results of the implementation of anti-crisis measures. However, the deterioration of the banking system during 2014 put the task to capitalization.

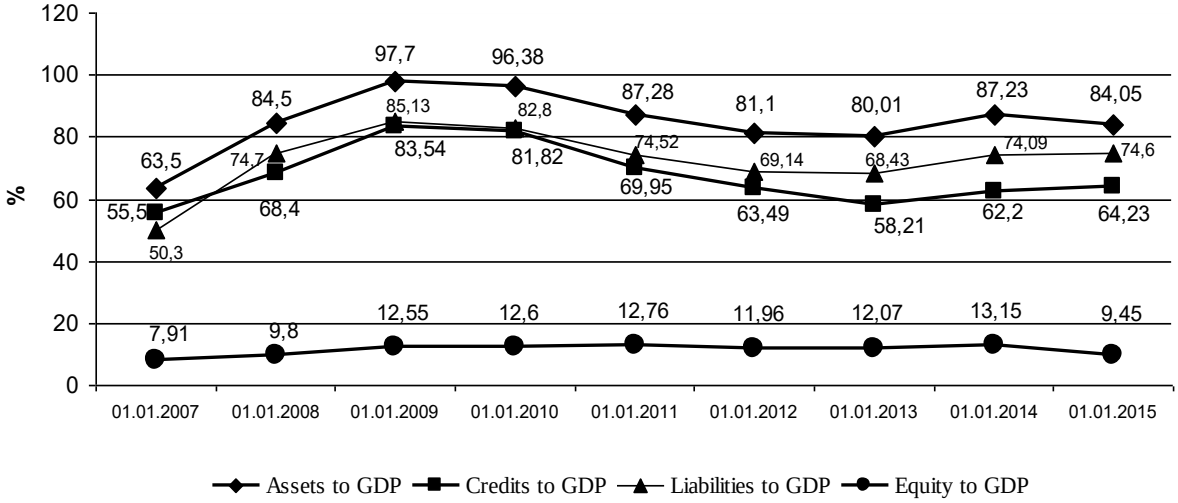

Figure 1 – The ratio of assets, credits, liabilities and equity of the banking system of Ukraine to GDP in the years of 2006-2014,%

Source: built on the basis of the National Bank of Ukraine [The official site of the National Bank of Ukraine]

The banking system of Ukraine characterized by a significant concentration of assets, liabilities and equity in major banks (table 1).

Table 1 – Concentration of total assets, capital and liabilities by groups of banks in Ukraine, %

	Total assets		Equity		Liability	
	01.01. 2008	01.01. 2015	01.01. 2008	01.01. 2015	01.01. 2008	01.01. 2015
Group I	64,80	72,99	57,20	74,45	65,80	72,81
Group II	17,20	14,44	16,80	10,22	17,20	14,98
Group III	10,20	7,49	12,90	6,93	9,90	7,56
Group IV	7,80	5,07	13,10	8,40	7,10	4,65

Source: built on the basis of the National Bank of Ukraine [The official site of the National Bank of Ukraine]

Banks belonging to the first and second group increased its equity interest in the banking system of Ukraine is caused by the greater needs in capital increase through provisioning and more powerful financial capabilities of shareholders of such banks. Thus some reduction of the share in the largest banks in assets and liabilities caused by active work with problem assets (including the sale of assets), restriction of credit expansion and repayment of funds raised in the pre-crisis period from foreign creditors. Reducing the share of the smallest banks (group IV) because in the post-crisis period, this group of banks was quite burdened by problem loans and to take into account the risk to which they were attracting deposits at higher interest rates just to maintain and not lose the resource base.

Also possible note the existence of significant concentrations of the income and expenses incurred by the largest banks of I group (table 2).

Table 2 – The concentration of income and expenses by groups of banks in Ukraine, %

	Income		Expenses	
	01.01.2008	01.01.2015	01.01.2008	01.01.2015
Group I	64,80	44,09	63,9	58,57
Group II	15,1	35,50	15,4	20,88
Group III	11,6	11,49	11,9	12,29
Group IV	8,5	8,92	8,8	8,26

Source: built on the basis of the National Bank of Ukraine [The official site of the National Bank of Ukraine]

These concentrations can be explained by the fact that an active market expansion carried out mainly banks I and II groups, which causes by their receiving the largest the volume income and incurring the largest expenses. Banks III and IV groups occupy niches by explaining some stability to their share in the structure of income and expenses of the banking system of Ukraine.

Indicators of banking system liquidity in the pre-crisis period answered set by the regulatory requirements of the National Bank of Ukraine. Thus there was even a surplus liquidity. But the fall of 2008, the situation in this area has changed dramatically in the opposite direction. The cause of this situation should look at the availability of certain imbalances in the management of assets and liabilities of the banking system of Ukraine in 2006 - 2008 (table 3).

Table 3 – Credits and deposits in the banking system of Ukraine in the years of 2006-2014, bln. hryvnia

	Loans of residents				Deposits of residents				Ratio of deposits to loans,%
	Total	Up to 1 year	From 1 year to 5 years	More than 5 years	Total	On demand and up to 1 year	From 1 year to 2 years	More than 2 years	
2006	245,2	86,2	159	-	185,9	105,4	80,6	-	76
2007	426,9	131,5	181,3	114,1	283,9	154	106,2	23,6	67
2008	734,0	222,0	278,6	233,4	359,7	200,5	122,3	36,9	49
2009	723,3	231,0	266,7	225,6	335,0	255,2	60,4	19,4	46
2010	732,8	242,8	275,6	214,4	416,7	286,0	106,7	24,0	57
2011	801,8	297,4	301,0	203,4	491,8	329,0	132,9	29,9	61
2012	815,1	344,2	294,5	176,4	572,3	373,2	163,9	35,2	70
2013	910,8	426,1	310,7	174,0	670,0	394,4	249,4	26,2	74
2014	1019,5	414,0	387,9	217,6	663,2	460,6	177,4	25,2	65

Source: built on the basis of the National Bank of Ukraine [The official site of the National Bank of Ukraine]

Credit investments of Ukrainian banks in the pre-crisis period by 65% - 75% were made from borrowed on the domestic market term funds. Significant reduction of said value during the banking crisis of 2008-2009 caused by uncontrolled outflow of resources through massive withdrawal of funds from public deposit and current accounts in banks. The response of the regulator, the National Bank of Ukraine on this situation was a moratorium on early repayment of term deposits. But despite the rather strict administrative measures for the period from November 2008 to February 2009 the amount of funds on deposit accounts of individuals fell by 26.7 bln. UAH. and 3.5 bln. USD USA. As at 01.01.2015 year the ratio of deposits to loans granted amounted to 65% (and as of 01.01.2014 - 74%). This situation demonstrates the inability of the banking

system to resist the negative influences of the crisis in 2014, again as in 2008-2009, led to a massive outflow of deposits and the loss of confidence in the banking system of Ukraine.

On the other hand, the existence of significant gaps between the attracted deposits and loans of the banking system indicates that macroeconomic imbalances reflected in the imbalance of banking activities, in particular in the sphere of management of attracted and placed funds. This led to the accumulation of problems with maintaining proper level of liquidity, which clearly manifested by deteriorating economic conditions and prevailing panic among depositors Ukraine.

The growth in bad loans caused the decline in liquidity as a result of bad loans, an increase of losses due to significant amounts of provisioning and increasing the number of insolvent institutions. During the deployment of the crisis in the banking market of Ukraine observed the rapid growth of NPLs (table 4).

Table 4 – Characteristics of the loan portfolio of banks of Ukraine in the years of 2005-2014

	Total loans to customers, bln. hryvnia	Loans to entities, bln. hryvnia	Loans to individuals, bln. hryvnia	Overdue debts, bln. hryvnia	Provision for active operations, %
2005	156,3	109,0	33,2	3,4	7,3
2006	268,3	167,7	77,8	4,5	13,3
2007	485,4	276,2	153,6	6,4	20,2
2008	792,2	472,6	268,9	18,0	48,4
2009	747,3	475,0	222,5	69,9	122,4
2010	755,0	508,3	186,5	84,6	148,8
2011	825,3	580,9	174,7	79,2	157,9
2012	815,3	609,2	163,9	77,8	141,3
2013	911,4	698,8	167,8	70,2	131,3
2014	1006,4	802,3	179,0	135,9	204,9

Source: built on the basis of the National Bank of Ukraine [The official site of the National Bank of Ukraine]

Evaluation of the growth of the loan portfolio of Ukrainian banks makes it possible to conclude that aggressive policy increase of loans in 2008. Thus the growth rate of lending to individuals exceeded the rate of increase in corporate lending. Consequently, the credit expansion was not directed to the real economy. Significant amounts of loan portfolio growth in crisis of 2008, not least caused by additional increases of loans in foreign currency, due to the devaluation of the national currency. Since 2009 credit growth was moderate pace. However, loans granted to legal entities from 2009 to 2014 decreased. Such dynamics are negative for the economy as a whole, as evidenced by the "isolation" of the banking sector from the real.

Also resulting crisis of 2008-2009 was the increase in arrears to 2010 inclusive (in 2010 their volume totaled 84.6 billion. USD USA). In 2014, the volume of outstanding debt reached 135.9 billion. UAH. and exceeded even graduation compared with 2010. It should be noted that the method used by the National Bank of Ukraine, taking into account only as overdue delinquent share of principal (or overdue accrued income) as problem loans. The methodological

framework global rating agencies based on opposing principles: in case of delayed payment of overdue credit debt is considered to be the entire amount of the debt. In addition, according to foreign practice to problem loans include those loans that have been restructured, and in Ukraine - no. That is why banks want to restructure in order to "cleanse" their balance sheets, but they do not actually solve the problem and hide it. Along with increasing the size of the outstanding loan debt was an increase in the volume of existing reserves for active operations (mainly for credit).

A significant deterioration quality of credit portfolio of Ukrainian banks caused the need to formation of reserves for active operations that directly affected the negative financial result, So, after incurred in 2009, a record loss of $ 38.5 million. UAH. The banking system of Ukraine in 2010-2011 also didn't came out on profitable activities. This is due to formation of bank reserves under active operations after changes in the quality assessment of the loan portfolio by the crisis. In 2014, the banking system in general received a loss of $ 53 million. UAH, which is significantly greater than in 2009 [The official site of the National Bank of Ukraine].

In our opinion, the crisis in Ukraine of 2014-2015 years can be have more disastrous consequences for the entire financial market than in 2008-2009. Examples that indicate on the inadequate government policies much. For example, the National Bank of Ukraine holds both monetary targeting and inflation targeting. According to the law don't make these two things at simultaneously. The task of the regulator should be targeting inflation. Another inadequate measures of the National Bank of Ukraine was that in February 2014 it was announced freely floating exchange rate. That is, the regulator "let" currency when the gap between exports and imports was huge. We think that the regulator had to do it in 2006-2007, when the gap was insignificant and thus mitigate the negative impact of the financial market. In this regard, there is need to develop and conduct adequate policy that takes into account both the realities of the Ukrainian economy, and advanced foreign experience. After all, as we see, the state of the banking system is in a critical condition and requires urgent action by the regulator, government and coherence with the management of banking institutions.

Conclusions. The evaluation of the impact of the crisis of 2008-2009 showed that Ukraine had not developed and not applied appropriate adaptation measures that would mitigate the negative impact on the banks and the economy as a whole. It certainly led to a deterioration of quality credit, ran the banks, panic among the population, obtaining significant losses, problems with liquidity, and the formation of significant amounts of reserves under credit transactions affected the capitalization. In addition, the deterioration of the macroeconomic and political situation in Ukraine during 2014-2015 years led to worse consequences than the global crisis of 2008. In this connection, the volume of bad debts soaring. The number of banks that are being wound up also increases. The banking system in 2014 received the huge losses (much more even than in 2009), and capitalization thus very low. You could even say that now in 2014-2015 years Ukraine has the second crisis during the past 8 years, the consequences of which more than during the first (2008-2009).

References

Ayadi, R., Arbak, E., Pieter de Groen, W., & Llewellyn, D. T. (2011). *Business Models in European Banking. A pre- and post-crisis screening*. Brussels: Centre for European Policy Studies.

Baranovsky, O. I. (2009). *Financial crisis: background, consequences and ways of prevention*. Kyiv: Kyiv National Trade and Economic University.

Chossudovsky, M., & Marshall, A. G. (2010). *Global Economic Crisis: The Great Depression of the XXI Century.* Montreal: Global Research.

Dewatripont, M., Rochet, J.-Ch., & Tirole, J. (2010). *Balancing the banks: Global Lessons from the Financial Crisis.* Princeton and Oxford: Princeton University Press.

Dullien, S., Kotte, D. J., Márquez, A., & Priewe, J. (2010). *The financial and economic crisis of 2008-2009 and developing countries.* New York and Geneva: United Nations.

Dźwigoł, H. (2010). *Podejście systemowe w procesie restrukturyzacji przedsiębiorstwa*. Gliwice: Wydawnictwo Politechniki Śląskiej. [in Polish].

Dźwigoł, H. (2013). *Zarządzanie przedsiębiorstwem w warunkach XXI wieku.* Gliwice: Wydawnictwo Politechniki Śląskiej. [in Polish].

Dźwigoł, H. (2015). Założenia do budowy metodyki badawczej. *Zeszyty Naukowe Politechniki Śląskiej, Organizacja i Zarządzanie,* 78, 99-116.

Kuznetsova, A. Y., & Julay, V. O. (2012). *Crisis management in the banking sector of Ukraine: status, problems and perspectives.* Kyiv: UB NBU.

Miśkiewicz, R. (2012). Zróżnicowanie struktur organizacyjnych ze względu na układ pionów scalonych na przykładzie przedsiębiorstw hutniczych [Diversification of Organizational Structures due to the Layout of Integrated Divisions on the Example of Steel Companies]. *Hutnik, Wiadomości Hutnicze, 79*(10), 760-766. [in Polish].

Miśkiewicz, R. (2009). Wykorzystanie podobieństwa struktur organizacyjnych w procesie przekształcania organizacji przedsiębiorstw [The Utilization of Organizations Structure Similarity in a Process of Company Organization Transformation Process]. *Zeszyty Naukowe Małopolskiej Wyższej Szkoły Ekonomicznej w Tarnowie, 1*(12), 77-87. [in Polish]

Miśkiewicz, R. (2007). Taksonomia jako narzędzie ocen struktur organizacyjnych przedsiębiorstw hutniczych [Taxonomic as a Tool in Estimation of Organizational Structures for Metallurgical Companies]. *Hutnik, Wiadomości Hutnicze, 74*(3), 151-154. [in Polish]

Nanto, D. K. (2009). *The Global Financial Crisis: Analysis and Policy Implications*. CRS Report for Congress Prepared for Members and Committees of Congress.

Pustoviyt, R. F. (2009). *The banking system of Ukraine in the European context: genesis, structure, competitive potential.* Kyiv: UB NBU.

Shpunar, P. D. (2012). *Key policy challenges regarding financial stability*. Director of the Financial Report of the National Bank of Poland Piotr D. Shpunara.

Shrivastava, P., & Statler, M. (2011). Learning from the global financial crisis: creatively, reliably, and sustainably. *Stanford business books: An Imprint of Stanford University Press Stanford, California*, 118-127.

Smovzhenko, T. S., & Slavyuk, R. A. (2010). *The development of the banking system of Ukraine.* Kyiv: UB NBU.

Spence, M., Blanchard, O. J., & Romer, D. (2012). In the Wake of the Crisis: Leading Economists Reassess Economic Policy. Cambridge: MIT Press (MA).

The official site of the National Bank of Ukraine. Retrieved from http://www.bank.gov.ua

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КОНЦЕПТУАЛЬНІ ПІДХОДИ ДО ФОРМУВАННЯ В БУХГАЛТЕРСЬКОМУ ОБЛІКУ ІНФОРМАЦІЇ ПРО ОСНОВНІ ЗАСОБИ ПІДПРИЄМСТВА

Анотація: В статті наведені концептуальні підходи до визначення та класифікації ремонту основних засобів підприємства. Це необхідно для виконання головних завдань бухгалтерського обліку. Надання повної та правдивої інформації про стан матеріально-технічної бази підприємства, сприятиме визначенню майбутніх економічних вигод від використання об'єктів. Наведена класифікація ремонту основних засобів забезпечує розкриття сутності ремонту об'єктів та сприятиме організації облікового процесу. Наведені поняття та класифікація є універсальними для усіх підприємств та допоможе ефективно використовувати основні засоби та сприятиме покращенню стану виробництва.

Ключові слова: основні засоби, поліпшення, ремонт, класифікація, поточний ремонт, модернізація.

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CONCEPTUAL APPROACHES TO FORMING THE INFORMATION ABOUT ENTERPRISE FIXED ASSETS IN ACCOUNTING

Abstract. Conceptual approaches to determination and classification of repair of a property, plant and equipment of the entity are given in article. It is necessary for accomplishment of the main tasks of financial accounting. Provision of complete and true information on a condition of material base of the entity will promote determination of future economic benefits from use of objects. The given classification of repair of a property, plant and equipment provides disclosure of essence of repair of objects, and will promote the organization of accounting process. The given concepts and classification are universal for all entities, and will help to use effectively a fixed assets and to promote improvement of a condition of production.

Keywords: fixed assets, improvement, repair, classification, running repair, modernization.

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Вступ. В сучасних умовах швидкого розвитку економіки основні засоби мають суттєвий вплив на діяльність підприємств, оскільки вони дають змогу оцінити рівень забезпеченості необхідними умовами для господарсько-фінансової діяльності підприємства. Актуальною проблемою в Україні є значна зношеність основних засобів (ОЗ), через це підприємства прагнуть спрямовувати власні кошти на ремонт або поліпшення рухомого та нерухомого майна. Одним з головних завдань бухгалтерського обліку є визначення того, чи призводить ремонт або поліпшення об'єктів до збільшення майбутніх економічних вигод, які з самого початку очікуються від їх використання.

Аналіз досліджень і постановка задачі. Аналіз джерел дослідження показує, що в економічній літературі та законодавчих актах не існує єдиного, спільного та досить чіткого визначення понять ремонту та поліпшення основних засобів та не наведено повної класифікації ремонту за різними ознаками.

Головною метою цієї статті є дослідити, ідентифікувати та сформулювати більш узагальнені терміни понять ремонту та поліпшення основних засобів, розробити узагальнену класифікацію ремонту за різними ознаками.

Результати дослідження. У таблиці 1 наведено трактування терміну «ремонт» в економічній літературі та законодавчих актах.

Таблиця 1 – Трактування терміну «ремонт»

№	**Джерело**	**Визначення автора**	**Власний коментар**
1	2	3	4
1	Носкій Р. [Ефимов 1964, с.865]	Це підтримання дієздатного стану обладнання, машин, апаратури, будівель споруд промислових підприємств шляхом заміни або відновлення зношених чи пошкоджених у процесі експлуатації деталей, вузлів чи елементів конструкції.	Дане визначення є досить повним та ґрунтовним, але стосується воно тільки промислових підприємств. У зв'язку з цим застосовувати його у широкому колі неможливо.
2	Бандурка О. [Бандурка 1998, с.183]	Це спосіб відтворення основних засобів (поряд із новим будівництвом, реконструкцією, введенням у дію нових об'єктів), який полягає в ліквідації ушкоджень, поломок, дефектів засобів праці і об'єктів соціального призначення.	Цей автор розширює коло застосування та більш повно характеризує об'єкти ремонту.
3	Даль В. [Даль 1980]	Це полагодження, виправлення, яких з року в рік потребує будинок чи який-небудь заклад; утримання, різні витрати на підтримання чого-небудь.	Даний автор не розглядає усі об'єкти ремонту та сфери його застосування.
4	Покропивний С. [Покропивний 2004]	Це усунення тимчасового фізичного спрацювання конструктивних елементів у натуральній формі та забезпечення в такий спосіб постійної дієздатності засобів праці протягом усього періоду їхньої експлуатації.	Перша частина визначення є обґрунтованою і з нею можна погодитися, на відміну від другої, в якій зазначається, що ремонт забезпечує постійну роботу засобів праці, але ж одного ремонту зазвичай не вистачає для роботи засобів упродовж всього періоду експлуатації.
5	[Наказ Міністерства транспорту України від 30 березня 1998 року № 102]	Ремонт - це комплекс операцій з відновлення справності або роботоздатності виробів та відновлення ресурсів виробів або їх складових.	Ремонт розглядається тільки як процес відновлення ресурсів.

Закінчення табл. 1

1	2	3	4
6	[Лист Держбуду України «Про віднесення ремонтно-будівельних робіт до капітального й поточного ремонтів» від 30.04.2003 р. № 7/7-401]	Поточний ремонт – комплекс ремонтно-будівельних робіт, що передбачає систематичну й своєчасну підтримку експлуатаційних якостей і попередження передчасного зношування конструкцій та інженерного устаткування; Капітальний ремонт – комплекс ремонтно-будівельних робіт, що передбачає заміну, відновлення й модернізацію конструкцій і устаткування будов у зв'язку з їх фізичною зношеністю й руйнуванням, поліпшення експлуатаційних показників, а також поліпшення планування будови і благоустрою території без зміни будівельних габаритів об'єкта.	Дане визначення є найбільш наближеним до ідеального, воно чітке, структуроване і зрозуміле.
7	МСФЗ 16 [«Міжнародний стандарт бухгалтерського обліку 16 (МСБО 16). Основні засоби» від 01.01.2012 р]	До поточного обслуговування відноситься ремонт та технічне обслуговування основних засобів, що складається з витрат на оплату праці, придбання комплектуючих частин та другорядні деталі. Умовою подовження терміну корисної експлуатації об’єкта основних засобів є великі технічні перевірки на наявність несправності або витрати, пов’язані із заміною важливої складової активу.	Замість терміну «поліпшення» наведено поняття «подальші витрати», що є більш ширшим за значенням і містить в собі витрати на обслуговування та витрати значного характеру.

Джерело: розроблено авторами

Визначення, які наведені в економічній літературі та у законодавчих документах груповані за спільними та відмінними ознаками в таблиці 2.

Таблиця 2 – Дескриптивні чинники терміну «ремонт»

№	**Ознака** / **Автор**	**Об’єкти**	**Тривалість строку використан-ня**	**Сутність роботи**	**Належність до усіх сфер застосу-вання**
1	2	3	4	5	6
1	[Носкій 1964]	+	+	+	-
2	[Бандурка 1998]	+	-	+	+
3	[Даль 1980]	-	+	+	-

Закінчення табл. 2

1	2	3	4	5	6
4	[Покропивний 2004]	-	+	-	+
5	[Наказ Міністерства транспорту України від 30 березня 1998 року № 102]	+	-	+	+
6	[Лист Держбуду України 2003]	+	-	+	+
7	[МСБО 16 2012]	+	-	+	+

Джерело: розроблено авторами

Наведені дескриптивні чинники терміну «ремонт» дають можливість сформулювати власне визначення цього терміну: ремонт – це процес заміни зношених та несправних частин і деталей на нові, через що функції основних засобів не змінюються, можливості не збільшуються, а технічні характеристики не покращуються, протягом усього терміну експлуатації.

В таблиці 3 наведено трактування терміну «поліпшення» в економічній літературі та законодавчих актах.

Таблиця 3 – Трактування терміну «поліпшення»

№	**Джерело**	**Визначення автора**	**Власний коментар**
1	2	3	4
1	П(с)БО 7 [П(с)БО 7 2000]	До видів поліпшення основних засобів належать: модернізація, модифікація, добудова, дообладнання, реконструкція тощо.	В даному законодавчому документі виділено основні види поліпшень, що говорить про універсальність даного визначення і дозволяє користуватися будь-якому підприємству будь-якої спеціалізації.
2	Ф. Бутинець [Бутинець 2003]; H. Dźwigoł [Dźwigoł 2010]; R. Miśkiewicz [Miśkiewicz 2012]	Це модифікація, удосконалення машин і обладнання, а також впровадження нових виробничих процесів, які забезпечують значне скорочення операційних витрат, що призводить до підвищення продуктивності основних засобів.	В даному визначені не виділено усіх видів поліпшень, а також це визначення можна застосовувати тільки для підприємств виробничого спрямування.
3	І. Бойчик [Бойчик 2007]; H. Dźwigoł [Dźwigoł 2013]; R. Miśkiewicz [Miśkiewicz 2009]	Це просте та розширене відтворення. Проста форма відтворення – це капітальний ремонт, а розширена - модернізація, технічне переоснащення та реконструкція, що здійснюється з використанням новітніх технічних досягнень.	В даному визначені наведена більш складна класифікація поліпшення. Це визначення можна застосовувати до будь-якого підприємства.

Закінчення таблиці 3

1	2	3	4
4	Л. Логвінська [Логвінська 2002]; H. Dźwigoł [Dźwigoł 2015]	Поліпшення відбувається через модернізацію, модифікацію, добудову, дообладнання, реконструкцію, що за економічним змістом є капітальними інвестиціями.	Дане визначення є найбільш зрозумілим, і автор виділяє усі основні види поліпшень.
5	I. Павлюк [Павлюк 2004]; R. Miśkiewicz [Miśkiewicz 2007]	До поліпшення відноситься реконструкція, модернізація, технічне переозброєння, а також поточний і капітальний ремонти об'єктів основних засобів, якщо вони призводять до збільшення майбутніх економічних вигід, первісно очікуваних від використання об'єкта.	Дане визначення є найбільш точним та універсальним.

Джерело: розроблено авторами

Серед визначень, які наведені в таблиці 3, можна виділити основні види поліпшень (таблиця 4).

Таблиця 4 – Види поліпшень основних засобів в економічній літературі та нормативно-правових актах

№	**Джерело** / **Види поліпшень**	П(с)БО 7 [П(с)БО 7 2000]	[Бутинець 2003]	[Бойчик 2007]	[Логвінська 2002]	[Павлюк 2004]
1	Модернізація	+	-	-	+	+
2	Модифікація	+	+	-	+	-
3	Добудова	+	-	-	+	-
4	Дообладнання	+	-	-	+	-
5	Реконструкція	+	-	+	+	+
6	Технічне обслуговування	-	-	-	-	-
7	Заміна окремої частини обладнання	-	-	-	-	-
8	Удосконалення	-	+	-	-	-
9	Капітальний ремонт	-	-	+	-	+
10	Поточний ремонт	-	-	-	-	+
11	Технічне переозброєння	-	-	+	-	+
12	Капітальні інвестиції	-	-	-	+	-

Джерело: розроблено авторами

Аналіз сутності терміну «поліпшення» основних засобів та видів поліпшень наведених у таблицях 3, 4, дає можливість сформулювати власне визначення цього терміну: поліпшення основних засобів – це процес, в ході

якого відбувається реконструкція, модифікація, модернізація, капітальний ремонт, добудова та дообладнання, які призводять до збільшення економічних вигід від їх використання, що влече за собою зміни функцій об'єкта, збільшення можливостей, покращення технічних характеристик.

Для розкриття сутності ремонту основних засобів потрібно розглянути їх класифікацію, як розподілений ремонт основних засобів, за якими ознаками чи сферам застосування. Від цього буде залежати як просто та швидко відбуватиметься обліковий процес ремонту основних засобів, та зменшить вірогідність допущення помилки у зазначеному процесі.

Розглядаючи проаналізовану літературу, можна однозначно сказати, що наразі не існує єдиної, спільної та досить чіткої класифікації ремонту основних засобів. В таблиці 5 наведено, як різні автори класифікують ремонт основних засобів.

Таблиця 5 – Класифікація ремонту основних засобів

Джерело	**Класифікація автора**	**Власний коментар**
1	2	3
О. Філімонен ков [Філіменк ов 2004]	Автор класифікує ремонт основних засобів за такою ознакою: 1) за видами – поточний, середній та капітальний	Цю класифікацію назвати досконалою не можна, оскільки виділено тільки один критерій класифікації. Але і за цією ознакою можна виділити додатковий вид ремонту – під час стихійного лиха.
Т. Головко [Головко 2008]	Автор класифікує ремонт основних засобів за такими ознаками: 1) за видами – поточний, капітальний; 2) за способом виконання – здійснюється підрядним способом та господарським способом; 3) за відношенням до виробничої діяльності – виробничих ОЗ, невиробничих ОЗ; 4) за відношенням до форми власності – власних ОЗ, орендованих ОЗ.	Ця класифікація є більш розширеною та детальною, ніж попередня. Автор виділяє нові критерії розподілу ремонту основних засобів. Але дану класифікацію можна доповнити майже за кожною ознакою: за видами – середній ремонт та під час стихійного лиха; за формою власності ОЗ розподіляються на взяті в оперативну оренду та у фінансовий лізинг.
М. Зюкова [Зюкова 2004]	Автор класифікує ремонт основних засобів за такими ознаками: 1) за джерелом фінансування – за рахунок власних коштів; інвестицій вкладників; безкоштовна допомога; державні субсидії, дотації; займані кошти (кредити); 2) за приналежністю – ремонт власних ОЗ, орендованих ОЗ	В цій класифікації автор виділяє нові ознаки, що можна використати як доповнення до основної класифікації.

Закінчення таблиці 5

1	2	3
	взятих в оперативну оренду, орендованих ОЗ взятих у фінансовий лізинг; 3) за відношенням до господарської діяльності – ремонт виробничих ОЗ, невиробничих ОЗ.	
О. Маркус [Маркус, Корнєєва 2014]	Автор класифікує ремонт основних засобів за такими ознаками: 1) за організаційною – гарантійний, поточний, капітальний, під час стихійного лиха; 2) техніко-економічна – плановий, позаплановий, аварійний.	Ця класифікація є недосконалою, оскільки виділено тільки дві ознаки.

Джерело: розроблено авторами

Майже всі наведені класифікації є недосконалими, оскільки не виділені всі критерії розподілу ремонту основних засобів. Відповідно до критеріїв, які наводять автори, та коментарів можна сформувати власну класифікацію ремонту основних засобів (рис. 1).

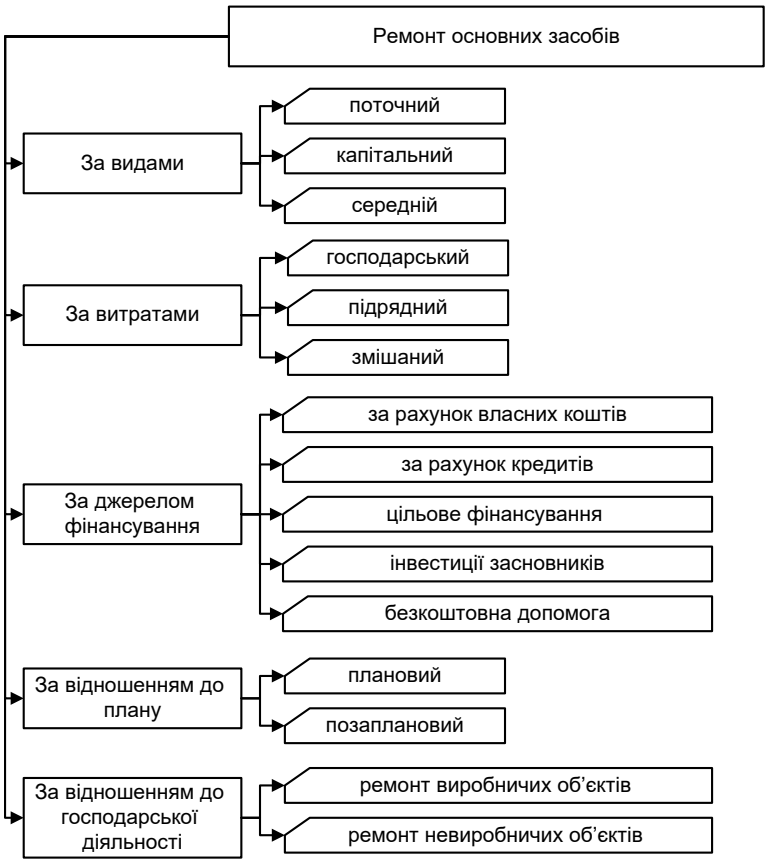

Рисунок 1 – Класифікація ремонту основних засобів

Джерело: власна розробка авторів

Висновки. Отже, наведені концептуальні підходи до визначення понять, наведена класифікація ремонту основних засобів є необхідною умовою для організації бухгалтерського обліку основних засобів. Кожне підприємство для того, аби здійснювати своєчасний і правильний облік ремонту або поліпшення основних засобів, має об'єднати об'єкти у групи та розробити економічно обґрунтовану їх класифікацію. На нашу думку, наведені вище поняття та класифікація є універсальними для усіх підприємств та допоможуть ефективно використовувати основні засоби і сприятимуть покращенню стану виробництва.

Література:

Бандурка О.М. Фінансова діяльність підприємства [підручник] / О. М. Бандурка, М. Я. Коробов, П. І. Орлов, К. Л. Петрова. – К.: Либідь, 1998. – 312 с.

Бойчик І.М. Економіка підприємства: Навч. посібник.- Вид. 2-ге, доповн. і переробл. - К.: Атіка, 2007. - 528 с.

Бухгалтерський фінансовий облік: Підручник для студентів спеціальності "Облік і аудит" вищих навчальних закладів. / За редакцією проф. Ф.Ф. Бутинця. - 5-е вид., доп. і перероб. - Житомир: ПП "Рута", 2003. - 726 с.

Головко Т.В. Фінансовий облік-1. Підручник. – К.:КНЕУ, 2008. - 416с.

Даль В. Толковый словарь живого великорусского языка / В. Даль. – Т.4 Р-У. – М.: Русский язык, 1980. – 683 с.

Ефимов А.Н. Экономическая энциклопедия. Промышленность и строительство /А. Н. Ефимов. – Т.2 – М.: Советская энциклопедия, 1964. – 963с.

Зюкова, М.М. Удосконалення обліку та аналізу основних засобів: автореф. дис. на здобуття вчен. ступ. кандидата екон. наук : спец. 08.06.04 «Бухгалтерський облік, аналіз і аудит» / М. М. Зюкова. – Харків: 2004.

Лист Держбуду України «Про віднесення ремонтно-будівельних робіт до капітального й поточного ремонтів» від 30.04.2003 р. № 7/7-401.

Ловінська Л. Г., Жилкіна Л. В., Голенко О. М. та ін. Бухгалтерський облік: Навчально-методичний посібник для самост. вивч. дисц. - К.: КНЕУ, 2002. – 370 с.

Маркус О.В., Корнєєва К.О. Застосування бюджетування як інструменту контролю витрат на ремонти основних засобів підприємства [Електронний ресурс]. - Режим доступу: http://molodyvcheny.in.ua/files/journal/2014/5/39.pdf

Міжнародний стандарт «Міжнародний стандарт бухгалтерського обліку 16 (МСБО 16). Основні засоби» від 01.01.2012 р.

Наказ Міністерства транспорту України від 30 березня 1998 року № 102 «Про затвердження Положення про технічне обслуговування і ремонт дорожніх транспортних засобів автомобільного транспорту».

П(с)БО 7 «Основні засоби», що затверджене Наказом Міністерства фінансів України № 92 від 27.04.2000 р. зі змінами і доповненнями. – Режим доступу: http://zakon.rada.gov.ua/.

Павлюк І.М. Бухгалтерський облік основних засобів та інших необоротних матеріальних і нематеріальних активів: Навчальний посібник. - К.: Центр навчальної літератури, 2004. - 159 с

Покропивний С.Ф. Економіка підприємства / С.Ф. Покропивний. – В 2 т. – [Т.1]. – К.: Хвиля-Прес Донецьк: МП «Пошук», 2004. – 400 с.

Філімоненков О.С. Фінанси підприємств. Навч. посіб. — 2-ге вид., переробл. і допов. — К.: МАУП, 2004. — 328 с.

Dźwigoł, H. (2010). *Podejście systemowe w procesie restrukturyzacji przedsiębiorstwa*. Gliwice: Wydawnictwo Politechniki Śląskiej. [in Polish].

Dźwigoł, H. (2015). Założenia do budowy metodyki badawczej. *Zeszyty Naukowe Politechniki Śląskiej, Organizacja i Zarządzanie,* 78, 99-116.

Dźwigoł, H. (2013). *Zarządzanie przedsiębiorstwem w warunkach XXI wieku.* Gliwice: Wydawnictwo Politechniki Śląskiej. [in Polish].

Miśkiewicz, R. (2012). Zróżnicowanie struktur organizacyjnych ze względu na układ pionów scalonych na przykładzie przedsiębiorstw hutniczych [Diversification of Organizational Structures due to the Layout of Integrated Divisions on the Example of Steel Companies]. *Hutnik, Wiadomości Hutnicze, 79*(10), 760-766. [in Polish].

Miśkiewicz, R. (2009). Wykorzystanie podobieństwa struktur organizacyjnych w procesie przekształcania organizacji przedsiębiorstw [The Utilization of Organizations Structure Similarity in a Process of Company Organization Transformation Process]. *Zeszyty Naukowe Małopolskiej Wyższej Szkoły Ekonomicznej w Tarnowie, 1*(12), 77-87. [in Polish]

Miśkiewicz, R. (2007). Taksonomia jako narzędzie ocen struktur organizacyjnych przedsiębiorstw hutniczych [Taxonomic as a Tool in Estimation of Organizational Structures for Metallurgical Companies]. *Hutnik, Wiadomości Hutnicze, 74*(3), 151-154. [in Polish].

References

Bandurka, O.M., Korobov, M.Ya., Orlov, P.I., & Petrova, K.L. (1998). *Finansova dijal'nist' pidpriiemstva.* Kyiv: Libid.

Boichik, I.M. (2007). *Ekonomika pidpriiemstva: Vid. 2-he, dopovn. i pererobl.* Kyiv: Atika.

Butynets, F.F. (2003). *Buhgalters'kiy finansoviy oblik: Pidruchnik dlja studentiv special'nosti «Oblik i audit» vishhih navchal'nih zakladiv: 5-e vid., dop. i pererob.* Zhitomir: PP «Ruta».

Dal, V. (1980). *Tolkoviy slovar' zhivogo velikorusskogo yazyka*: T.4 R-U. – Moskwa: Russkiy yazyk.

Dźwigoł, H. (2010). *Podejście systemowe w procesie restrukturyzacji przedsiębiorstwa*. Gliwice: Wydawnictwo Politechniki Śląskiej. [in Polish].

Dźwigoł, H. (2015). Założenia do budowy metodyki badawczej. *Zeszyty Naukowe Politechniki Śląskiej, Organizacja i Zarządzanie,* 78, 99-116.

Dźwigoł, H. (2013). *Zarządzanie przedsiębiorstwem w warunkach XXI wieku.* Gliwice: Wydawnictwo Politechniki Śląskiej. [in Polish].

Efimov, A.N. (1964). *Ekonomicheskaya enciklopediya. Promyshlennost' i stroitel'stvo: T.2.* Moskwa: Sovetskaya enciklopediya.

Filimonenkov, O.S. (2004). *Finansi pidpriiemstv. 2-ge vid., pererobl. i dopov.* Kyiv: MAUP.

Golovko, T.V. (2008). *Finansovij oblik-1.* Kyiv: KNEU.

List Derzhbudu Ukraïni «Pro vidnesennja remontno-budivel'nih robit do kapital'nogo j potochnogo remontiv» vid 30.04.2003 r. № 7/7-401.

Lovinska, L.G., Zhilkina, L.V., Golenko, O.M. ta in. (2002) *Buhgalters'kiy oblik.* Kyiv: KNEU.

Markus, O.V., & Korneeva, K.O. (2014). *Zastosuvannja bjudzhetuvannja jak instrumentu kontrolju vitrat na remonti osnovnih zasobiv pidpriemstva.* Retrieved from http://molodyvcheny.in.ua/files/journal/2014/5/39.pdf

Mizhnarodniy standart «Mizhnarodniy standart buhgalters'kogo obliku 16 (MSBO 16). Osnovni zasobi» vid 01.01.2012 r.

Miśkiewicz, R. (2012). Zróżnicowanie struktur organizacyjnych ze względu na układ pionów scalonych na przykładzie przedsiębiorstw hutniczych [Diversification of Organizational Structures due to the Layout of Integrated Divisions on the Example of Steel Companies]. *Hutnik, Wiadomości Hutnicze, 79*(10), 760-766. [in Polish].

Miśkiewicz, R. (2009). Wykorzystanie podobieństwa struktur organizacyjnych w procesie przekształcania organizacji przedsiębiorstw [The Utilization of Organizations Structure Similarity in a Process of Company Organization Transformation Process]. *Zeszyty Naukowe Małopolskiej Wyższej Szkoły Ekonomicznej w Tarnowie, 1*(12), 77-87. [in Polish]

Miśkiewicz, R. (2007). Taksonomia jako narzędzie ocen struktur organizacyjnych przedsiębiorstw hutniczych [Taxonomic as a Tool in Estimation of Organizational Structures for Metallurgical Companies]. *Hutnik, Wiadomości Hutnicze, 74*(3), 151-154. [in Polish].

Nakaz Ministerstva transportu Ukraini vid 30 bereznja 1998 roku № 102 «Pro zatverdzhennya Polozhennya pro tehnichne obslugovuvannya i remont dorozhnih transportnih zasobiv avtomobil'nogo transportu».

Pavljuk, I.M. (2004). *Buhgalters'kiy oblik osnovnih zasobiv ta inshih neoborotnih material'nih i nematerial'nih aktiviv*. Kyiv: Centr navchal'noi literaturi.

Pokropivnij, S.F. (2004). *Ekonomika pidpriiemstva. V 2 t. – [T.1].* Kyiv: Hvilya-Pres / Donec'k: MP «Poshuk».

P(s)BO 7 «Osnovni zasobi», shho zatverdzhene Nakazom Ministerstva finansiv Ukraini № 92 vid 27.04.2000 r. zi zminami i dopovnennyami. Retrieved from http://zakon.rada.gov.ua/

Zgukova, M.M. (2004). *Udoskonalennya obliku ta analizu osnovnih zasobiv: avtoref. dis. na zdobuttya vchen. stup. kandidata ekon. nauk : spec. 08.06.04 «Buhgalters'kiy oblik, analiz i audit».* Kharkiv: KhDUHT.

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PERIODIZATION OF THE STAGES OF THE FORMATION AND DEVELOPMENT OF KNOWLEDGE ABOUT ECONOMIC SECURITY OF ENTERPRISE

Abstract. The compressed historical excursion to the sources of the science of security is conducted. The economic security is explored through prism of the history forms of the worldview – mythological, theology, philosophical and scientific.

Periodization of the stages of formation and development of the science of security on historical epochs – Antiquity, Middle Ages, New history (Renaissance and Enlightenment), Contemporary history are offered. A historical and analytical methods are used. Different research area and conceptions of modern scientific schools: «science of security», «science of national security», «securitology», «economic security of state» (ecosestate), «economic security of enterprise» (ecosesent), «management security», «akmesecuritology» are educed.

Keywords: securitology, science of security, economic security, enterprise, periodization, history forms of the worldview, pre-conditions.

Formulas: 0; fig.: 0; tabl.: 1; bibl.: 65

JEL Classification: B 49, C 52, C 61, C 87, E 51, P 44

Introduction. The problem of security has centuries-old if not much millennial history, so as it is the basic necessity of man. A human mind a long ago tries to get skills of self-preservation and methods of protecting from possible dangers that in all spheres of vital functions are appeared. A global financially-economic crisis compels to look over a paradigm of knowledge about economic security on all levels: at the level of the state, enterprise, personality. Particularly actual for today there is constructing of paradigm of knowledge about economic security exactly of enterprise, so as they are a primary link in the system of economic security of national economy and are her by an important subsystem

Literature review and the problem statement. Russian scientist Atamanov G.A. counted up, that about two thousand PhD and habilitation thesis on a theme security is written in Russia for the last ten-year period [Atamanov 2010]. In Ukraine an author counted approximately one thousand thesis on this subjects.

About fifty types of economic security interlace today. Except economic security and already traditional: informational, social, psychological, food, ecological, military, technological, power, there are its eccentric kinds, for example, epizootic, oscillation, noosphere, pedagogical, network et al.

History of comprehension of problem of security of the state, society and personality found a place in labours of the ukrainian scientist Pasternak-Taranuschenko G.A. [Pasternak-Taranuschenko 1994] and the russian scientist Senchagov B.K. [Senchagov 2005]. Philosophical, sociological and historical aspects of problem of security in history of science are studied [Pavlova 2007].

Approaches to the estimation of category «economic security» are investigated [Arhireyska 2013]. General trends and pre-conditions of the formation of economic security of enterprise within the framework of the scientific pictures of the world: scholastically, mechanistically, statistical, system and diatropical are identified [Miśkiewicz 2007; Miśkiewicz 2009; Miśkiewicz 2012; Korchevska 2014]. The attempts of philosophical explanation of the phenomenon of economic security were done repeatedly. But to this time it does not offer only position to key definitions in the field of it, and scientific doctrine has eclecticism.

The purpose of this paper is a worldview, historical and methodological analysis of economic security of enterprise.

Research results. First the question of economic security existed in a ***mythological form*** the echoes of that reached to our days. So, in Roman mythology even there was a goddess Securitaty (Securitas), that personified security of citizens and states. She was represented by a worthy matron, more often at a column with heaved up a right arm, and her attributes were a scepter, laurel, horn of plenty and branch of olive.

Then the mythological form of economic security was appropriately substituted by a ***theology form***. The analysis of literature testifies that her core is an ontological category of «genesis». As one of ancient religions Judaism asserts that after the first fall of humanity one of main necessities was conceived is safe existence. In Old Testament of Bible marked about a necessity to examine defense of life through the prism of original source all pure on Earth, through unique Personality, to God (2 Kings 20: 19; Job 5: 24; Job 24: 23; Psalms 4: 9; Psalms 11 : 6; Psalms 121 : 7; Isaiah 14 : 30; Isaiah 32 : 17; Isaiah 33 : 6; Joel 28 : 26; Obadiah 2: 18). He is the demiurge of Life and ruler of Life, and equates with Life. An axiom is that all existing aims in the world (person, enterprise, state), conscious or unconscious, to self-preservation, freedom, improvement of quality of terms of existence.

The ethic and philosophical doctrine of Confucianism asserted that Sky was higher divine force that determines a fate all living on Earth. But to Sky personality «kind» qualities of man (only at that rate, a man becomes «co-creator» Sky) must be added. By the way, philosophical looks of Socrates in sense of study not nature and matter, namely man and his virtues very similar with doctrine of Confucianism. Confucianism considers that deference is an important value that proclaims the submission of children to the parents straight, and by implication is subordination of people to the sovereign. Such service symbolizes security of clan.

A theology form got a blow from the side of to the ancient Greek philosopher of Aristotle, that studied and compared one hundred fifty various political forms. He also studied the question of identity of art of riches and by science about household. Security of citizens was provided, if two types of justice were observed: distributive (equality of dignity) and comparative («to each his own»).

Economic security tries to acquire the ***philosophical form*** a long ago. So, Xenophon, Plato, Aristotle, Epicure, Cicero, Seneca L., Epictetus, Aurelius M., Machiavelli N., Hobbes T., Spinoza B., Locke J., Beckon F., Voltaire, Rousseau J., Diderot D., Holbach P., Smith A. and many other philosophers and sociologists examined one or another her aspects. On this stage of clear determination of security not observed.

Economic security acquires the ***scientific form*** slowly enough. Whole direction was formed exactly in this history form of the worldview - the science of

security («Безпекознавство» in Ukrainian language, tonics. author). Ukrainian economist Lipkan V.A. determines the science of security as an original matrix of sciences and scientific directions about security, social interdisciplinary science, that general and specific objective trends of organization and functioning of the systems of security of different class are investigated and also theoretical generals are developed, that is directed to on an increase efficiency of their functioning [Lipkan 2003]. American economists of Morreale S. and Lambert D. noted, that economic security of enterprise is one of elements of defence of national security [Morreale, Lambert 2009].

Periodization of the stages of formation and development of knowledge about economic security is driven to the table 1.

Table 1 – Periodization of the stages of the formation and development of knowledge about economic security of enterprise

Author	Own interpretation
1	2
Antiquity (8th century BC- 476)	
Xenophon (444-356 BC, Ancient Greece)	In the work «Peri poron» offered to the athenian state to create a giant enterprise on development of silver mineries. A management must them provide welfare of all athenian citizenship [Xenophon 1925].
Plato (427-347 BC, Ancient Greece)	Economic security of citizens is provided on the basis of objective intercommunication with the state. «The state provides existence not only, but also provides all good things of life to every man. They must be acquired by legal labour, and also must be safe and harmless for the state» [Plato 1986]. He laid internal and external security of the state on warriors (guard) according to the division of labor.
Aristotle (384 – 322 BC,	Security is considered as a «task of the state: providing a meal; then - by handicrafts (human life requires many tools); thirdly, by a weapon (a weapon is needed for
Ancient Greece)	support of power into the state, so against external enemies, if they will try to offend); fourthly, the supply of monetary resources is needed for own necessities and for soldiery necessities; fifthly, caring about a religious cult (priestliness); sixthly, most important is a decision that useful and that justly in the relations of citizens inter se» [Aristotle 1983].
Epicure (341-270 BC, Ancient Greece)	He saw security in just laws. Laws are considered as means of protection and defence «sage» from «crowd», as a public guarantee of will and autonomy of individual. «Laws, - Epicure talks, - published for the sake of sage, - not in order that they did not do an evil, and in order that an evil was not done them» [Lukasheva 1999].
Cicero (106-43 BC, Ancient Rome)	When property appeared on earth, then there was a necessity of her guard and providing of security of her proprietors [Diogen Laertskiy1986].
Seneca L. (4 BC-65, Ancient Rome) Epictetus (50-138, Ancient	Stoics considered that providing of security is possible only due to mutual satisfaction of interests of citizens, households**,** society. «In actual fact, what does our security depend on, however from that we use mutual services? Only due to this exchange of benefactions. Disconnect us - what

Continuation of table 1

1	2
Greece) Aurelius M. (354-430, Ancient Rome)	we will be then? By a booty and victim of animals», «if to destroy society, then unity of human race - unity that is support life will collapse…» [Sapov 1995].
Middle Ages (476–1453)	
Aurelius A. (354-430, Italy), Aquinas T. (1225-1274, Italy), Bonaventura (1218-1274, France) Duns Scotus J. (1266-1308, Scotland)	Security was interpreted as an inalienable attribute of divine providence, as function of faith. Worked out morally and ethic dogmas. Their basic principle it is priority of spirit and secondaryness of matter, advantage of spirit above a flesh. Understanding of security is changed and began to be considered in the context of divine conditionality of existence. Cardinally principle of security is changed: ancient principle of self-preservation and survival of personality and state grew into principle of rescue and maintenance of the soul. It determined fatalism of people. Such interpretation of security unavoidable conduced to the loss of her social orientation [Pavlova 2007].
Machiavelli N. (1469-1527, Italy)	Security of personality and inviolability of peculiar he named value of freedom, considered it an aim and basis of durability of the state. Most dangerous for a ruler it to trench upon property of citizens, it generates a hatred. «When a sovereign thinks to leave life to somebody, he can leave, if there are a ground and obvious reason, but he must beware to trench upon stranger good. People will forget death of father rather then loss of inheritance» [Lichman 2001].
New history (1454–1918)	
a) Renaissance (1454 - 17th centuries)	
Hobbes T. (1588-1679, England)	He identificated society and state, considered the state not as divine, but as human establishment. It sense consisted in replacement of the natural state «man to the man is a wolf» by principles of public agreement (general existence) [Hobbes 1991]. The state must support and secure this agreement, and also every human right for the personal and public security.
Spinoza B. (1632-1677, Netherlands)	«Freedom or hardness of the soul is private virtue, virtue of the state is security» [Spinoza 1957]. He interpreted the civil world not simply as war absence, but as unity of the souls, national consent. Also he grounded position about freedom as necessary condition of development of safety of personality and strengthening of guarantees of safe existence of civil society.
Locke J. (1632-1704, England)	He distinguished the important sphere of security - economic, i.e. the main task of the state is defence of property. He asserted that a man had a right of defence of the life, freedom and property. However in the natural state these rights not always were assured, as not all people respected rights other. Everybody could interpret this right arbitrary, on the discretion. In case of external aggression a man could not provide this right independent. For providing of own security people created the state and concluded a public

Continuation of table 1

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	agreement. People did it in a not order to give up own rights in behalf on the state, and in an order to provide their best method, than in the natural state [Rousseau 1969].
Beckon F. (1561-1626, England)	He counted an economy, from one side, by basis of proof guarantees of existence of nation, and other side, by primary cause of crisis of security. He entered a new concept «culture of security». Prevention of danger and timely reacting became her basis [Beckon 1977].
b) Enlightenment (17th century - 1918)	
Voltaire (1694-1778) Rousseau J. (1712-1778) Diderot D. (1713-1784, France)	Safe development of nation is not possible without the guarantees of maintenance of inseparable rights to every separate citizen. Important rights are freedom, property, safety and resistance to oppression. This thesis they fastened as a world view setting and constitutional requirement in Declaration of the Rights of Man and of the Citizen in 1789 and Constitution of France in 1791.
Holbach P. (1723-1789, France)	Security consists in providing of life-asserting relations between a people and state. He distinguished the theory of public agreement in accordance with that people were obligated to render to each other of service. State of equilibrium between influence of power and degree of will of man in all types of public activity he considered the criterion of safe existence (people renounce part of freedom in an exchange on benefits that must give them in society) [Holbach 1963].
Smith A. (1723-1790 England)	Economic security of enterprise is considered from positions of economic liberalism. A market economy will result in harmony of individual and collective will with a maximally possible benefit for all and each due to satisfaction of private interests of businessmen and free competition. A sphere of production is the basic source of riches of people [Smith 2007], and a division of labor is the basic factor of increase of productive force.
Malthus T. (1766-1834, England)	Set dependence between the increase of population and food resources that are the condition of security of society [Malthus 1895]. First described food security as component of economic security.
List F. (1789-1846, Germany) Hamilton A. (1755-1804, USA)	Economic security is related to protecting from external threats that is descendant differences in the competitiveness of economies of countries. A protectionism trade policy and state support of development of national producers are offered as methods of providing of economic security.
Marx K. (1818-1883, Germany)	Economic security is considered from position of material and spiritual production and consumption. The source of tension is unequal attitude of people toward material welfares (to property). He considered that a competition between individuals (enterprises) can not provide security and stability. In marxism the system of security is

Continuation of table 1

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	considered from position of class interests. This contradiction can be settled by means of establishment of dictatorship of proletariat [Marx 1975].
Walras L. (1834-1910, Switzerland)	An enterprise is one of elements of the equilibrium system. If it will make an effort prang such equilibrium, then it will be «punished» by an environment. Thus «actions» of environment at that rate will be objective, id est not personalized [Pogorelov 2010]. Economic security is one of criteria of public welfare. The simultaneous and complete achievement of economic security is impossible different agents. If economic security of one of participants of market rises, then there is a redistribution of resources in his benefit, and also an income increases and socio-economic position becomes stronger. However other participant loses part of resources, income goes down, has socio-economic losses and is in an economic danger [Buchanan, Tullock 1962].
Pareto V. (1848-1923, Italy)	Economic security arrives at a maximum, and allocation of resources becomes optimal, if any change of this distribution worsens welfare of even one optimum of the economic system («Pareto optimality») [Blaug 1994]. Worked out the complex of incentive instincts, interests, passions and named that «residuo». One of six «residuo» is instinct of integrity of individual that is directed to on providing security of personality and property inviolability. Offered such instrument as the Pareto chart. It can be applied for the exposure of threats and increase of security of participants of economic process.
Marshall A. (1842-1924, England) Schumpeter J. (1883-1950, Austria) Taylor F. (1856-1915, USA)	The representatives of classic liberalism considered the subjective estimations of enterprise («freedom of choice»). Economic security can be attained on the basis of combining of resources, and development of enterprise is related to its functions [Taylor 1911]. Schumpeter J. asserted that an equilibrium conduced to stagnation. Therefore the real systems differ from ideal, and also are static non-equilibrium. However a dynamic equilibrium can be supported in them [Schumpeter 1982].
Contemporary history (1918–present time)	
a) 1918–1975	
Keynes J. (1883-1946, England)	Economic security related to overcoming of exogenous threats – «market failures», instability of the economy growing, uneffectiveness of government control, unemployment. Market subjects do not have a self-regulating mechanism. Therefore there must be intervention from the «state of general welfare» [Keynes 2002], that is oriented on social partnership.
Friedman M. (1912-2006, USA)	A market is a self-regulating mechanism. Excessive intervention from the state is not needed. The representatives of monetarism consider that the guarantor of economic security is money.

Continuation of table 1

1	2
Veblen T. (1857-1929) Galbraith J. (1908-2006, USA)	The representatives of institutionalism investigate economic security from social and psychological positions. Power in a corporation belongs to the not proprietor, and technical structure (to the management and management apparatus). It creates the network of agreements between corporations and plans the work. An aim of technical structure is a survival, security, strong positions at the market, but not pursuit after a profit. The representatives of institutionalism are based on the internal financing and maximization of growth by means of marketing, advertisement and support of society.
Lewin K. (1890-1947 Germany – USA)	The theory of the field of forces provides that the state of enterprise depends on balance of powers that support and restrain changes [Lewin 1947]. Internal threat for an enterprise this resistance of personnel, that results in additional charges.
Bogdanov O. (1873-1928, Russia) Wiener N. (1894-1964, USA) Ludwig von Bertalanffy (1901-1972, Austria)	The theory of the systems is based on likeness of laws in the different spheres of knowledge. An enterprise and economic security can be considered as a system. Such approach allows to take into account all components, detection development trends and forecast. For example, possibility to create the graphic images of «tree of dangers and reasons» with the purpose of analysis of security of the different systems is appeared. The platform of analysis of the systems is a theory of organization - tectology [Bogdanov 1905], «cybernetics as science dealing with management and connections of machine, animal and society»)[Wiener 1968], general mathematical trend of difficult biological, public and other systems [Bertalanffy 1950].
Muth J. (1961) Lucas R. (1975, USA)	Economic security as a separate category is not considered. The representatives of new classic economy investigate economic agents. They are able quickly to adapt oneself to the changeable buyers market due to the use of the got information (theory of rational expectation), therefore intervention from the state is not needed.
Buchanan J., Tullock G. (1962, England)	The detailed and clear determination of economic security is not observed. The representatives of theory of public choice [Buchanan, Tullock 1962] criticize government control of economy. They accuse the publicmen of aspiring to the personal maximal benefit that can influence on security.
A. Maslow (1908-1970, USA)	Security is the primary necessity of man. It needs primary satisfaction. If a man worries only about security, then it mixes to satisfy the necessities of higher level [Maslow 2006]. Security necessity for a man (exactly, in stability, in dependence, in defence, in freedom from fear, alarm) and for an enterprise (exactly, in structurization, order, law, limitations, organizations of chaos) prevails in crisis situations.
Ashby W. (1903-1972, England)	On the basis of biological and cybernetic approach and «law of requisite variety» [Ashby 2006] the successful decision of problems of security is development of greater amount of different methods of adjusting, what variety of threats.

End of table 1

1	2
Forrester J., Meadows D. (1972, USA)	Representatives of macroeconomic ecological and economic models [Forrester, Meadows 2006] see the danger of growth in any directions of the system, including, and enterprises. They pay attention on external threats - demographic and ecological crises.
b) 1975 – present time	
Coase R. (1910-2013) Meckling W. (1976) Williamson O. (1985, USA)	The representatives of New Institutional Economics consider economic security of firm from position of institutional environment (structure and «rules of the game» that put in order cooperation between people on contractual basis), ownership and organizational forms rights from position of individual agents. It is been of interest: theory of transaction costs [Coase 1988]; a agency theory is a problem of «separation of property from control». It central question is harmonization of interests of agents (hired managers) with interests of principals (proprietors) [Coase 1988]; theory of «contracting of relations» - hierarchical organizations, such as companies, represent alternative governance structures, which differ in their approaches to resolving conflicts of interest [Williamson 1985] (important is a fight against a corruption).
Hannan M., Freeman J. (1977, USA)	The representatives of organizational ecology denies the adaptivity of enterprise. They accent attention on his inertance, that is related both to the external factors (by threats) and with organizational history [Hannan, Freeman 1977]. An inertance interferes with leaders in good time to foresee threats and hampers providing of security.
Haken G. (1977, Germany) Prigogine I. (1917-2003, Russia-Belgium)	Economic security of enterprise is investigated from position of processes of self-organization, id est origin and development of well-organized structures in a chaotic environment [Haken 1980]. Synergetics effects hold an enterprise on the proof trajectory of development despite on exogenous shocks and endogenous fluctuations.
Neyman D., Morgenshtein O. (1970, USA) Kardash V. (1935-2010, Russia)	A game theory studies strategic cooperation of parties from the point of view of mathematics. It explains to the logician of rational behavior of individuals in the conditions of conflict of interests. The fundamental law of economic compromises ensues from a theory [Neyman, Morgenshtein 1970]. Essence of conception of conflict-compromise economic dynamics consists in that the collisions of economic relations decide by the compromises of the differently directed interests. The system of general socio-economic interests that is presented by socio-economic institutes is formed as a result [Kardash 2004].
Neyman D., (1903-1957) Gale D. (1921-2008, USA), Tom R. (1923-2002, France)	An economic dynamics is the division of mathematical economy. It consideres the problems of modeling of development of the economic systems for the reflection of it in time. The theory of catastrophes interesting from the point of view of economic security of enterprise. It allows to describe dramatic and incomprehensible changes in behavior of the difficult systems [Danilov-Danil'yan 2003].

The analysis of opinions of separate personalias and scientific theories concluded that semantic construct «economic security of enterprise» not considered before. If to continue to study different research areas, then practically everybody has pre-conditions of development of knowledge about economic security. It has universal character and is to important in all spheres human life.

There is direction in world economic science, where economic security of the state of «Economic security of state» or ecosestate and economic security of enterprise of «Economic security of enterprise» or ecosesent are investigated. Ukrainian scientist Pasternak-Taranuschenko G.A. investigated philosophical principles of economic security of the state (ecosestate) and offered a thesaurus. He could not defend thesis, because such science was absent. He small to give one's attention to economic security of enterprise, but defined: «Ecosesent is this economic position of enterprise that resists to the external and internal changes of financially-economic environment» [Pasternak-Taranuschenko 1994].

Russian scientist Yarochkin V. offered such science as securitology («Секюрітологія» in Ukrainian language, tonics. author). It is science dealing with safety of vital functions of man and humanity, or science dealing with trends and mechanisms of providing of security of man, society, state, humanity from external and internal threats he determined [Yarochkin 2000]. Unfortunately, he does not distinguish such object of security as an enterprise is in the research. In 1997 his book «System of security of firm» is published [Yarochkin 1997]. Serikov Y. and Kozhenevsky L. assert that science of «securitology» accents attention on safety of vital functions of man. It is investigated in such countries: Bulgaria, Germany, Holland, Poland, Russia, Slovakia, Czech Republic, Ukraine [Serikov, Kozhenevsky 2010].

Security as an universal interdisciplinary category presents foundation of the newest scientific system – the science of security. It got a certain worldview prospect and methodological definition at the beginning of a 21th century. Category definition is given [Lipkan 2003]. Also he offered the concept of «the science of national security» («Національнобезпекознавство» in Ukrainian language, tonics. author). Ukrainian scientist Kozachenko G.V. notes that modern the science of security is research area that gives understanding to security (any subject - state, region, enterprise, man) in the past, present and future time, the established facts are summarized, after chance there is a necessity and after singular there is a general, and on this basis it providing comes true [Kozachenko 2013]. She notes justly, when knowledge accumulate, then any research area (but true) grows into science - securitology («Безпекологія» in Ukrainian language, tonics. author). Securitology is doctrine, complex of interconnected ideas, inwardly differentiated, but integral system of knowledge, in that one elements depend on other, and an base presents totality of statements, concepts and categories that are based on methodological principles and rules. Securitology it is a form of synthetic knowledge. Separate concepts, hypotheses and laws of the science of security lose a former autonomous and become the elements of the integral system [Kozachenko 2013].

The polish researcher Hanausek T. enters a concept «Management security». He considers: «if there is possibility (even speculative), namely purposeful, managed human influence that minimizes or eliminates threats, a that management security becomes to possible and recommended (desirable). If such management becomes possible, then it must have the speculative base. Management security exists and develops» [Hanausek 2001].

Ukrainian scientist Lyashenko O.M. distinguishes the economic component of security paradigm of enterprise. She offers new research area. It arose up on crossing of many areas of knowledge and named «Management by economic security of enterprise». It is totality of associate processes in the system of economic security of enterprise, namely harmonization of interests external and internal stakeholders of enterprises, opposition to the threats of economic security and forming of the resource providing of economic security of enterprise. They allow to attain the certain measure of economic freedom of enterprise within the limits of objective and subjective limitations peculiar to the system of economic security. The concept of «Akmesecuritology» («Акмебезпекологія» in Ukrainian language, tonics. author) is first entered [Lyashenko 2011].

Conclusions. Actuality of questions of security, its interdisciplinary character, the volume of present works on the problems of security was determined recognition of the science of security by the theoretical, epistemological area of knowledge. However, the science of security did not yet acquire an immanent theoretical cleanness.

The compressed historical excursion to the sources of the science of security is conducted. Pre-conditions of development of economic security on historical epochs are studied. With 1993 for 2015 a large number of researches appeared on economic security of enterprise. This definition exists by virtue of conventionality and can be competent methodological concept in the variety of securitology. For twenty years the traditional approaches from determination was formed. Their exploration and critique are planned in next research.

References:

ARISTOTLE (1983). *Sochineniya.* V 4-h t. Moskva: Misl, 4.

Arhireyska N.V. (2013). Doslidzhennya sistemnih pidhodiv schodo otscinki kategorii «ekonomichna bezpeka». *Elektronne naukove fahove vidannya «Efektivna ekonomika»*, *8*. Retrieved from http://www.economy.nayka.com.ua/?op=1&z=2235.

Ashby, W.R. (2006).*Vvedenie v kibernetiku*. Moskva: KomKniga.

Atamanov, G.A. (2010) Osnovnie vidi bezopasnosti antropnih sistem i ih ierarhiya. *Elektronniy nauchniy zhurnal «Problemy bezopasnosti», 2(10).* Retrieved from http://www.naukaxxi.ru/materials/257/

Beckon, F. (1977). *O smutah i myatezhah.* V 2-h t. Moskva: Misl, 1.

Bertalanffy, L. (1950*). An Outline of General System Theory. Vol. 1, 2*, 134-165.

Blaug, M. (1994). Ekonomicheskaya teoriya blagosostoyaniya Pareto. *Ekonomicheskaya misl v retrospektive = Economic Theory in Retrospect*. Moskva: Delo.

Bogdanov, A. A. (1905–1924). *Vseobshaya organizacionnaya nauka (tektologiya).* V 3-h t. Moskva, 3.

Buchanan, J., & Tullock, G. (1962). *The Calculus of Consent.* Ann Arbor: University of Michigan Press.

Coase, R. (1988). Lecture on The Nature of the Firm. *Journal of Law, Economics and Organization, 4*, 33-47.

Danilov-Danil'yan, V.I. (2003). *Ekonomiko-matematicheskiy entciklopedicheskiy slovar*. Moskva. Bolshaya Rossiyskaya entsciklopediya: Izdatelskiy dom «Infra-M».

Diogen Laertskiy. (1986). *O zhizni, ucheniyah i izrecheniyah znamenitih filosofov*. Moskva: Misl.

Dźwigoł, H. (2000). Budgeting – cost management system. In J. Chuangxin & Y. Shijian (Eds.), *Technology innovation and to put it in practice, papers on the technology in coal industry* (pp. 490-493). Xuzhou, China: China University of Mining and Technology Press

Dźwigoł, H. (2001). Nowoczesne podejście do zarządzania przedsiębiorstwem w warunkach

koniecznej restrukturyzacji. *Wiadomości Górnicze*, 10, 395-399. [in Polish].
Dźwigoł, H. (2002). Zarządzanie projektami w górnictwie węgla kamiennego. *Przegląd Organizacji,* 1, 20-22.
Dźwigoł (2002), *Usprawnienie systemu zarządzania kopalniami węgla kamiennego poprzez zarządzanie projektami*. *Wiadomości Górnicze,* 1, 2-5.
Dźwigoł, H. (2003b). Controlling jako instrument wspomagający zarządzanie przedsiębiorstwem w procesie zmian. *Wiadomości Górnicze,* 11, 488-495.
Dźwigoł, H. (2003a). Zarządzanie procesami marketingu i sprzedaży. Organizacja rynku. *Wiadomości Górnicze*, 5, 212-215.
Dźwigoł, H. (2004). Zmiana jako warunek restrukturyzacji przedsiębiorstwa. *Wiadomości Górnicze,* 4, 171-172.
Dźwigoł, H. (2005). Projektowanie modelu organizacyjnego przedsiębiorstwa przyszłości. In J. Pyka (Ed.), *Nowoczesność przemysłu i usług. Współczesne koncepcje i metody zarządzania przedsiębiorstwami* (pp. 239-249). Katowice: Towarzystwo Naukowe Organizacji i Kierownictwa. [in Polish].
Dźwigoł, H. (2009). Model restrukturyzacji organizacyjnej przedsiębiorstwa górniczego. *Organizacja i Zarządzanie: Kwartalnik Naukowy, 2*(6), 25-43. [in Polish].
Dźwigoł, H. (2010). *Podejście systemowe w procesie restrukturyzacji przedsiębiorstwa*. Gliwice: Wydawnictwo Politechniki Śląskiej. [in Polish].
Forrester, J. (2006). *Mirovaya dinamika*. Moskva: ACT.
Haken, G. (1980). *Sinergetika*. Moskva: Mir.
Hanausek, T. (2001). Zarządzanie bezpieczeństwem – nowa dziedzina nauki. *Bezpečnosť a ochrana majetku.* Košice: LIPORT LFK, 36-39.
Hannan, M.T., & Freeman, J. (1977) «The population ecology of organizations». *American Journal of Sociology, 82 (5).* 929-964.
Hobbes, T. (1991) *Leviafan, ili Materiya, forma i vlast gosudarstva tscerkovnogo i grazhdanskogo*. V 2-h t. Moskva: Misl, 2.
Holbach, P.A. (1963). *Estestvennaya politika ili besedi ob istinnih printscipah upravleniya*. V 2-h t. Moskva: Socekgiz, 2.
Jensen, M., & Meckling, W. (1976). Theory of the firm: Managerial Behavior, Agency costs and Ownership Structure. *Journal of Financial Economics*, *Vol 3*, 305-360.
Kardash, V.A. (2004) Ischislenie rinochnih kompromissov. *Obozrenie prikladnoi i promishlennoi matematiki, Vol. 11, 1*, 41-50.
Keynes, J.M. (2002). *Obcshaya teoriya zanyatosti, procenta i deneg*. Moskva: Gelios ARV.
Korchevska, L.O. (2014). Filosofsko-istorichniy pidhid do vivchennya ekonomichnoi bezpeki pidpriemstva. *Visnik Hmelnitskogo nacionalnogo universitetu. Naukoviy zhurnal*. *Vol. 3 (212), 3*, 104-108.
Kozachenko, G.V. (2013). Economichna bezpeka yak fundamentalna kategoriya bezpekologii. *Materiali I Vseukrainskoi naukovo-praktichnoi конferentscii «Bezpekoznavstvo: teoriya ta praktika»*.
Kvilinskyi, O.S. (2012). Formuvannia dodatkovykh perevah funktsionuvannia ta rozvytku malykh pidpryiemstv [Formation of Additional Benefits of Operation and Development of Small Enterprises]. *Economy of Industry, 3-4*(59-60), 140-147. [in Ukrainian].
Lewin, K. (1947). Frontiers in Group Dynamics: Concepts, Method and Reality in Social Science. *Human Relations, 1,* 5-41.
Lichman, B.V. (2001). Istoriya Rossii. Teoriya izucheniya. Retrieved from http://lichm.narod.ru/history-old-118.html.
Lipkan, V.A. (2003). *Bezpekoznavstvo*. Kiev: Evropeyskiy universitet.
Lukasheva, E.A. (1999). *Prava cheloveka*. Moskva: NORMA-INFRA*M.
Lyashenko, O.M. (2011) Kontsceptualizatsciya upravlinnya ekonomichnou bezpekou pidpriemstva : [monografiya]. Lugansk: SNU ім. V. Dalya.
Malthus, T.R. (1895). *Opit zakona o narodonaselenii*. Retrieved from http://demoscope.ru/weekly/knigi/maltus/maltus.html.

Marx, K. (1975). *Nemetskaya ideologiya*. Moskva.
Maslow, A. (2006). *Motivaciya i lichnost*. Sankt-Peterburg: Izdatelstvo Piter.
Miśkiewicz, R. (2012). Zróżnicowanie struktur organizacyjnych ze względu na układ pionów scalonych na przykładzie przedsiębiorstw hutniczych [Diversification of Organizational Structures due to the Layout of Integrated Divisions on the Example of Steel Companies]. *Hutnik, Wiadomości Hutnicze, 79*(10), 760-766. [in Polish].
Miśkiewicz, R. (2009). Wykorzystanie podobieństwa struktur organizacyjnych w procesie przekształcania organizacji przedsiębiorstw [The Utilization of Organizations Structure Similarity in a Process of Company Organization Transformation Process]. *Zeszyty Naukowe Małopolskiej Wyższej Szkoły Ekonomicznej w Tarnowie, 1*(12), 77-87. [in Polish]
Miśkiewicz, R. (2007). Taksonomia jako narzędzie ocen struktur organizacyjnych przedsiębiorstw hutniczych [Taxonomic as a Tool in Estimation of Organizational Structures for Metallurgical Companies]. *Hutnik, Wiadomości Hutnicze, 74*(3), 151-154. [in Polish]
Morreale, S., & Lambert D. (2009). Homeland Security and the Police Mission. *Journal of Homeland Security and Emergency Management. Vol. 6, 1,* Article 68.
Neyman, D., & Morgenshtern O. (1970). *Teoriya igr i ekonomicheskoe povedenie*. Moskva: Nauka.
Pasternak-Taranuschenko, G. (1994). Ekonomichna bezpeka derzhavi. Vvedennya do ekosesteytu. *Visnik NAN Ukraine, 5*, 23-28.
Pasternak-Taranuschenko, G.A. (1994). *Istoriya viniknennya ta rozvitku nauki pro ekonomichnu bezpeku derzhavi*. Retrieved from http://econbez.narod.ru/1security/2articles/10.htm.
Pavlova, N.S. (2007). Filosofsko-sotsiologicheskie i istoricheskie osnovaniya postanovki problemi bezopasnosti v istorii nauki. *VESTNIK OGU, 7,* 87-93: Retrieved from vestnik.osu.ru/2007_7/14.pdf.
Plato. (1986). *Dialohi.* Moskva: Misl.
Pogorelov, U.S. (2010). *Otscinuvannya ta modeluvannya rozvitku pidpriemstva*. Monografiya. Lugansk: Globus.
Rousseau, J. (1969). *Ob obschestvennom dogovore*. Moskva: Misl.
Sapov, V.V. (1995). *Rimskie stoiki: Seneka, Epiktet, Mark Avreliy*. Moskva: Respublika.
Schumpeter, I. (1982). *Teoriya ekonomicheskogo razvitiya (Issledovanie predprinimatelskoi pribili, kapitala, kredita, procenta i tcikla kon'ukturi*). Moskva: Progres.
Senchagov, B.K. (2005). *Ekonomicheskaya bezopasnost Rossii.* Moscow: Delo.
Serikov, Y.O., & Kozhenevski, L.F. (2010). *Bezpeka zhittediyalnosti – sek'uritologiya*. Kharkov: XNAMG.
Smith, A. (2007). *Issledovanie o prirode i prichinah bogatstva narodov*. Moskva: Eksmo.
Spinoza, B. (1957). *Izbrannie proizvedeniya*. V 2-h т. Moskva: Misl, 2.
Taylor, F.U. (1911). *Printscipi nauchnogo menedzhmenta*. Retrieved from http://www.improvement.ru/bibliot/taylor/index.shtm.
Wiener, N. (1968). *Kibernetika*. Moskva: Sov. radio.
Williamson, O.E. (1985). *The economic institutions of capitalism: firms, markets, relational contracting*. New York.
Xenophon.(1925) Hiero. Agesilaus. Constitution of the Lacedaemonians. Ways and Means. Cavalry Commander. Art of Horsemanship. On Hunting. Constitution of the Athenians. *Loeb Classical Library*. Vol. VII.
Yarochkin, V.I. (1997*). Sistema bezopasnosti firmy*. Moscow.
Yarochkin, V.I. (2000). *Sek'uritologiya – nauka o bezopasnosti zhiznedeyatelnosti*. Retrieved from http://kievsecurity.org.ua/b/x22/ index.shtml.

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ПАРАМЕТРИЧЕСКИЙ СИНТЕЗ ГИДРООБЪЕМНО-МЕХАНИЧЕСКИХ ТРАНСМИССИЙ ДЛЯ ТРАНСПОРТНЫХ СРЕДСТВ ПО КРИТЕРИЮ МАКСИМАЛЬНОГО КОЭФФИЦИЕНТА ПОЛЕЗНОГО ДЕЙСТВИЯ

Аннотация. В статье поставлена задача параметрического синтеза бесступенчатых гидрообъемно-механических трансмиссий (ГОМТ) колесных и гусеничных транспортных средств, которые выполняют относительно стабильные технологические процессы. Для решения задачи параметрического синтеза ГОМТ указаных машин предложено использовать критерий среднеинтегрального коефициента полезного действия (КПД) трасмиссии. Суть задачи параметрического синтеза для кинематической схемы ГОМТ состоит в отыскании собственного вектора конструктивных параметров по критерию максимума среднеинтегрального КПД ГОМТ при удовлетворении всему множеству конструктивных и эксплуатационных ограничений для деформируемой формы регулировочной характеристики в заданных пределах технологических скоростей.

Ключевые слова: трансмиссия, гидрообъемно-механическая трансмиссия (ГОМТ), коэфициент полезного действия (КПД), регулировочная характеристика (РХ), конструктивные параметры, критерий, ограничения, колесные машины, трактор.

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PARAMETRICAL SYNTHESIS OF HYDROVOLUMETRIC-MECHANICAL TRANSMISSIONS FOR VEHICLES ACCORDING TO THE CRITERION OF MAXIMUM EFFICIENCY

Abstract. In the article there is implemented the problem of parametrical synthesis of continuously variable hydrovolumetric-mechanical transmissions (HVMT) of the wheeled and track-type vehicles that perform relatively stable

processes. To solve the problem of parametric synthesis of HVTM specified machines is proposed to use the criterion of the middling-integral efficiency of trasmission. Also there is implemented the definition of parametrical synthesis problem for the kinematic scheme of HVMT as a synthesis of eigenvector of constructive parameters on the criterion of HVMT maximal middling-integral efficiency when satisfying the whole set of constructive and operational constraints for deformable shape of adjusting characteristic within the defined range of technological speeds. Such formulation of the problem gives the opportunity to find the most efficient constructive parameters of the HVMT from the point of view of the higher transmission efficiency and machine efficiency. At this the problem of parametrical synthesis of the general formulation is simplified compared to previously proposed variants of such problem.

Keywords: transmission, hydrovolumetric-mechanical transmission (HVTM), efficiency, adjusting characteristic (AH), constructive parameters, criterion function, constraints, wheeled vehicles, tractor.

Formulas: 5; fig.: 2, tabl.: 0, bibl.: 15

Вступление. Тенденция оснащения транспортных средств бесступенчатыми гидрообъемно-механическими трансмиссиями (ГОМТ) на базе гидрообъемных передач (ГОП) - отличных вариаторов угловой скорости и тягового момента - возрастает с каждым годом. Это обусловлено рядом преимуществ, которыми обладают ГОМТ:

– прежде всего, бесступенчатое регулирование скорости движения и силы тяги в весьма широком диапазоне работы машины;

– высокая компактность при небольшой массе и габаритных размерах трансмиссии;

– существенное облегчение труда оператора-водителя за счет простоты автоматизации управления, повышение эргономичности машины в целом;

– возможность дополнительного торможения гидрообъемной передачей, что снижает износ элементов штатной тормозной системы;

– повышение надежности работы двигателя внутреннего сгорания и других агрегатов в связи с наличием упругих свойств и эффекта демпфирования рабочей жидкости в системе гидропривода ГОП.

Однако существует и ряд недостатков при использоавнии ГОМТ:

– относительно более низкий общий коэффициент полезного действия (КПД) по сравнению с механическими трансмиссиями;

– зависимость КПД от режимов работы;

– более высокая стоимость и сложность изготовления.

В целом, необходимо отметить, что современные тенденции к интегральной загрузке трактора (или другой колесной или гусеничной машины) как энергонасыщенного мобильного средства для реализации современных прогрессивных сельскохозяйственных технологий (и не только указаного типа технологий) с учетом стоимостных затрат на агрегатирование и горюче-смазочные материалы, заработной платы механизаторов, погектарного расхода топлива и погектарных затрат в гривнах выдвигают важнейшую задачу в области математического моделирования и вычислительных методов – задачу создания адекватных математических

моделей и параметрического синтеза сложных технических систем двигатель-трансмиссия-машина.

Анализ исследований и постановка задачи. Внедрение в производство ГОМТ в потенциально крупнейшей тракторопроизводящей стране мира – в Украине, сдерживалось, в частности, отсутствием системного подхода к расчетно-теоретическому обоснованию схемной проблемы указанного вида трансмиссий (ГОМТ). То есть отсутствовала научная методология математического моделирования работы ГОМТ и ее отдельных элементов в составе колесных и гусеничных средств в широком диапазоне их эксплуатационных режимов, а также при выполнении относительно стабильных технологических процессов. Вместо относительно адекватных математических моделей, описывающих статику, динамику и энергетику отдельных элементов трансмиссии и машинотракторного агрегата в целом, использовались упрощенные кинематические и силовые соотношения [Львовский 1976; Дорменев 1987; Кириченко 2003]. При этом игнорировались или не учитывались основные особенности сложных взаимосвязей объемных и гидромеханических потерь в гидрообъемных передачах (ГОП), механические потери в зубчатых зацеплениях с учетом возможных циркуляционных режимов работы ГОМТ в составе колесных тракторов [Пономаренко 1972; Крюков 1978]. Ни в одном из известных источников по теории трактора [Львовский 1976; Дорменев 1987; Кириченко 2003; Schlosser 1961; Thoma 1963; Wilson 1967; Wolfram A. Reidel 1990; Olson, Erdman, Riley 1991; The Ball Piston Engine 2003] за последние десятилетия отсутсвуют исследования в направлении применения математического моделирования двухпоточных бесступенчатых ГОМТ и их проектированию для сельскохозяйственных тракторов.

В работах [Самородов 2002; Самородов, Рогов 2002] представлена общая постановка задачи параметрического синтеза гидрообъемно-механических трансмиссий, предложена методология оптимизации конструктивных параметров ГОМТ по наиболее важным силовым и энергетическим критериям – динамическому фактору, КПД трансмиссии, мощности тепловыделений в ГОМТ, которые носят стохастический интегральный характер [Самородов 2002], представлены результаты параметрического синтеза ГОМТ для быстроходной, маневренной гусеничной машины [Самородов, Рогов 2002].

Однако, для целого ряда транспортных средств, которые выполняют относительно стабильные технологические процессы (сельскохозяйственные трактора, комбайны, корнеуборочные машины, дорожно-строительные и землеройные машины и т.п.), в качестве основного критерия следует выбирать интегральный критерий по КПД ГОМТ в заданном интервале наиболее вероятных технологических скоростей и нагрузочных режимов [Самородов 1998; Самородов 2002]. С одной стороны такой подход является частным случаем общей постановки задачи параметрического синтеза ГОМТ [Самородов 2002], а с другой – в настоящей работе авторы несколько модернизируют используемые критерии качества.

Целью работы является постановка и решение задачи параметрического синтеза ГОМТ по критерию наивысшего КПД трансмиссии и машины применительно к тракторам с ГОМТ при выполнении относительно стабильных технологических рабочих процессов в наиболее вероятном интервале эксплуатационных скоростей.

Такая постановка даст возможность отыскать наиболее рациональные конструктивные параметры ГОМТ с точки зрения наивысшего КПД трансмиссии и машины. При этом задача параметрического синтеза в общей постановке несколько упрощается по сравнению с изложенной в работах [Самородов 1998; Самородов 2002; Самородов, Рогов 2002].

Результаты исследования. Для ГОМТ, проектируемой для транспортных средств, которые выполняют относительно стабильные технологические процессы, разбивка полного скоростного интервала $[0; V_{max}]$ на L диапазонов осуществляется «пилообразными» регулировочными характеристиками (РХ) различного наклона к оси скоростей V при заданной максимальной скорости V_{max} машины (рис.1).

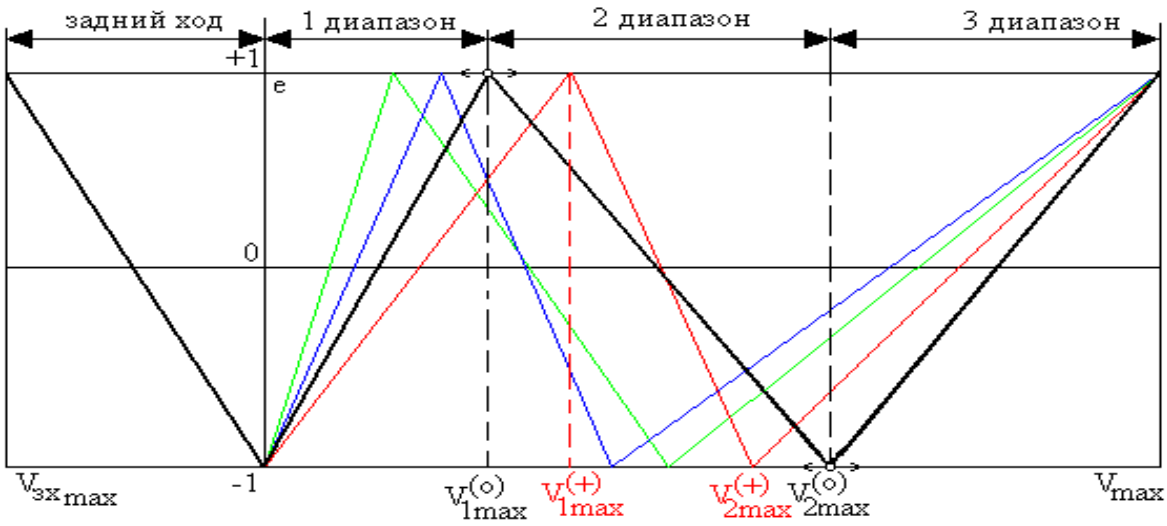

Рисунок 1 – «Пилообразные» деформируемые РХ ГОМТ
Источник: собственная разработка автора

Множества всех передаточных отношений ГОМТ – вектора конструктивных параметров $\bar{\Gamma}(i_1, i_2,..., i_m, k_1, k_2,..., k_n)$ (i и k – соответственно передаточные отношения m редукторов и n планетарных рядов) – для различных "пилообразных" РХ, обеспечивающих общий скоростной диапазон $[0; V_{max}]$ различны. Очевидно, "пилообразные" РХ допускают непрерывную деформацию своей формы (рис.1) путем варьирования (выбора) максимальных скоростей на концах каждого из диапазонов. Под множеством собственных векторов конструктивных параметров ГОМТ понимается подмножество $\Gamma \subset \bar{\Gamma}$, удовлетворяющее всему множеству Λ конструктивных и эксплуатационных ограничений и обеспечивающее функциональность трансмиссии [Самородов 2002; Самородов, Рогов 2002]. Среди возможного множества собственных векторов Г и соответствующих им РХ естественно имеются такие, которые обеспечивают в ГОМТ наиболее эффективные с точки зрения КПД режимы работы ГОП, минимизируют вредные циркуляции мощности в ГОМТ и связанные с ними потери в зубчатых зацеплениях, снижают суммарные тепловыделения в трансмиссии, и в итоге обеспечивают ГОМТ наивысший возможный КПД, а транспортному средству – наивысшую производительность и экономичность. При поиске таких рациональных векторов Г необходимо учитывать наиболее вероятные режимы движения

машины, близкие к математическому ожиданию эксплуатационных скоростей, а на этих скоростях – наиболее вероятные коэффициенты сопротивления движению (технологические нагрузки). Такие режимы движения машины как раз и соответствуют выполнению стабильных технологических процессов.

Под задачей параметрического синтеза для выбранной кинематической схемы ГОМТ будем понимать синтез собственного вектора Г конструктивных параметров по критерию среднеинтегрального КПД ГОМТ при удовлетворении всему множеству Λ конструктивных и эксплуатационных ограничений для деформируемой формы РХ в заданных пределах технологических скоростей.

Пусть существует математическая формализация критерия оптимальности по КПД ГОМТ как функции векторного аргумента $\Gamma(i_1, i_2,..., i_m, k_1, k_2, ..., k_n)$ при выполнении множества ограничений Λ. Тогда логически возникает задача параметрической оптимизации [Реклейтис 1986], постановка которой заключается в следующем.

Используем введенный ранее [Самородов 2002] критерий оптимальности по КПД ГОМТ:

$$W_\eta = \frac{1}{\bar{V}_2 - \bar{V}_1} \int_{\bar{V}_1}^{\bar{V}_2} \eta\left(\Gamma, \bar{V}, q, f\right) d\bar{V} \qquad (1)$$

В формуле (1) $\eta(\Gamma, \bar{V}, q, f)$ – закон изменения КПД ГОМТ как функции собственного вектора $\Gamma(i_1, i_2,..., i_m, k_1, k_2,..., k_n)$ варьируемых параметров, относительной скорости $\bar{V} = V/V_{max}$ и рабочего объема гидромашин q; $\bar{V}_1, \bar{V}_2$ – минимальная и максимальная относительные скорости, соответствующие заданному интервалу реальных эксплуатационных скоростей V_1 и V_2; f – наиболее вероятный коэффициент сопротивления движению в интервале рабочих скоростей $V \in [V_1; V_2]$.

Физический смысл введенного критерия отражает возможности транспортного средства по КПД ГОМТ в заданном скоростном диапазоне реальных скоростей $V \in [V_1; V_2]$, например при сравнении альтернативных вариантов трансмиссий с учетом того, что машина находится чаще в зоне математического ожидания $M[\bar{V}] \in [V_1; V_2]$ относительной эксплуатационной скорости, которой и характеризуется выполнение стабильного технологического процесса. Чем больше значение критерия (1), тем более производительна и экономична машина по КПД.

Геометрический смысл введенного критерия – это площадь криволинейной трапеции под графиком КПД ГОМТ на интервале $V \in [V_1; V_2]$, деленная на величину этого интервала и трансформирующаяся в среднеинтегральный КПД на указанном рабочем интервале скоростей.

На рис. 2 для иллюстрации геометрического смысла указанного критерия (1) приведены результаты расчетно-теоретического исследования КПД ГОП η_Γ и КПД ГОМТ η на фоне статических регулировочных характеристик e(V) для бесступенчатой трехдиапазонной ГОМТ перспективного лесотехнического трактора ЛТ-60 (разработка ГП «Завод им. Малышева», Харьков, Украина).

На рис. 2 1a – РХ и 3a – КПД ГОП на первом реверсивном диапазоне; 1b – РХ, 2b – КПД ГОМТ и 3b – КПД ГОП на первом рабочем (двухпоточном) нереверсивном диапазоне; 1c–РХ, 2c–КПД ГОМТ и 3c – КПД ГОП на втором транспортном диапазоне. Наиболее вероятный интервал эксплуатационных скоростей $V \in [4; 8]$ (V_1=4 км/ч, V_2 = 8 км/ч) соответствует РХ 1b – двухпоточного первого диапазона. Среднеинтегральный КПД ГОМТ, то есть критерий (1), с геометрической точки зрения получается путем деления площади криволинейной трапеции V_1ABV_2 на разность $V_2–V_1$. То есть, следует отыскать такую РХ, для которой введенный выше критерий (1) имеет максимум.

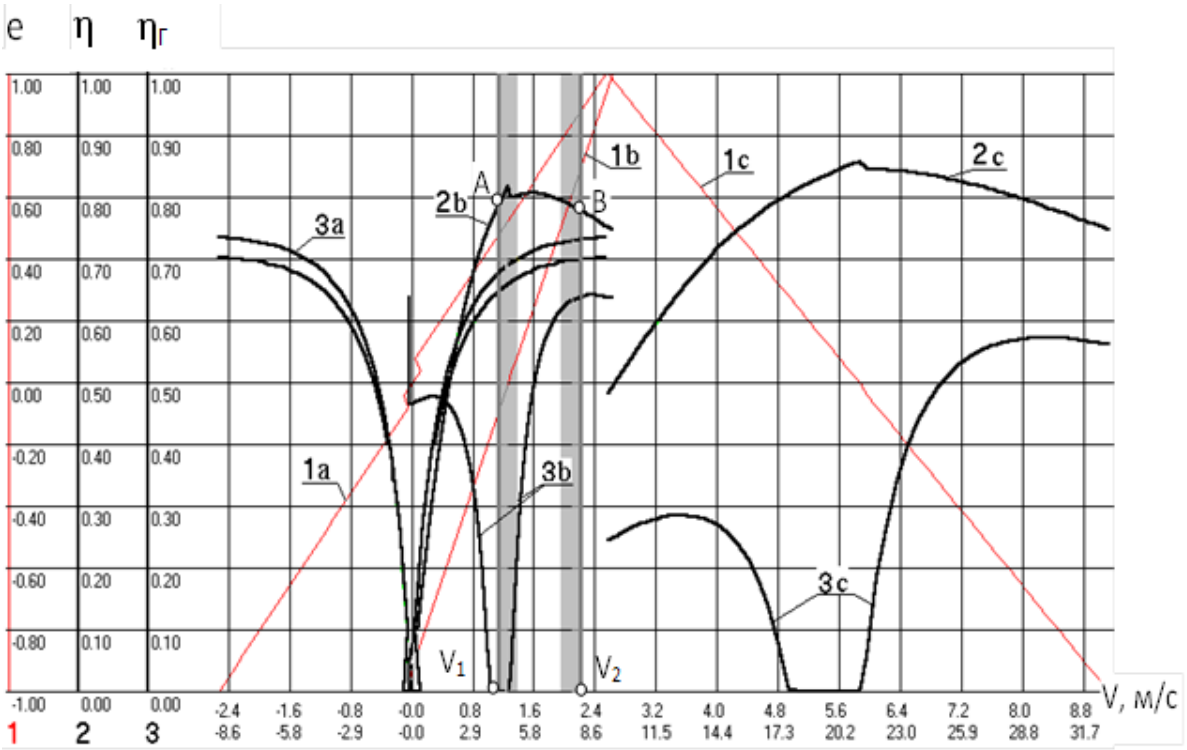

Рисунок 2 – К определению среднеинтегрального КПД
Источник: собственная разработка автора

Форма «пилообразных» РХ ГОМТ определяется значениями максимальных скоростей V_{jmax} (j = 1,2,..,L) в конце каждого из L диапазонов. Поскольку заданной РХ соответствует собственный вектор Г конструктивных параметров, то каждая из этих скоростей является функцией вектора Г:

$$V_{jmax} = V_{jmax}\left[\Gamma\left(i_1, i_2, \ldots i_m, k_1, k_2, \ldots k_n\right)\right] = V_{jmax}\left[\Gamma\right]; \qquad (2)$$

Для ГОМТ, разработанных не на основе параметрического синтеза, а на основе инженерного и конструкторского опыта, собственный вектор Г в общем случае не является оптимальным. Однако, соответствующая ему РХ со скоростями V_{jmax} (j = 1, 2, …, L) (на рис.1 это $V_{1max}^{(1)}$, $V_{2max}^{(1)}$, $V_{3max}^{(1)}$ =V_{max}) и сам вектор $\Gamma = \Gamma^{(1)}\left(i_1^{(1)}, i_2^{(1)}, \ldots i_m^{(1)}, k_1^{(1)}, k_2^{(1)}, \ldots k_n^{(1)}\right)$ могут быть использованы как хорошее первое приближение при решении задачи параметрического синтеза. Глобальными переменными при деформации формы пилообразных

РХ как раз и являются конечные максимальные скорости V_{jmax} – функции вектора Г.

Функционал качества $\Phi_{\Delta V}[\Gamma]$, характеризующий задание конечных скоростей на каждом скоростном диапазоне, является суммой нормированных квадратичных отклонений деформированной РХ с максимальными скоростями $V_{jmax}^{(+)}$ (рис. 1):

$$\Phi_{\Delta V}[\Gamma] = \left(V_{1\min}[\Gamma]\right)^2 + \sum_{j=1}^{L}\left(1 - \frac{V_{jmax}^{(+)}}{V_{jmax}[\Gamma]}\right)^2. \qquad (3)$$

Минимум данного функционала (теоретически равный нулю) достигается варьированием вектора конструктивных параметров Г до совпадения синтезируемой РХ с заданной, соответствующей скоростям $V_{jmax}^{(+)}$. Варьируя этими глобальными переменными $V_{jmax}^{(+)}$ в разумных с точки зрения эксплуатации машины интервалах, порождается множество РХ со своими собственными векторами Г, на множестве которых и необходимо найти минимум введенного критерия качества (3), которому соответствует вектор $\Gamma^*\left(i_1^*, i_2^*, \ldots i_m^*, k_1^*, k_2^*, \ldots k_n^*\right)$ оптимальных конструктивных параметров, удовлетворяющий множеству Λ ограничений

$$\begin{aligned} &i_{p\min} \le i_p \le i_{p\max},\ p = 1, 2, \ldots, m;\\ &k_{t\min} \le k_t \le k_{t\max},\ t = 1, 2, \ldots, n;\\ &\omega_{tcm} \le \omega_{tcm\ max},\quad t = 1, 2, \ldots, n, \end{aligned} \qquad (4)$$

где $\omega_{tcm}, \omega_{tcm\max}$ – соответственно угловая скорость сателлитов t-го планетарного ряда и их максимальная допустимая скорость.

Наличие в ГОМТ n диапазонов предусматривает n–1 переключение, следовательно, требует n–1 согласующих кинематических уравнений типа $V_{jmax}=V_{j+1,min}$ или $\omega_{Xj\ max} = \omega_{Xj+1,min}$ (по угловым скоростям ведущих колес) для обеспечения кинематически чистого (при допущении отсутствия потерь в ГОП и в ГОМТ в целом) переключения с диапазона на диапазон. n–диапазонная ГОМТ с РХ требует задания еще n–кинематических уравнений для граничных кинематических параметров V_{jmax}, ($j=\overline{1, n}$) или ω_{Xjmax} ($j=\overline{1, n}$) и одно уравнение связи, описывающее трогание машины при $\bar{e}=\pm 1$ и $V_{1min}=0$. Таким образом РХ описывается n–1+n+1=2n кинематическими согласующими уравнениями. Тогда функционал (3) представляется в виде:

$$\Phi_{\Delta V}[\Gamma] = \left(\omega_{X1\min}[\Gamma]\cdot r\right)^2 + \sum_{j=1}^{L-1}\left[\left(1 - \frac{V_{j\ max}^{(+)}}{\omega_{jmax}[\Gamma]\cdot r}\right)^2 + \left(1 - \frac{V_{jmax}^{(+)}}{\omega_{j+1\min}[\Gamma]\cdot r}\right)^2\right] + \left(1 - \frac{V_{L\max}^{(+)}}{\omega_{L\max}[\Gamma]\cdot r}\right)^2, \qquad (5)$$

где r – радиус ведущего колеса.

В функционале (5) первое и последнее слагаемые в процессе оптимизации стремятся к нулю, что соответствует нулевой скорости трогания машины и максимальной заданной скорости на L-том скоростном диапазоне. Стремление к нулю выражения, стоящего под знаком суммы, обеспечивает кинематическую стыковку скоростных диапазонов в L – 1 точке, то есть "пилообразную" РХ. Таким образом, на множестве ограничений (4) необходимо решить минимаксную задачу:

$$\min \Phi_{\Delta V}\left[\Gamma\right] = \Phi_{\Delta V}\left[\Gamma^{*}\right]; \qquad \max W_{\eta}\left(\Gamma\right) = W_{\eta}\left(\Gamma^{*}\right).$$

Выводы. Таким образом, представляется возможным сделать следующие выводы. Под задачей параметрического синтеза для выбранной кинематической схемы ГОМТ следует понимать синтез собственного вектора Г конструктивных параметров по критерию максимума среднеинтегрального КПД ГОМТ при удовлетворении всему множеству Λ конструктивных и эксплуатационных ограничений для деформируемой формы РХ в заданных пределах технологических скоростей. В указанной выше постановке, задача параметрического синтеза несколько упрощается по сравнению с общей постановкой, изложенной в работах [Самородов 1998; Самородов 2002; Самородов, Рогов 2002]. Применительно к тракторам с ГОМТ, работающих в относительно стабильном технологическом режиме, такая постановка вполне правомерна и дает возможность отыскать наиболее рациональные конструктивные параметры ГОМТ с точки зрения наивысшего КПД трансмиссии и машины.

Литература

Дорменев С. И. Тракторные моторно-трансмиссионные установки с двигателями постоянной мощности / С. И. Дорменев, А. П. Банник, И. А. Коваль и др.// М.: Машиностроение. – 1987. – 184 с.

Львовский К.Я. Трансмиссии тракторов / К. Я. Львовский, Ф. А. Черпак, И. Н. Серебряков и др. // М.: Машиностроение. – 1976. – 280 с.

Пономаренко Ю. Ф. Высокомоментные радиально-поршневые гидромоторы горных машин / Ю. Ф. Пономаренко // М.: Недра. – 1972. –375 с.

Кириченко И. Г. Наукові основи створення високоефективних землерійно-транспортних машин / И. Г. Кириченко, Л. В. Назаров, В. В. Ничке // Харьков: ХНАДУ. – 2003. – 588 с.

Крюков А. П. Теоретические основы анализа и синтеза схем трансмиссий с гидрообъемными передачами для гусеничных машин / А. П. Крюков // Автореф. дис. д-ра. техн. наук. – ВНИИТМ. – Л. – 1978. – 38 с.

Реклейтис Г. Оптимизация в технике / Г. Реклейтис, А. Рейвиндран, К. Рэгсдел // Кн. 1. – М.: Изд. «Мир». – 1986. – 348 с.

Самородов В. Б. Общая постановка задачи параметрического синтеза гидрообъемно-механических трансмиссий / В. Б. Самородов // Механика и машиностроение. – №1, 2002. – С. 109-115.

Самородов В.Б. Проблемы и направление теоретических исследований в области гидрообъемно-механических трансмиссий в Украине / В. Б. Самородов // Механика и машиностроение. – №1, 1998. – С.105-109.

Самородов В.Б. Результаты параметрического синтеза гидрообъемно-механической трансмиссии гусеничной машины / В. Б. Самородов, А. В. Рогов // Механика и машиностроение. – №1, 2002. – С.115-121.

Olson, D.G., Erdman, A.G., and Riley, D.R., 1991, "Toplogical Analysis of Single-Degree-of-Freedom Planetary Gear Trains," ASME Journal of Mechanical Design, Vol. 113, pp. 10-16.
Schlosser W.M. Mathematical model for hydraulic power and motors // Hydraulic power transmission. – 1961. – Vol.7. – №76. – pp. 252 – 257.
Shluter – Tractoren – Barenstark / Wolfram A. Reidel. Frankfurt am Mein: DLG – Verl. – 1990. – 228 p.
The Ball Piston Engine. A New Concept in High Efficiency Power Machines, 2003.
Thoma J. Performance of hydrostatic transmission // Hydraulic pneumatic power. – 1963. – Vol.9. – №97. – pp.273 – 285.
Wilson W.E. Mathematical models in fluid Power engineering. – Hydraulic Pneumatic Power, mach, 1967, V.13, №147, pp.136 – 140.

References

Dormenev, S. I., Bannik, A. P., Koval, I. A. & others (1987). *Traktornye motorno-transmissionnye ustanovki s dvigatelyami postoyannoy moshhnosti.* Moskwa: Mashinostroenie.
Kirichenko, I. G., Nazarov, L. V., & Nichke, V. V. (2003). *Naukovi osnovi stvorennya visokoefektivnih zemleriyno-transportnih mashin.* Kharkiv: HNADU.
Krjukov, A. P. (1978). *Teoreticheskie osnovy analiza i sinteza shem transmissiy s gidroobiemnymi peredachami dlya gusenichnyh mashin*: *Avtoref. dis. d-ra. tehn. nauk.* Leningrad: VNIITM.
Lvovskiy, K. Ja., Cherpak, F. A., Serebryakov, I. N. & others (1976). *Transmissii traktorov*. Moskwa: Mashinostroenie.
Olson, D. G., Erdman, A. G., & Riley, D. R. (1991). Toplogical Analysis of Single-Degree-of-Freedom Planetary Gear Trains. *ASME Journal of Mechanical Design, Vol. 113*, 10-16.
Ponomarenko, Yu. F. (1972). *Vysokomomentnye radial'no-porshnevye gidromotory gornyh mashin*. Moskwa: Nedra.
Recleytis, G., Reyvindran, A., & Regsdel, K. (1986). *Optimizaciya v tehnike: Kn. 1.* Moskwa: Izd. «Mir».
Samorodov, V. B. (2002). Obshhaya postanovka zadachi parametricheskogo sinteza gidroobiemno-mehanicheskih transmissiy. *Mehanika i mashinostroenie, 1*, 109-115.
Samorodov, V. B. (1998). Problemy i napravlenie teoreticheskih issledovaniн v oblasti gidroobiemno-mehanicheskih transmissiy v Ukraine. *Mehanika i mashinostroenie, 1*, 105-109.
Samorodov, V. B., & Rogov, A. V. (2002). Rezu'taty parametricheskogo sinteza gidroobiemno-mehanicheskoy transmissii gusenichnoy mashiny. *Mehanika i mashinostroenie, 1*, 115-121.
Schlosser, W. M. (1961). Mathematical model for hydraulic power and motors. *Hydraulic power transmission, Vol.7, 76*, 252-257.
The Ball Piston Engine. A New Concept in High Efficiency Power Machines, 2003.
Thoma, J. (1963). Performance of hydrostatic transmission. *Hydraulic pneumatic power, Vol.9, 97*, 273-285.
Wilson, W. E. (1967). Mathematical models in fluid Power engineering. *Hydraulic Pneumatic Power, Vol.13, 147*, 136-140.
Wolfram, A. Reidel (1990). *Shluter – Tractoren – Barenstark.* Frankfurt am Mein: DLG – Verl.

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A NEW METHODOLOGY OF COMPLEX SYSTEMS MANAGEMENT

Abstract. The development of research in the area of complex systems management is considered in the given work. Six levels of management are analyzed. They are distinguished based on criteria of management object complexity, management information and objectives. A new approach to the development of complex systems management models is represented. It combines the internal and external information not only for measurement of the current state, but also it provides the tools for management performance evaluation with the help of analysis of the influence of management results on the external environment.

Keywords: management methodology, complex system, monitoring, external environment, performance, web.

Formulas:0; fig.: 1, tabl.: 1, bibl.: 24

JEL Classification: B41, I23, O20

Introduction. Performance is an essential factor of living standards improvement in industrial countries with a developed market economy. Since Ukraine has set a course for European integration, this becomes a core factor for the movement towards restructuring of the economy and enhancement of its performance and quality.

Any complex system functioning under the conditions of competitive market economy is an open system. It acts in the external environment, interacts with consumers, suppliers, competitors, as well as state and public institutions. This makes it necessary to coordinate the behavior with all stakeholders and to bear social responsibility for the results of activities. Therefore, the problem of performance improvement has become a global economical, social, political and technical problem which requires an effective solution.

Literature review and the problem statement. Modern complex systems use different performance measurement systems for management purposes. This intends the existence of definite measurement criteria. However, usually the implementation of performance measurement systems has a formal or even mistaken character which may lead to wrong decisions and irreversible effects. Such situation grounds the necessity to explore the problem of complex systems management as a collection of such tasks as goals setting, development of performance management system, resources distribution, monitoring and evaluation. This is the basis of a single theoretical and methodological approach and corresponding information technologies and software.

Nowadays we can observe a fast development of markets and intense rivalry, that's why the demand for information of non-financial character becomes more and more critical. The evolution of indicators of enterprise's development strategy has proven that a traditional finances-oriented approach has some important disadvantages. For instance, this includes the absence of non-financial indicators, a subtle connection with strategic planning, orientation on past results, short-term and fragmentary orientation on external and internal aspects of enterprise's activities.

The constant growth of the complexity of structure and processes in modern management systems leads to involvement of big volumes of data and, thus, to sophistication of models and methods of information processing. Despite the level of modern computer technologies development, the information used for management of complex systems is still characterized as incomplete, inaccurate, subjective and semi structured. This causes a low effectiveness of the formal models of data processing. On the other hand, the defined drawbacks of information do not allow to improve management performance based on the existing approaches. All these problems result in the necessity not only to improve existing models and methods of management but to search for the new data sources for management and new ways of solving the problems of performance and quality management.

So, **the purpose** of this work is the improvement of the processes of performance and quality management in complex systems by means of the new approach of management.

Research results. *The main stages of development of approaches to complex systems management.* Many authors devoted their works to the problems of management of complex systems. Among them are I. Ansoff [Ansoff, Bosnian, Storm 1982], V. N. Burkov [Burkov, Irikov 2014], Dźwigoł H. [Dźwigoł 2014; Dźwigoł 2013; Dźwigoł 2010; Dźwigoł 2005; Dźwigoł 2004], D. O. Novikov [Novikov, Ashimov, Sultanov 2013], V. L. Volkovich [Volkovich, Godlevsky 1991], V. S. Mihalevich [Mihalevich, Volkovich 1982], T. Saaty [Saaty, Vargas 2006], A. D. Tsvirkun [Tsvirkun 2003], and many others. The theoretical background for solving the problems of management of complex systems development is formed by the general theory of systems, system analysis, and optimization methods. Often the problems of complex systems management are solved on the basis of ideology of management by objectives [Irikov, Trenev 1999].

According to the formulated goal of this paper, let's consider the development of scientific ideas in the domain of complex systems management as a regular process involving a complex management object and taking into the account high requirements to information quality used for management.

It is widely known that modern management theory starts from the classical control theory, namely from Watt's governor [Glad, Ljung 2000]. This device, which provides the constant angular velocity of revolution of vehicle's axle, for the first time realized the principle of management based on negative feedback. This principle is now one of the key management principles in any complex systems. Consequently, it can be claimed that the first stage of management is the challenge to provide a stable functioning of management object. Let's classify as the approaches of the first level of management those ones which consider relatively simple object that can be explored by means of classical methods and for which management we use only the information about the change of its parameters under the conditions of the known analytical function of definition of the output parameters.

The research in the area of stability of control inputs in technical systems leads to the creation of the classical automatic control theory [Glad, Ljung 2000]. The problem of control in its classical statement supposes that the feedback must be built to provide the transition of the dynamical system from the neighborhood of one state of equilibrium to another. It is important that information, based on which the feedback and control inputs are formed, is gathered from the "outputs" of the management object which can be complex enough in modern systems of automatic control. Current research of the control with a feedback are directed on the development of approaches to management in the real time mode and definition of a big number of controlled parameters. Modern research in this area is focused on the transient processes of dynamical systems. So the second level management is represented and considers complex dynamical objects as a closed system.

Usually a statement about the complexity and open character of the modern management systems does not require any proof. Interaction of the management object with the external environment is a significant aspect for the management of the third level. The main peculiarity of the methods and approaches of this level is a stochastic statement of the classical control problem [Glad, Ljung 2000], i.e. accounting of the random influences of the external environment on the definition of the values of controlled parameters of management object. The important fact here is that on this stage of evolution of methods of complex systems management we add the information about external environment to the general information that must be considered during the feedback definition. Such problem statement caused the appearance of various methods of accounting uncertainty and randomness of the external environment and internal processes of complex system [Glad, Ljung 2000].

Management of the fourth level is definitely a cybernetic approach [Glushkov 1974]. Cybernetics as a science about the general laws of obtaining, storage, transmission and processing of information in complex management systems formulated the basic principles of the development of management systems and automation systems. An essential contribution to the development of cybernetics was done by such Ukrainian scientists as M. M. Amosov, P. I. Andon, A. V. Anisimov, V. M. Glushkov, V. F. Gubarev, V. S. Deineka, M. Z. Zgurovsky, O. G. Ivakhnenko, I. M. Kovalenko, V. M. Kuntsevich, O. V. Palagin, I. V. Sergienko. The objects of cybernetics are any controlled systems considered to be abstract and independent of their material nature. For a long time the cybernetic principles have been predominating among the advanced approaches to complex systems management.

The complexity of the management object caused the development of the cybernetic approach in different directions of applied research. Today this approach is not irrelevant. However, it can be noted that methods of management of the fourth level are focused on the management objects and on the completely new view (comparing with the previous levels) on the problem of complex systems management. Still methods of the fourth level are predominantly based on the information about management object or external environment, but only from the point of view of the controlled object.

The growing complexity of systems and its processes, namely in economical and social systems, caused the search for the new approaches and the development of cybernetic principles for the new circumstances. Therefore, we suggest to consider adaptive methodology of management [Armitage, Berkes, Doubleday 2008] as the fifth level. It is focused on the dynamics not only of the management object, but also on the constant change of the external environment. Modern management approaches based on objectives are the typical examples of the management of the fifth level.

Starting from the late 1980s we can observe the rethinking and development of existing concept management towards multifeature orientation. New models based on the new concept of Performance Measurement became quite popular. The representatives of the new management models are Data Envelopment Analysis, Performance Measurement in Service Business, Balanced Scorecard, Tableau de Bord, Productivity Measurement and Enhancement System [Okes, Westcott 2002].

These contemporary management concepts based on performance measurement, as far as the concept of strategic management, determine the necessity to study the external environment of the controlled system. So the objective laws of the environment should be explored and the parameters should be forecast which is a precondition to management decision formulation. Summarizing these approaches we can introduce the notion of the management of the sixth level as the methodology of proactive management [Okes, Westcott 2002]. The distinct feature of these methods is a high degree of accounting of information from the external environment, i.e. the targeted collection of data about the environment of the complex system. However, this information reflects only the environment where the system is functioning. Thereby, management is based on the information which is collected inside the control circuit. A methodology of control inputs forming corresponds to the management of the fifth and the fourth levels, but takes into account the component of the external environment.

So the conducted analysis of the existing approaches to complex systems management allows one to define a set of problems that must be resolved.

Firstly, the complexity of systems and their processes require involvement of big volumes of heterogeneous, non-formalized, fuzzy and conflicting data. This demonstrates the need to make research directed on the improvement of existing systems and the development of new information technologies of data processing for management goals.

Secondly, as the analysis has shown, existing approaches are focused on the information that is collected inside the system. In this case data retrieved from external sources are used only for description of the external environment. This causes the need to explore the possibilities of using the external information for management purposes.

Thirdly, the existing management methods are based on the usage of expert information. This confirms the relevance of the research in the direction of the further development of expert methods, namely the issues of forming, processing and combination of scales used by experts for estimation.

Combining information from internal and external sources for improvement of management performance. Based on the analysis of existing approaches to performance and quality management, we can make a conclusion the tool that currently formalizes the management process is the system of key performance indicators. Such systems are the basis for performance and quality management. They are oriented on measurement and evaluation of a set of indicators which are chosen by taking into account all aspects of system's functioning. They differ in the principles of building the structure of indicators and are oriented on different stakeholders.

As the analysis has shown, the complexity of the management object from one side and the extension of goals and tasks of management from another side caused the appearance of new management concepts relying on the system of measurement and evaluation of management performance and quality. The main issue of these approaches is an unformalized and subjective character of the system of indicators that should be measured.

For management purposes, it is necessary to know the values of performance and quality indicators which can't be obtained directly from the system. This problem is presented as monitoring and evaluation [Kusek, Rist 2004, Cherednichenko, Yanholenko 2013].

Monitoring is a continuous process of data collection about research object on specified indicators [Kusek, Rist 2004]. It provides all stakeholders with indications of achievement of objectives of the given object's functioning. Monitoring is always complemented by evaluation. Evaluation is the process of obtaining estimates of results of a system's functioning and respective correspondence to the stated goals [Kusek, Rist 2004]. These two processes are considered as a single one, since they are interconnected and are a part of management cycle.

The definition of indicators for monitoring and evaluation presupposes the agreement on short-term and long-term goals and results which are interesting for management. Key indicators which are used for monitoring of the results must be agreed with the top management of an enterprise. The stage of results monitoring includes definition of data sources and methods of data collection. On the first iteration, the baseline values of indicators are determined. Then they are observed in real time. Evaluation of results based on the collected data provides management with explanation of why the stated goals were or were not achieved and in what extent. On the stage of using findings of monitoring and evaluation the analysis of results is conducted which may leads to correcting the plan for further development. Excepting this, some efforts must be realized in order to support the continuous work of monitoring and evaluation system.

There are two approaches to the construction of monitoring system: implementation-focused and results-based [Göergens, Kusek 2009]. Data collected during monitoring must provide the management system with information concerning the achievement of stated goals. These data must meet the following criteria: precision, recall, relevancy and timeliness. The main difference between two approaches is in the target orientation. In the case of implementation-focused monitoring the estimation of goals achievement is based on indicators associated with system outputs. And in the case of results-based

monitoring, indicators reflect the outcomes. So, the evaluation is focused either on the obtained products (services) or on the effect of activities' outcomes. The comparison of two approaches is given in table 1.

Table 1 – Comparison of the approaches to monitoring and evaluation

Criterion	Implementation-focused monitoring and evaluation	Results-based monitoring and evaluation
Goal	To provide the information about the aspects of realization of the project (program or strategy)	To provide the information about project success
Logical model	Inputs ↔ Actions ↔ Outputs	Goals ↔ Results
Target orientation	Outputs	Outcomes
The direction of data collection	Data about inputs, actions and outputs	Data about outputs and their contribution to the achievement of the expected results
Realization	Systematic reports on prepared inputs and obtained outputs	Systematic reports on quantitative and qualitative information about results achievement

Source: authors' own development

We can conclude that the main task solved by results-based monitoring and evaluation is to determine the degree of success of project (program) realization towards the expected outcomes [Kusek, Rist 2004]. Such type of monitoring and evaluation is a powerful tool for results measurement and usage of obtained information as a feedback for decision making. The given work considers results-based monitoring and evaluation.

Measurement is the process of getting the information about quantitative characteristics of an object's features by experiment [Cherednichenko, Yanholenko, Iakovleva, Kustov 2014]. Quantitative values of indicators allow managers to take grounded decisions. The current values can be compared with the past values and with the target values which allows to explore the dynamics and to correct the trajectory of the development of complex system.

Monitoring and evaluation is usually performed with respect to all lines of activity. The internal data sources are mainly used in this process which may lead to some degree of subjectivism. We can name such data sources for monitoring as official reports: i.e. documentation of structural divisions and information obtained from employees and consumers. Information from external sources is rarely used. To these types of sources we can refer rankings and reports of public and state organizations. However, data from rankings are not quite useful from the management point of view, since most commonly the methodology of indicators calculation remains confidential.

Except mentioned traditional data sources, we can claim that results of enterprise's activities may have their reflection in the web space, which is an external environment [Cherednichenko, Yanholenko, Iakovleva 2013, Cherednichenko, Yanholenko 2013]. Access to such data is open. Nevertheless,

they are almost not used for monitoring of the performance and quality indicators.

Despite of what data are used for monitoring, the estimation of the quality of monitoring results is practically absent for today. The issues of quality of obtained results remain unsolved which discredits precision and reliability of collected data.

The main idea of the given work is that existing approach to complex systems management must be complemented with new mechanisms of collection, processing and evaluation of data retrieved from the external sources (fig. 1). We will consider the web as an external environment containing information that is a reflection of a real world in some extent. Further we consider complex systems in a management circuit of which we can see a person. Results of work of such systems can be characterized based on the analysis of information stored on the web-sites of some portals, blogs, forums, social networks, etc.

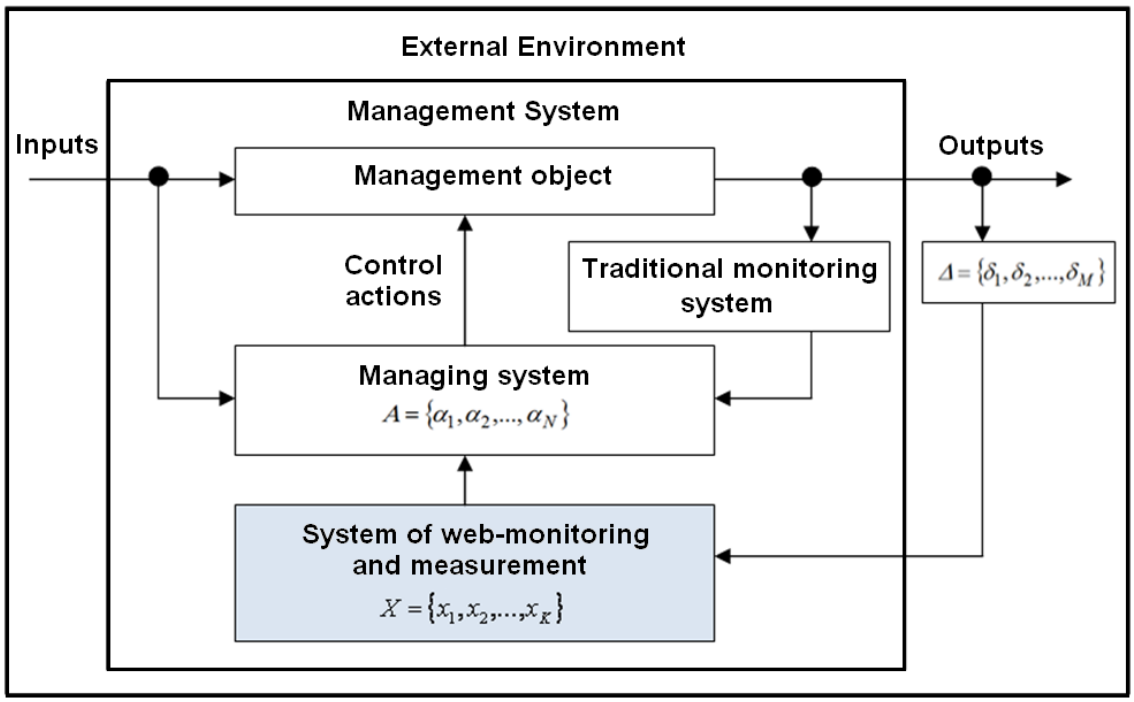

Figure 1 – Management system based on combination of internal and external sources

Source: authors' own development

Conclusions. Nowadays traditional monitoring system gathers and processes data which are in fact located inside management system. The main drawbacks of such approach are limitation of data sources and difficulties in obtaining of estimates of management results. Except this, estimates obtained inside management system are characterized by some degree of subjectivism and incompleteness. In order to improve this situation, in the given work we suggest to complement traditional management system with a new scheme of monitoring of indicators which are available for observation in the external environment, in particular, on the web. The involvement of external data sources may increase data integrity and objectivism, while the usage of the web provides the possibility of automation of monitoring process.

So the suggested approach to complex systems management combines internal and external information not only for measuring the current state of the system but also in order to evaluate management results by means of introduction of new external data sources.

Future research in the area of new methodology of complex systems management determines for us a set of problems to be solved. Firstly, information gathered by monitoring system on the web has an unformalized, semi-structured character. It is stored in different formats and has a definite degree of incompleteness, inaccuracy, etc. this requires to solve the problem of integration of heterogeneous information taking into account its business value for management purposes.

Secondly, the conducted research allows us to claim that data for monitoring must be collected both inside and outside the system. Therefore the problem of the common data sharing occurs. In particular, the degree of confidence, priority and usefulness of data must be defined. Taking into account that indicators' measurement is usually performed in different scales, the problem of common usage of these scales arises. Also the further research will be directed on methods of transformation and interpretation of the obtained estimates of performance and quality indicators.

References

Ansoff, H. I., Bosnian, A., & Storm, P. (1982). *Understanding and Managing Strategic Change.* Amsterdam: Elsevier.

Armitage, D., Berkes, F., & Doubleday, N. (2008). *Adaptive Co-Management: Collaboration, Learning, and Multi-Level Governance (Sustainability & the Environment).* Vancouver: UBC Press.

Burkov, V. N., & Irikov V. A. (2014). *Vvedenie v teoriyu upravleniya organizatsionnyimi sistemami.* Moscow: Librokom.

Cherednichenko, O., & Yanholenko, O. (2013). Towards Quality Monitoring and Evaluation Methodology: Higher Education Case-Study. *H. C. Mayr et al. (Eds.): UNISCON 2012. Springer LNBIP, vol. 137*, 120-127.

Cherednichenko, O., Yanholenko, O., Iakovleva, O., & Kustov, O. (2014). Models of Research Activity Measurement: Web-Based Monitoring Implementation. *S. Wrycza: 7th SIGSAND/PLAIS EuroSymposium 2014. Springer LNPIB, vol. 193*, 75-87.

Cherednichenko, O., Yanholenko, O., & Iakovleva, O. (2013). Web-Based Monitoring and Evaluation: Research Activity Assessment Case Study. *Scientific Conference SCIECONF 2013*, 455-458.

Cherednichenko, O., & Yanholenko, O. (2013). Towards Web-Based Monitoring Framework for Performance Measurement in Higher Education. *Science and Education a New Dimension: Natural and Technical Science, vol. 8*, 151–155.

Dźwigoł, H. (2014). Menedżerowie przyszłości a zarządzanie strategiczne. *Zeszyty Naukowe Politechniki Śląskiej, Organizacja i Zarządzanie,* 70, 93-104. [in Polish].

Dźwigoł, H. (2013). *Zarządzanie przedsiębiorstwem w warunkach XXI wieku.* Gliwice: Wydawnictwo Politechniki Śląskiej. [in Polish].

Dźwigoł, H. (2010). *Podejście systemowe w procesie restrukturyzacji przedsiębiorstwa*. Gliwice: Wydawnictwo Politechniki Śląskiej. [in Polish].

Dźwigoł, H. (2005). Projektowanie modelu organizacyjnego przedsiębiorstwa przyszłości. In J. Pyka (Ed.), *Nowoczesność przemysłu i usług.*

Współczesne koncepcje i metody zarządzania przedsiębiorstwami (pp. 239-249). Katowice: Towarzystwo Naukowe Organizacji i Kierownictwa. [in Polish].

Dźwigoł, H. (2004). Zmiana jako warunek restrukturyzacji przedsiębiorstwa. *Wiadomości Górnicze,* 4, 171-172.

Glad, T., Ljung, L. (2000). *Control Theory.* New York: Taylor&Francis.

Glushkov, V. M. (1974). *Vvedenie v ASU. 2nd ed.* Kiev: Tehnika.

Göergens, M., & Kusek, J. Z. (2009). *Making Monitoring and Evaluation Systems Work: A Capacity Development Toolkit. The International Bank for Reconstruction and Development,* The World Bank.

Irikov, V. A., & Trenev, V. N. (1999). *Raspredelennyie sistemyi prinyatiya resheniy. Teoriya i prilozheniya.* Moscow: Nauka.

Kusek, J. Z., & Rist, R. C. (2004). *Ten Steps to a Results-Based Monitoring and Evaluation System: a Handbook for Development Practitioners.* Washington, DC: The World Bank.

Kvilinskyi, O.S. (2012). Formuvannia dodatkovykh perevah funktsionuvannia ta rozvytku malykh pidpryiemstv [Formation of Additional Benefits of Operation and Development of Small Enterprises]. *Economy of Industry, 3-4*(59-60), 140-147. [in Ukrainian].

Mihalevich, V. S., & Volkovich, V. L. (1982). *Vyichislitelnyie metodyi issledovaniya i proektirovaniya slozhnyih system.* Moscow: Nauka.

Novikov, D., Ashimov, A., Sultanov, B. et al. (2013). *Macroeconomic Analysis and Parametric Control of a National Economy.* New York: Springer.

Okes, D., & Westcott, R.T. (2002). *The Certified Quality Manager Handbook (2nd ed.).* Milwaukee: ASQ Quality Press.

Saaty, T., & Vargas, L. (2006). *Decision making with the analytic network process. Economical, political, social and technological applications with benefits, opportunities, costs and risks.* Springer.

Tsvirkun, A. D. (2003). Upravlenie razvitiem krupnomasshtabnyih sistem v novyih usloviyah. *Problems of Management*, *vol. 1*, 34-43.

Volkovich, V. L., & Godlevsky, M. D. (1991). Voprosyi koordinatsii ierarhicheskih sistem na osnove ideologii sistemnoy optimizatsii. *Automatics*, *vol. 5*, 56-63.

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CLOUD COMPUTATION OF NONANTICIPATIVE ANALOGS FOR HEAT/COLD WAVES TELECONNECTIONS

Abstract. In this original research work, a nonanticipative analog method is used for the long-term forecast of the air temperature extremes for specifically located places. Arguments of forecast models are datasets from around the world, which reflects the concept of teleconnections. Presented approach is more useful than current methods for predicting extreme values because it does not require the estimation of a probability distribution from scarce observations. Up to 26% of all extremes are specifically predicted. The methodology has 100% accuracy with respect to the sign of predicted and actual values. Forecast models are designed in the Microsoft Windows Azure public cloud.

Keywords: cloud computing, nonanticipative long-term forecast, head/cold waves, quantum computing.
Formulas: 2; fig.: 2, tabl.: 2, bibl.: 30

Introduction. There is barely any societal sector, which is not to some extent concerned by air temperatures extremes and their long-term forecast together with related resilience and security issues. Long-term forecast models give an understanding of dependencies among different remote places and variables, which are measured with significant lead-time [Zubov 2013]. In addition, they allow prediction of possible natural disasters (e.g. [Rocheva 2012]) and the taking of appropriate preventive measures if necessary. Air temperature has a great influence on the load of power service [Robinson 1997], and predictions are used for estimating future fuel needs. More critically, heat waves may produce significant disruptions to agricultural industries [Hudson, Marshall, Alves 2011] and provoke heart problems. The loss of human life as well as environmental, economic and material damage from extreme air temperatures could be reduced if some of heat/cold waves are predicted. Even a small success rate implies a large socio-economic benefit. Nonanticipative analog algorithm for the long-term forecasting of heat/cold waves (fundamentals are presented in [Zubov 2013]) has NP complexity [Neumann 2010] because forecast models are reasoned by combinatorial optimization in polynomial time. In addition, the right data is fundamentally not obtainable. Long-term forecasting of natural disasters is topical issue for the securing society nowadays.

Literature review and the problem statement. Public cloud Platform-as-a-Service is high-performance tool for NP-complex algorithms [Collier, Shahan 2015]. In particular, Windows Azure virtual machines (VMs) may host the above-mentioned apps. In fact, forecast software was developed using Windows Forms. Hence, VMs can use standard operating systems Windows Server 2008/2012 R2 to start executable files. In Jul 2014, presented methodology got the Microsoft Research Climate Data Award, which allows to start Microsoft Azure public cloud with 32 processors Intel(R) Xeon(R) E5-2660 2.20 HGz.

This paper is organized as follows: In Section 2, computational process of the forecast models' reasoning using Microsoft Azure VMs is described. In Section 3, the principle of nonanticipative analog long-term forecasting of heat/cold waves based on inductive modelling is shown; air temperature extremes at Ronald Reagan Washington National Airport are discussed as well. Conclusions are summarized in Section 4.

Research results. *Computational Process of the Forecast Models' Reasoning Based on Microsoft Azure VMs.* 32 processors Intel(R) Xeon(R) E5-2660 2.20 HGz in Microsoft Azure public cloud account are in use by six VMs with Windows Server 2012 R2 operating systems – management portal is shown in Fig. 1. All VMs are of D-series type. First VM is hosted by West US datacenter and consists of 2 cores; 2nd VM is hosted by East US datacenter and consists of 4 cores; 3rd VM – West US, 8 cores; 4th VM – West Europe, 8 cores; 5th VM – East Asia, 8 cores; 6th VM – North Central US, 2 cores. All VMs (except 1st and 3rd; 1st VM is inside virtual private network which allows to use point-to-site connection over a Secure Socket Tunnelling Protocol tunnel) are located in different datacenters because of performance – it was found that VMs work slower if they are hosted at the same datacenter.

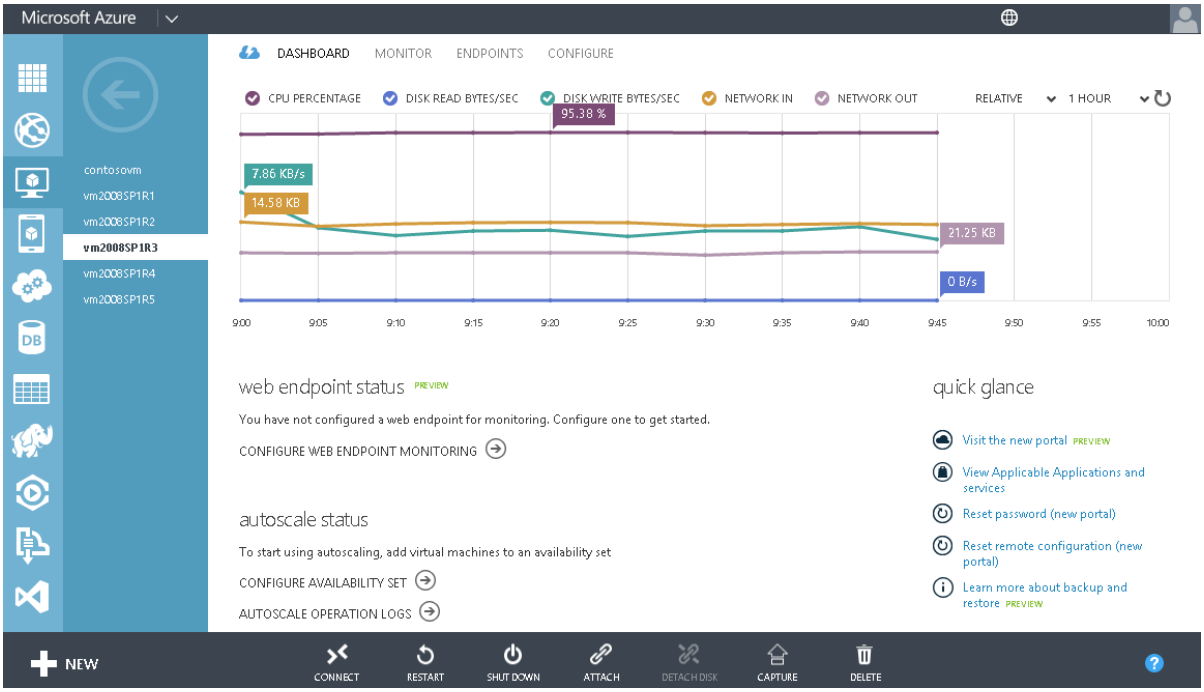

Figure 1 – Microsoft Azure management portal with six VMs (32 cores in total)
Source: screenshot of Microsoft Azure management

Reasoning of forecast models takes a lot of time – two weeks for one place approx. Hence, new concept using quantum computing was proposed for the computational process speed-up [Dahl 2015; Smelyanskiy 2012; McGeoch 2013]. Different quantum computer types are discussed (e.g. quantum logic gates, one-way quantum computer, quantum cellular automata, topological quantum computer, adiabatic quantum computer) nowadays, but only adiabatic quantum computer was built by D-Wave Systems Company. D-Wave One has its roots in a 16-qubit processor built in 2006. It led to the firm's 28-qubit processor in 2007, and then its 128-qubit processor in 2010. D-Wave Two with 512-qubit processor was completed in 2013 [Dahl 2015].

Nowadays, access to D-Wave adiabatic quantum computer [McGeoch, Wang 2013; Zhengbing Bian et al. 2014] is restricted because of high use value. Therefore, presented hereafter idea is hypothetical prospect of the adiabatic quantum computing usage for the design of forecast models.

D-Wave Systems produces the adiabatic quantum computer which contains up to 512 flux qubits (project code name ″Vesuvius″). They are microscopic loops of niobium metal that are capable of quantum behavior at low temperatures. That is, electrical currents in the loops can flow in clockwise (+1) or counter-clockwise (-1) direction, or both, when in quantum superposition. Qubits are connected to neighbors according to the topology of quantum processor. The hardware is controlled by a framework of Josephson functions that allow individual qubit values to be stored and read, and to influence the states of neighboring qubits. D-Wave uses quantum annealing to minimize the dimensionless energy of an Ising model [McGeoch, Wang 2013]

$$M(s|h,J)=\sum_{m\in V(G)} h_m s_m + \sum_{(m,n)\in E(G)} J_{m,n} s_m s_n , \qquad (1)$$

where $s_m\in\{-1,+1\}$ – spin variables indexed by the vertices V(G) of graph G with allowed pairwise interactions given by the edges E(G) of G; G – graph which represent the topology of quantum processor; $h_m\in[-2,2]$, $J_{m,n}\in[-1,1]$ – real-valued dimensionless coefficients.

Presented on Section 2 combinatorial forecast algorithm (1)-(2) cannot be realized directly using objective function (1). However, other combinatorial optimization can be realized using (1) with three qubits:

$$h_1 = 2x^*_{i(j-1)} / \max\left|x_{ij} - \bar{x}_{ij}\right|,\ h_1 = 2x^*_{i(j-2)} / \max\left|x_{ij} - \bar{x}_{ij}\right|,\ h_1 = 2x^*_{i(j-3)} / \max\left|x_{ij} - \bar{x}_{ij}\right|$$

$$J_{1,2} = 0.5\left(x^*_{i(j-1)} + x^*_{i(j-2)}\right) / \max\left|x_{ij} - \bar{x}_{ij}\right|,\ J_{1,3} = 0.5\left(x^*_{i(j-1)} + x^*_{i(j-3)}\right) / \max\left|x_{ij} - \bar{x}_{ij}\right|,$$

$$J_{2,3} = 0.5\left(x^*_{i(j-2)} + x^*_{i(j-3)}\right) / \max\left|x_{ij} - \bar{x}_{ij}\right|,\ x^*_{ij} \in E$$

Ket $s=|\, s_1, s_2, s_3 >$ represents three-day history. Here, ket $s^*=\left|s_1^*, s_2^*, s_3^*\right\rangle$ together with i^* minimize Ising model (3) on $\min\{M(s^*|h,J)|\ x^*_{ij}\in E\}$ less then $M(s^*|h,J)|\ x^*_{ij}\notin E$.

Principle of nonanticipative analog long-term forecasting of heat/cold waves. Nowadays, a large set of meteorological variables (air temperature, precipitation, wind, pressure, visibility, snow depth, etc. at different locations) is used for forecasting [Kattsov 2010]. They interact constantly, and some variables may be evaluated using the others in accordance with known teleconnection patterns (e.g. [Nada Pavlovic Berdon 2013]). Thus, the reasoning of forecast models must involve the full set of meteorological variables. However, temperature and precipitation are the targets of long-term forecasting mainly because of practical needs. Precipitation has a close relationship to air temperature and vice versa [Van Den Dool, Nap 1985]. Correlation analysis shows that precipitation forecasting is effective within two weeks, air

temperature over a much longer period (greater than a year) [Zubov, Vlasov 2004]. The impact is increased further because extremes can be used for the correction of forecasted averages.

A wide spectrum of forecast models has now been developed [Vilfand, Tishenko, Khan 2003]. They are usually classified into synoptic (e.g. [Vorobiov 1991]), hydrodynamic (e.g. [Belov, Borisenkov, Panin 1989]), and statistical (e.g. [Onwubolu et al. 2007]) groups. The first two are used only for short and medium-term forecasting mainly because they produce significant errors at long term (more than 20 % of the mean) and use highly complex equations. Heterogeneous algorithms are used for long-term weather forecasting – seasonal time series [Qiang Song 2011], neural networks [Gyanesh Shrivastava 2012], probability theory [Sadokov, Kozelcova, Kuznecova 2011], ensemble forecasting [Astahova, Alferov 2008], distinct scenarios of anthropogenic forcing [Bardin 2011], dependency on ENSO cycle [Higgins, Kim, Unger 2004], self-organizing systems based on inductive modelling [Madala, Ivakhnenko 2004], etc. The nonlinearity and sensitivity of existing forecast models, possible small errors in initial conditions (dust, sand, pollution, etc.), random observation errors, background states, and lack of data combine to reduce the forecast accuracy and complicate the design of models [Douglas, Phillip J. Englehart 2007; Fathalla A. Rihan, Chris G. Collier 2010; Tyndall et al. 2010].

Inductive modelling shows good results when enough of the right data is fundamentally not obtainable. In [Zubov 2013], it was shown that robust highly accurate long-term forecasting of average daily air temperatures might be achieved using inductive modelling. The principle used in that work to predict high-impact weather events substantiates the interaction of different climate system components centered in different places. The first stage of the forecast model reasoning is the selection of three most data-related places using the Pearson product-moment correlation coefficient, which has to be greater than 0.8 in absolute value. The second stage is finding weights of the forecast model to use with the inductive modelling objective function "minimum of regularity plus maximum of conjunctions" with a combinatorial algorithm. This approach corresponds to the teleconnections [Glantz, Katz, Nicholls 1991] because of a linkage between weather changes occurring in widely separated regions of the globe.

It is assumed that some event (or group of events) A(j) has an impact on another event B(j'), where B(j') – extreme air temperature (defined as two standard deviations away from the climatological baseline), j, j' – event dates and (j'-j)>0. Air temperature correlation analysis (Zubov, 2013) shows that enough of the right data is not obtainable. In this case, four-fold repetitions of extreme air temperature for a give lead time (j'-j) after the same A(j), within the learning sample is taken to establish the validity of A(j) as a predictor. The dependency thus discovered is used as objective function for prediction. A nonanticipative long-term forecast methodology will be illustrated using Ronald Reagan Washington National Airport air temperature extremes. NOAA Satellite and Information Service [http://www7.ncdc.noaa.gov/CDO/cdo] is used as a main free data source from 1973 to 2014 yr, providing 119 average daily air temperature datasets from around the world, Ronald Reagan Washington National Airport's mean visibility in miles, mean wind speed in knots, mean dew point in Fahrenheit, maximum and minimum temperatures in Fahrenheit reported during the day, Darwin and Tahiti sea level pressures, southern oscillation index (SOI), equatorial SOI, sea surface temperature, multivariate ENSO index

(average monthly). In addition, sea level data [Aburatsu, Japan; http://ilikai.soest.hawaii.edu/woce/wocesta.html; average daily] is used. Hence, 131 datasets are taken into consideration – $X_i=\{x_{i1}, x_{i2}, \ldots, x_{ij}, \ldots\}$, $i=\overline{1,131}$, $j=\overline{1,15340}$ (j=1 corresponds to Jan 1, 1973, j=15340 – to Dec 31, 2014; some stations are presented in Table 1). These datasets and resources were selected because of free public access, air temperature daily averages, and data archives since 1973 yr at least. Moreover, extreme temperature anomalies were not identified completely nowadays, which does not allow to use the detailed weather data generators (e.g. [Adelard et al. 2000]). Preprocessing standardizes the data using climatological values (baseline) $\bar{x}_{ij}$ calculated as expectations for the appropriate date from Jan 1, 1973 to Dec 31, 2013 (e.g. $x_{114,4}=39.3^0$F, $\bar{x}_{114,4}=37.5^0$F, $x^*_{114,4}=-1.8^0$F):

$$x^*_{ij} = x_{ij} - \bar{x}_{ij}. \qquad (2)$$

A value is considered extreme if the difference between this value and its expectation is greater than two standard deviations (SD) in absolute units. Considering the Ronald Reagan Washington National Airport dataset, positive x^+_{114,j_+} ($j_+=\overline{1,364}$) and negative x^-_{114,j_-} ($j_-=\overline{1,309}$) extremes are studied within the above interval ($x^+_{114,j_+}, x^-_{114,j_-} \in E$, E – set of extremes). Data are split into learning (from 1975 to 2010 yr: $j=\overline{731,13879}$; years 1973 and 1974 are reserved because of lead-time l and summation interval of length n which are up to one year each) and validation (from 2011 to 2014: $j=\overline{13880,15340}$) samples.

Table 1 – Some stations (i.e. number of datasets) around the world, which are used for the forecast models' design.

i	Country or region	Station (named by NOAA)
1	Algeria	Annaba
2	American Samoa	Tafuna-Pago International AP
3	Antigua And Barbuda	V C Bird INTL
4	Argentina	Ministro Pistarini INTL
5	Aruba	Reina Beatrix INTL
6	Australia	Canberra Airport
...	...	...
i	**Country or region**	**Station (named by NOAA)**
113	United Kingdom	Heathrow Airport
114	USA	Ronald Reagan Washington National Airport
115	Uruguay	Carrasco INTL
116	Uzbekistan	Yuzhniy
117	Vanuatu	Aneityum
118	Venezuela	Simon Bolivar INTL
119	Vietnam	Danang INTL

Source: author's own development

Considering the Ronald Reagan Washington National Airport dataset, the objective function that defines an event $A(j)$ as a precursor to an extreme event $B(j')$ is based on situations in the learning sample where

$$\sum_{k=0}^{n-1}\left(x^{*}_{i_1,(j'-k-l)}+x^{*}_{i_2,(j'-k-l)}\right)\Big|^{i_1,i_2\in I}_{x^{*}_{114,j'}\in E,\ j'=[731,13879],\ l\in L,\ n\in N} > \operatorname*{Max}_{i_1,i_2 n,l} \ \vee$$
$$\vee\ \sum_{k=0}^{n-1}\left(x^{*}_{i_1,(j'-k-l)}+x^{*}_{i_2,(j'-k-l)}\right)^{i_1,i_2\in I}_{x^{*}_{114,j'}\in E,\ j'=[731,13879],\ l\in L,\ n\in N} < \operatorname*{Min}_{i_1,i_2 n,l}, \tag{3}$$

$$\operatorname*{Max}_{i_1,i_2 n,l} \equiv \max_{\substack{j=[731,13879]\\ x^{*}_{114,j}\notin E}} \sum_{k=0}^{n-1}\left(x^{*}_{i_1,(j-k-l)}+x^{*}_{i_2,(j-k-l)}\right)\Big|_{i_1=[1,131],\ i_2=[i_1,131],\ l=[14,365],\ n=[1,365]}, \tag{4}$$

$$\operatorname*{Min}_{i_1,i_2 n,l} \equiv \min_{\substack{j=[731,13879]\\ x^{*}_{114,j}\notin E}} \sum_{k=0}^{n-1}\left(x^{*}_{i_1,(j-k-l)}+x^{*}_{i_2,(j-k-l)}\right)\Big|_{i_1=[1,131],\ i_2=[i_1,131],\ l=[14,365],\ n=[1,365]}.$$

In equations (3), (4) k – temporal summation index (days); n – length of summation interval (days); $l = j' - j$ – lead-time (days); $i_1, i_2 \in I$, $n \in N$, $l \in L$ for interrelated sets $I \subset [1,131]$, $N \subset [1,365]$, $L \subset [14,365]$ of meteorological variables, possible lengths of summation intervals, and lead-times respectively). Cardinality of a set I equals two because of high computational complexity of the proposed nonanticipative analog algorithm. The sets I, N, and L encompass the precursor events A(j) for a given extreme event B(j'), for $j = j' - l$. A given event is defined by a unique tuple (i_1, i_2, n, l) together with Min and Max. Then, input datasets i_1 and i_2 with appropriate lead-time l and summation interval of length n are selected to define a prediction rule if the sum of meteorological variables from datasets i_1 and i_2 is greater than maximum Max (or less than minimum Min) four times at least (with a time difference greater than 30 days) within the learning sample, for cases where $x^{*}_{114,j'} \in E$, i.e. where there is an extreme event B(j') at day j'. Hence, every extreme selection rule includes six parameters – the indices of two datasets i_1 and i_2, the lead-time l, the summation interval of length n, maximum Max, and minimum Min. Max and Min are computed as the maximum and minimum values of the sums over the datasets i_1 and i_2, with the same summation interval n and lead-time l, where an extreme event does not occur in the learning sample (i=114 is the index of the Ronald Reagan Washington National Airport dataset, and has to be altered for prediction of extreme events in other locations). The gist of the representation in terms of n, l, j, and j' is illustrated in Fig. 2.

The eleven rules for Ronald Reagan Washington National Airport air temperature positive extremes are as follows:

1. i1=1, i2=18, n=11 days, =249 days, Min=-230.60F, Max=205.50F. This rule is described by the tuple (1, 18, 11, 249, -230.6, 205.5) concisely. This rule was in use five times within learning sample on Oct 21, 1979, Nov 18, 1987, Nov 30, 2001, Dec 1, 2001, and Sept 8, 2010.

2. (9, 106, 1, 220, -, 17.1). In this rule, sum of meteorological variables has to be greater than maximum Max only. This rule was in use six times within

learning sample on Sept 27-28, 1998, Aug 23, 2002, Oct 9-10, 2007, and Sept 8, 2010.

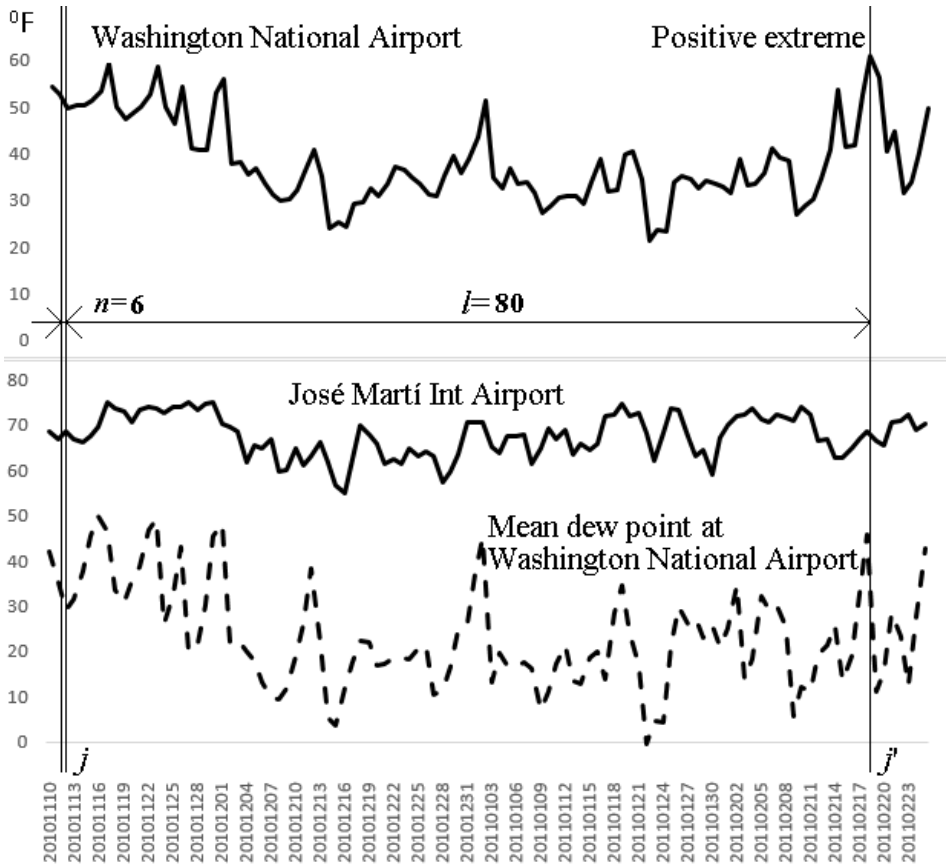

Figure 2 – Illustration of variables n, l, j, and j' (calculation of extreme air temperature at Washington National Airport on Feb 18, 2011 using average daily air temperature from Jose Marti International Airport (Cuba, 27) and mean dew point from Washington National Airport (USA, 127) with lead-time 80 days and summation interval 6 days)

Source: author's own development

3. (11, 95, 5, 60, -237.4, 157.8). This rule was in use five times within learning sample on Apr 27-28, 1990, Feb 28, 1997, Apr 14, 2002, and Mar 23, 2007.

4. (27, 127, 6, 80, -151.0, 167.6). This rule was in use eight times within learning sample on Apr 12-13, 1977, Mar 17, 1990, Mar 30-31 and Apr 1, 1998, Feb 11-12, 2009.

5. (38, 58, 4, 256, -167.7, 111.2). This rule was in use five times within learning sample on Oct 21, 1979, Sept 6, 1985, Nov 20, 1985, and Oct 9-10, 2007.

6. (60, 71, 11, 84, -167.9, 153.2). This rule was in use four times within learning sample on Mar 30, 1977, Mar 31, 1981, Mar 11, 1986, and Apr 14, 2002.

7. (60, 94, 10, 85, -161.9, 139.1). This rule was in use five times within learning sample on Mar 30, 1977, Mar 11, 1986, Apr 13, 2001, and Apr 14-15, 2002.

8. (60, 102, 11, 84, -159.3, 145.4). This rule was in use four times within learning sample on Mar 30, 1977, Mar 31, 1981, Apr 13, 2001, and Apr 14, 2002.

9. (79, 92, 205, 332, -1619.0, 1741.3). This rule was in use six times within learning sample on Mar 12-14, 1990, Apr 27, 1990, Apr 9-10, 1991, and Mar 6, 2004.

10. (82, 116, 1, 302, -34.9, 36.4). This rule was in use four times within learning sample on Dec 8, 1978, Nov 26, 1979, Dec 18, 1984, and Oct 1, 1986.

11. (95, 112, 4, 60, -188.1, 138.1). This rule was in use five times within learning sample on Apr 22, 1985, Apr 27-28, 1990, Apr 14, 2002, and Mar 23, 2007.

These rules allow forecasting of positive extremes, as documented in Table 2.

Table 2 – Forecasted Ronald Reagan Washington National Airport positive air temperature extremes within validation sample (2011-2014 yr).

Rule No. $(\overline{1,4})$	Exact date of extreme value forecast	Forecasted sector of the month	Observed maximum value in forecasted sector of the month, ^{0}F	Climato-logical baseline, ^{0}F	SD, ^{0}F	Analysis
4	Feb 27-28, 2011	The middle of Feb 2011	61.1 (Feb 18, 2011)	38.7	10.3	Extreme value
9	Mar 9-31					
9	Apr 1-8 and 14-18, 2011	The end of Mar 2011	57.1 (Mar 22, 2011)	46.7	7.9	The same sign, difference is greater than one SD
11	Apr 2-3 and 11-12, 2012	The middle of Apr 2012	75.0 (Apr 16, 2012)	57.8	8.0	Extreme value
2	Sept 13, 2012	The end of Sept 2012	73.6 (Sept 22, 2012)	69.7	5.9	The same sign, difference is greater than climatological baseline
2	Oct 10, 2012	The middle of Oct 2012	67.6 (Oct 15, 2012)	60.3	6.3	The same sign, difference is greater than one SD
1	Oct 14-23, 2012					
5	Oct 20-23, 2012					
10	Dec 2-5, 2012	The beginning of Dec 2012	57.9 (Dec 4, 2012)	43.8	9.0	
5	Aug 30-31 and Sept 1-4, 2013	The beginning of Sept 2013	84.0 (Sept 11, 2013)	72.9	4.6	Extreme value
5	Oct 8, 2013	The beginning of Oct 2013	77.8 (Oct 6, 2013)	63.2	6.8	
1	Oct 26-30, 2014	The middle of Nov 2014	63 (Nov 12, 2014)	48.8	6.1	

Source: author's own development

All invocations of the above rules are listed in the table. The forecasted extremes were compared to maximal or minimal observed values in the same sector of the month (with months divided into thirds), since prediction of the exact date is not to be expected. Positive air temperature extremes at Ronald Reagan Washington National Airport were predicted on Feb 18, 2011 using rules

4 and 9, on Apr 16, 2012 (rule 11), on Sept 11 and Oct 6, 2013 (rule 5), and on Nov 12, 2014 (rule 1). For instance, positive air temperature extreme on Feb 18, 2011 was identified using average daily air temperature from Jose Marti International Airport (Cuba, 27) and mean dew point from Ronald Reagan Washington National Airport (USA, 127) which is shown in Fig. 2. This place had nineteen groups of heat waves from 2011 to 2014. Hence, the proposed nonanticipative method predicted 26.3 % of actual positive extremes (55 % accuracy if forecasted extremes are discussed only). In addition, the nonanticipative long-term forecasting of the Ronald Reagan Washington National Airport positive air temperature extremes has 100% accuracy with respect to the sign of predicted and actual values.

Probability of the heat wave occurrence at Ronald Reagan Washington National Airport is 11.8 % which is calculated as the ratio of the number of heat waves (179) to the number of forecasted sectors from 1973 to 2014 (42*12*3=1512). Here, we assuming that the heat waves, which are typically short, do not span more than one sector. Under a null hypothesis that each invocation of the rules picks a "heat wave" sector randomly, there is an 11.8 % chance that the guess is correct. For the twelve invocations listed in Table 2, there is a $1-(1-0.118)^{12}=0.778$ (77.8 %) chance that at least one forecasted heat wave would be right. The probability of this occurrence, together with a correct prediction of sign for the other eleven invocations, under the same null hypothesis, is reduced by another factor of $2^{11}=2048$. The probability of these results with the added condition that one of the other three forecasted sectors is close to extreme is reduced further still. Thus, the probability that random rules give results like those in Table 2, is less than 5% and our results are significant at the 95% level.

In fact, no rules were found for negative air temperature extremes.

Conclusions. In this paper, cloud computation of nonanticipative analogs for heat/cold waves teleconnections is discussed using Microsoft Windows Azure public cloud. High-performance D-series VMs with operating system Windows Server 2012 R2 are used for the reasoning of forecast models. VMs with 32 processors Intel(R) Xeon(R) E5-2660 2.20 HGz were hosted in the Windows.

A nonanticipative analog method for long-term forecasting of heat/cold waves is used for the finding of teleconnections. The forecast method identifies the dependencies between the current values of two meteorological variables and the future state of another variable (which may be identical to the first, as with air temperatures used here). The main issues are the formulation of the objective function and selection of input data and therefore high computational complexity. The method was applied to the prediction of heat/cold waves for Ronald Reagan Washington National Airport. The data included standard meteorological variables from 119 places around the world, as well as sea level (Aburatsu, Japan), average monthly Darwin and Tahiti sea level pressures, SOI, equatorial SOI, sea surface temperature, and multivariate ENSO index (131 datasets in total). Every dataset is split into two samples, for learning and validation, respectively. Initially, the sum of the values at two different locations (minus corresponding expectation values) is calculated with lead-time from 14 to 365 days on summation interval of length from 1 to 365 days. Objective function defines the distribution based on two input datasets with appropriate lead-time and summation interval, which have maximum (or minimum) sum compared with the rest of data four times at least (with a minimum time difference of at least 30 days), when a later extreme event occurs in the learning sample. Specific

extreme events at Ronald Reagan Washington National Airport were thus predicted in the validation sample, based on rules referring to events in earlier years. Some extremes are specifically predicted (up to 26.3% of all extremes). The methodology has 100 % forecast accuracy with respect to the sign of predicted and actual values.

The most likely prospect for the further development of this work is quantum-computing system using D-Wave Two where qubits represent historical data in forecast model.

References

Adelard, L., Boyer, H., Garde, F., & Gatina, J.-C. (2000). Detailed Weather Data Generator for Building Simulations. *Energy and Buildings, 31*, *1*, 75-88.

Astahova, E.D., & Alferov, Y.V. (2008). High Performance Version of the Atmosphere Spectral Model for Deterministic and Ensemble Weather Forecast' Design using Multiprocessor Systems. *J. of Russian Hydrometcentre, 342*, 118-133.

Bardin, M.Y. (2011). Scenary forecasts of air temperature variations for the regions of the Russian Federation up to 2030 using the empirical stochastic climate models. *Russian Meteorology and Hydrology J., 36,* 217-228.

Belov, P.I., Borisenkov, E.P., & Panin, B.D. (1989). *Numerical Methods of Weather Prediction*. Leningrad: Gidrometeoizdat Press.

Collier, M., Shahan, R. (2015). *Microsoft Azure Essentials*. Washington: Microsoft Press.

Dahl, E.D. (2015). Quantum Computing 101. *Machine Design*. Retrieved from http://machinedesign.com/technologies/quantum-computing-101

Douglas, Arthur V., & Phillip J. Englehart. (2007). A Climatological Perspective of Transient Synoptic Features during NAME 2004. *J. Climate, 20*, 1947-1954.

Fathalla A. Rihan, & Chris G. Collier. (2010). A Basis for Improving Numerical Forecasting in the Gulf Area by Assimilating Doppler Radar Radial Winds. *Int. J. of Geosciences, 1*, 70-78.

Glantz, M.H., Katz, R.W., & Nicholls, N. (Eds.). (1991). Teleconnections Linking Worldwide Climate Anom-alies. *Cambridge University Press*.

Gyanesh Shrivastava, Sanjeev Karmakar, Manoj Kumar Kowar, Pulak Guhathakurta. (2012). Application of Artificial Neural Networks in Weather Forecasting: A Comprehensive Literature Review. *Int. J. of Computer Applications, 51,* 17-29.

Higgins, R.W., Kim, H-K., & Unger, D. (2004). Long-Lead Seasonal Temperature and Precipitation Prediction Using Tropical Pacific SST Consolidation Forecasts. *J. Climate, 17*, 3398-3414.

Hudson, D., Marshall, A. G., & Alves, O. (2011). Intraseasonal Forecasting of the 2009 Summer and Winter Australian Heat Waves Using POAMA. *Weather and Forecasting, 26*, 257-279.

Kattsov, V.M. (2010). Climate prediction: Progress, Problems, and Prospects. *Russian Meteorology and Hydrology, 35*, 10-12.

Madala, H.R., & Ivakhnenko, A.G. (1994). *Inductive Learning Algorithms for Complex Systems Modeling*. Boca Raton: CRC Press.

McGeoch, C., & Wang, C. (2013). Experimental Evaluation of an Adiabatic Quantum System for Combinatorial Optimization. *CF 2013*, 023:1-023:11.

Nada Pavlovic Berdon. (2013). The Impact of Teleconnection on Pressure, Temperature and Precipitation in Serbia. *Int. Journal of Remote Sensing Applications, Vol. 3, Iss. 4*, 185-192.

Neumann, F., & Witt, C. (2010). Bioinspired computation in combinatorial optimization: algorithms and their computational complexity. *Natural Computing Series*: Springer.

Onwubolu, G.C., Buryan, P., Garimella, S., Ramachandran, V., Buadromo, V., & Abraham, A. (2007). Self-organizing Data Mining for Weather Forecasting. *IADIS European Conf. Data Mining*, 81-88.

Qiang Song. (2011). Average Power Function of Noise and Its Applications in Seasonal Time Series Modeling and Forecasting. *American J. of Operations Research, 1*, 293-304.

Robinson, Peter J. (1997). Modeling Utility Load and Temperature Relationships for Use with Long-Lead Forecasts. *J. Appl. Meteor., 36*, 591-598.

Rocheva, E.V. (2012). Droughts' Possible Premises in the Agricultural Russian Regions. *Meteorology and Hydrology*, *9*, 5-18.

Sadokov, V.P., Kozelcova, V.F., & Kuznecova, N.N. (2011). Probabilistic Forecast of Warm and Cold Weather in Belorussia. *J. of Russian Hydrometcentre, 345*, 144-154.

Smelyanskiy, V.N., Rieffel, E.G., Knysh, S.I., Williams, C.P., Johnson, M.W., Thom, M.C., Macready, W.G., & Pudenz, K.L. (2012). A Near-Term Quantum Computing Approach for Hard Computational Problems in Space Exploration. *arXiv:1204.2821*.

Tyndall, Daniel P., John D. Horel, & Manuel S. F. V. de Pondeca. (2010). Sensitivity of Surface Air Temperature Analyses to Background and Observation Errors. *Wea. Forecasting, 25*, 852-865.

Van Den Dool, H. M., & Nap, J. L. (1985). Short and Long Range Air Temperature Forecast near an Ocean. *Mon. Wea. Rev., 113*, 878-886.

Vilfand, R.M., Tishenko, V.A., & Khan, V.M. (2003). Surface Air Temperature's Forecast with Month Lead Time using Ensemble Approach. *Gidrometeoizdat Press, Fundamental and Applied Hydrometeorological Research*, 3-13.

Vorobiov, V.I. (1991). *Synoptic meteorology*. Leningrad: Gidrometeoizdat Press.

Zhengbing, Bian, Fabian Chudak, Robert Israel, Brad Lackey, William G. Macready, & Aidan Roy. (2014). Discrete optimization using quantum annealing on sparse Ising models. *Front. Phys.*, 18 Sept 2014, Retrieved from http://dx.doi.org/10.3389/fphy.2014.00056

Zubov, D. (2013). Average Daily Air Temperature's Long-Range Forecast Using Inductive Modeling and Satellite Datasets. Proceedings of joint 2013 EUMETSAT Meteorological Satellite and 19th American Meteorological Society Satellite Meteorology, Oceanography, and Climatology Conferences, Vienna, Austria, Sept 16-20, 2013. Retrieved from http://www.eumetsat.int/website/home/News/ConferencesandEvents/DAT_2027670.html

Zubov, D.A., & Vlasov, Y.N. (2004). Long-term Forecasting of the Air Average Temperature and Atmospheric Precipitations Using the Linear Auto Regression Model and Maximal Error's Minimization Objective Function. *Scientific J. of V.Dahl East Ukrainian National University*, 40-49.

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SELECTIVE INVARIANT MULTIVARIABLE CONTROL SYSTEM DESIGN BASED ON INVERSE MODEL APPROACH

Abstract. The problem of disturbance rejection in multivariable control systems is considered. It has been shown that different two-degree-of-freedom control structures used for immeasurable disturbance estimation and compensation may be treated as a particular case of a general Inverse Model Control approach. The decomposition of the problem into the separate disturbance estimation and compensation is suggested. Moreover the connection between inverse model design problems and unknown input observer theory has been established in order to give a practical way to inverse model parameterization and design. The properties of closed-loop selective invariant control system with model-based controllers have been also investigated with the aim of attainable accuracy estimation.

Keywords: disturbance rejection, inverse model, invariance, model-based control, unknown-input observers.

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Introduction. Recently a number of innovative model-based control methods have been developed for multivariable systems taking into account the requirements of accuracy, dynamic performance, stability and robustness [Morari, Zafirov 1989]. The role of model-based control methods is essentially increased when the control problem under uncertainty is considered. Because uncertainties of the plant may be treated as a parametric disturbance of nominal plant model, the disturbance rejection problem has become on of the most important in advanced process control theory.

There are two main approaches to disturbance rejection problem. First, namely disturbance attenuation methods, use the available *a priory* information about disturbances in statistical or deterministic (set-membership) form. At that the design solution is obtained in a class of simple feedback control structures and is formalized as an optimization problem with the averaged or guaranteed cost function. The demands of controller internal stability are used as a supplementary restriction. In practice, the cost functions in the form of a norm of

closed-loop transfer function are widely used and a corresponding solution may be obtained using $\mathbf{H}_2$ or $\mathbf{H}^\infty$ optimal control methods [Francis 1987].

It is necessary to underline that the systems, which are optimal with respect to a class of disturbances, usually doesn't ensure the high accuracy for all disturbances realizations. The most difficult case is the situation where the spectrums of reference signal and disturbances are essentially intersected. This situation is typical for many process control applications.

Another approach is based on the utilization of current information about disturbances obtained by the direct or indirect measurements. Such an approach realized in control structures known as "two-degree-of freedom controllers" [Wolovich 1995] is the generalization of combined feed-back and feed-forward control method. The corresponding design methods using the different types of plant's and disturbances models in control loop (internal model-based control) are very popular in robust process control. At that, the dynamic models are used both for disturbance estimation (indirect measurement) and for prediction and compensation in order to ensure selective invariance properties of closed-loop system [Tsypkin, Holmberg 1995], i.e. rejection for a certain class of disturbance. The idea of selective invariance was initially developed for SISO systems with scalar disturbance [Seraji 1989, Tsypkin, Holmberg 1995] and it generalization for multivariable systems are of the great theoretical and practical interest.

Problem statement and literature review. In this paper the unified approach for different model-based disturbance rejection methods for multivariable systems is stated based on general inverse model control (IMC) method [Kostenko, Lyubchik 1996 , Lyubchik 1995, Lyubchyk 2011] which ensure the selective invariance properties. The IMC includes model-based input disturbance estimation, output plant's reaction prediction and disturbances influence compensation. The corresponding control structure consists of the disturbance observer and feed-forward controller based on the designed inverse models of the controlled plant's channels. Such an approach ensures not only the closed-loop system stabilization, but also high accuracy reference signal tracking and immeasurable arbitrary disturbance rejection.

The basic of IMC approach is the state space representation of the inverse models. If the invertibility conditions take place [Silverman 1969], the structure inversion algorithm may be applied, in this case the structure and parameters of inverse models are strictly determined by the parameters of the corresponding control channels and, in some cases, may have unsatisfactory dynamic properties. For example, for non-minimum phase system the inverse models will be unstable. The inverse model design method must include the suitable parameterization of its equations and free parameters are selected from the simultaneous conditions of stability and desired dynamic properties. The most general way for such parameterization is the unknown-input observer (UIO) theory [Hou, Muller 1992, Kurek 1982], then the observer equation combined with the unknown input signal estimate may be treated as the designed inverse model.

Consider a disturbance rejection control problem for linear discrete-time multivariable system described by the state-space model

$$x_{k+1} = Ax_k + B_1u_k + B_2w_k,\ y_k^1 = C_1x_k, \quad y_k^2 = C_2x_k, \qquad (1)$$

where $x_k \in \mathbf{R}^n$ - state vector in time k, $u_k \in \mathbf{R}^{m_1}$ - control, $w_k \in \mathbf{R}^{m_2}$ - disturbance vector, $y_k^1 \in \mathbf{R}^{q_1}$, $y_k^2 \in \mathbf{R}^{q_2}$ - output controlled and measured variables respectively. It will be assumed that system (1) has relative order 1 and the simplest type of invertibility condition for (1) takes place, i.e. $\operatorname{rank} C_i = q_i$, $\operatorname{rank} B_i = m_i$ and $\operatorname{rank}(C_i B_i) = m_i \le q_i$. Such an assumption is not very restrictive and used only for the simplicity of statement.

The disturbance is described by the state-space model $w_{k+1} = \Phi w_k$, where matrix Φ is unknown.

The output control problem under disturbance is to find the control sequence $\{u_k\}$, depending from the measured variables, which ensure the reference signal y_k^* tracking and disturbances w_k rejection. The requirement of closed-loop system stabilization along with the disturbance rejection leads to the *disturbance rejection problem with stability* (DRPS). If, besides stability, arbitrary pole placement is demanded, the *disturbance rejection problem with pole placement* (DRPPP) may be stated. Moreover, as long as the state vector of the system can't be measured directly and the formulation of the *disturbances rejection problem by measurement feedback* (DRPMF) can be defined.

The most important step of the design procedure is the parameterization of corresponding state feedback or dynamic compensator matrices. From practical point of view it is desirable to decompose the DRPM into the structural synthesis of the designed controller renders the fixed and free parameters and parametric synthesis based on the appropriate parameters tuning methods in order to satisfy the design goals, such as pole placement, performance optimization and so on.

Research results. Consider at first the output control problem when the disturbance can be measured directly. Such an approach is realized in feed-forward control structures and closely connected with the problem of dynamic system inversion.

In accordance with the local optimal control (LOC) method [Kelmans, Poznyak, Chernitser 1981] the control signal is found from the local criteria minimization problem

$$J_k = \left\| y_{k+1}^* - C_1 A x_k - S_{11} u_k - S_{12} w_k \right\|^2 + \alpha \|u_k\|^2 \to \min \qquad (2)$$

where α is a weight coefficient, $S_{ij} = C_i B_j$

The corresponding control law is given by

$$u_k = D_1(\alpha)\left(y_{k+1}^* - C_1 A x_k - S_{12} w_k\right), \; D_1(\alpha) = \left(\alpha I_{m_1} + S_{11}^T S_{11}\right)^{-1} S_{11}^T, \qquad (3)$$

From (1), (3) the equation of closed-loop system follows

$$x_{k+1} = \Pi_1(\alpha) A x_k + B_1 D_1(\alpha) y_{k+1}^* + \Pi_1(\alpha) B_2 w_k \qquad (4)$$

The equation (4) coincides with the regularized inverse model of the system (1) control channel [Lyubchyk 2011].

Consider the stability condition of closed-loop system (4). Without the restriction of generality it may be assumed that the (1) is stable, in over case it may be guaranteed by using the stabilizing feedback. As it has been shown in [Kostenko, Lyubchik 1996], the non-zero part of the spectrum of $\Pi_1 A$, where projection matrix $\Pi_1 = \Pi_1(0) = I_n - B_1 S_{11}^{-1} C_1$, coincides with the transmission zeroes of system (1). Thus for minimum-phase plants the stability of closed-loop system (8) is guaranteed for any α, in over cases the stability margin value α^* exists. At that, the limited attainable accuracy of control is determined from the equation for control error $e_k^1 = y_k^* - y_k^1$

$$e_{k+1}^1 = E(\alpha)\left(y_{k+1}^* - C_1 A x_k - S_{12} w_k\right), \; E(\alpha) = \alpha\left(\alpha I_m - S_{11} S_{11}^T\right)^{-1}. \qquad (5)$$

The inverse model control (IMC) method is the generalization of combined control with inverse model [Lyubchik 1995]. The control law is accepted in the form

$$u_k = -K_1 e_k + u_k^*, \qquad (6)$$

where the first component is realized the output feedback with ensures the desired dynamic properties of closed-loop system, and the second component is used for reference signal tracking and disturbance compensation. Such a control signal is formed by the feed-forward controller, based on the inverse model of control channel of system (1):

$$\begin{aligned} \tilde{x}_{k+1} &= \Pi_1 A \tilde{x}_k + B_1 S_{11}^{-1} y_{k+1}^* + \Pi_1 B_2 w_k, \\ u_k^* &= S_{11}^{-1}\left(y_{k+1}^* - C_1 A \tilde{x}_k - S_{12} w_k\right). \end{aligned} \qquad (7)$$

From (1) and (7) follows the equation for closed-loop system

$$\theta_{k+1} = A\theta_k + B_1 K_1 e_k^1, \quad e_{k+1} = -C_1 A\theta_k - S_{11} K_1 e_k^1, \qquad (8)$$

where $\theta_k = x_k - \tilde{x}_k$.

Taking into account the evident balance property $C_1\theta_{k+1} + e_{k+1} = 0$, the equation (8) may be represented in the equivalent form

$$\theta_{k+1} = (A - B_1 K_1 C_1)\theta_k, \quad e_{k+1} = -C_1\theta_k. \qquad (9)$$

Therefore, IMC method ensures the arbitrary reference signal tracking and disturbances decoupling if the invertibility conditions of system (1) take place. However, the control law (6) may be realized in the only case when the feed-forward compensator (7) is stable. Thus the direct IMC can be used only for minimum-phase plants. In general case a regularized feed-forward compensator may be designed using the similar technique as for LOC:

$$\begin{aligned} \tilde{x}_{k+1} &= \Pi_1(\alpha)A\tilde{x}_k + B_1D(\alpha)y^*_{k+1} + \Pi_1(\alpha)B_2w_k, \\ u^*_k &= D(\alpha)\left(y^*_{k+1} - C_1Ax_k - S_{12}w_k\right), \end{aligned} \tag{10}$$

with parameters matrices $D(\alpha) = \left(\alpha I_m + S_{11}^T S_{11}\right)^{-1} S_{11}^T$, $\Pi_1(\alpha) = I_n - C_1D(\alpha)B_1$.

In such a case the equations for control error dynamics are:

$$\theta_{k+1} = (A - B_1K_1C_1)\theta_k + B_1K_1f_k, \quad e_k = C_1\theta_k + f_k, \tag{11}$$

where $f_k = E_1(\alpha)\left(y^*_k - C_1A\tilde{x}_{k-1} - S_{12}w_{k-1}\right)$ is the equivalent disturbance.

Using (1) it is easy to estimate the attainable accuracy of combined IMC in the dependence of the desired stability margin of feed-forward compensator.

Consider the internal model-based control system design when the disturbances w_k can't be measured directly. The corresponding modifications of control law have to use the estimations of disturbances $\hat{w}_k$, obtained from the measured data $\left\{y^2_k\right\}$ (the method of indirect disturbance measurement). In accordance with the concept of internal model the indirect disturbances measurement may be realized using either internal dynamic plant model [Morari, Zafirov 1989], or static two-input matching model [Tsypkin, Holmberg 1995].

In the first case taking the internal model in the following form

$$\hat{\tilde{x}}_{k+1} = A\hat{\tilde{x}}_k + B_1u_k, \quad \hat{\tilde{y}}_k = C_2x_k \tag{12}$$

one can obtained the disturbances estimate as

$$\hat{w}_k = S_{22}^+\left(y^2_{k+1} - \hat{y}_{k+1}\right). \tag{13}$$

At that, the estimation error $e^2_k = w_k - \hat{w}_k$ will include the bias proportional to w_k. In order to avoid it the corrected internal model may be used

$$\hat{x}_k = A\hat{x}_k + B_1u_k + B_2\hat{w}_k, \tag{14}$$

or taking (13) into account

$$\hat{x}_{k+1} = \Pi_2 A\hat{x}_k + \Pi_2 B_1 u_1 + B_2 S_{22}^{+} y_{k+1}^2, \tag{15}$$

where $\Pi_2 = I_n - B_2 S_{22}^{+} C_2$, and "+" denotes the Moore-Penrouze generalized inversion.

Moreover the estimation error is given by

$$e_{k+1}^2 = \Pi_2 A e_k^2, \tag{16}$$

and will be invariant with respect to the unmeasured disturbance.

The equations(15), (16) exactly coincides with the equation of inverse model of system's (1) disturbance channel [Kostenko, Lyubchik 1996] so the internal model method generalization for multivariable system leads to the IMC.

Using two-input static model approach, the disturbance estimate is formed in accordance with the equation

$$\hat{w}_k = S_{22}^{+}\left(y_{k+1}^2 - CA\hat{x}_k - S_{21}u_k\right), \tag{17}$$

where the state vector estimate $\hat{x}_k$ is obtained by the dynamic state observer with the additional internal feedback intended for bias elimination

$$\hat{x}_{k+1} = Ax_k + B_1 u_k + L\left(y_k - C_2\hat{x}_k\right) + B\hat{w}_k \tag{18}$$

or in equivalent form

$$\hat{x}_{k+1} = F\hat{x}_k + B_2 S_{22}^{+} y_{k+1}^2 + Ly_k^2 + \Pi_2 B_1 u_k, \tag{19}$$

where $F = \Pi_2 A - LC_2$, L - is an arbitrary tuning matrix with appropriate dimension.

The equation (19) coincides with the equation of unknown-input observer (UIO) [Hou, Muller 1992, Kurek 1982], so the disturbance observer in the form of two input static model [11] for multivariable systems converts with the combination of (17) into the UIO based tuning inverse model [Kostenko, Lyubchik 1996] of system's (1) disturbances channel. It is evident that if the observability conditions of matrix pair $(\Pi_2 A, C_2)$ take place, the inverse model may be designed in accordance with the pre-established dynamic properties.

If the proper inverse model is used, the corresponding disturbance estimates are formed with one step delay with respect to the current measurement. Such a delay may be compensated in the control loop in

accordance with the general selective invariance idea [Tsypkin, Holmberg 1995] using the disturbance model $w_{k+1} = \Phi w_k$. In such a way the equations of feed-forward compensator with indirect disturbances measurement may be obtained in the form

$$\begin{aligned} \tilde{x}_{k+1} &= \Pi_1(\alpha)A\tilde{x}_k + B_1 D(\alpha) y^*_{k+1} + \Pi_1(\alpha)B_2\Phi\hat{w}_{k-1}, \\ u^*_k &= D(\alpha)\left(y^*_{k+1} - CA\tilde{x}_k - S_{12}\Phi\hat{w}_{k-1}\right), \end{aligned} \tag{20}$$

the closed-loop system equations are

$$\begin{aligned} \theta_{k+1} &= (A - B_1K_1C_1)\theta_k + B_1K_1f_k + B_2\Phi e^2_{k-1}, \\ e^1_k &= -C_1\theta_k + f_k - S_{12}\Phi e^2_{k-1}, \quad e^2_{k+1} = Fe^2_k. \end{aligned} \tag{21}$$

Moreover the generalized separation principle takes place, i.e. the dynamic properties of control loop and disturbances observer may be established independently.

In the case when disturbance model matrix Φ is unknown the suitable identification algorithms may be applied using the disturbance estimates (13) or (17). For example, if the recurrent least square method is used, the disturbance model identification algorithms are in the form

$$\hat{\Phi}_{k+1} = \hat{\Phi}_k + \left(\hat{w}_{k+1} - \hat{\Phi}_k\hat{w}_k\right)\hat{w}^T_k\Gamma_k, \tag{22}$$

where

$$\Gamma_k = \Gamma_{k-1} - \left(1 + \hat{w}^T_k\Gamma_k\hat{w}_k\right)^{-1}\Gamma_{k-1}\hat{w}_k\hat{w}^T_k\Gamma_{k-1}. \tag{23}$$

The corresponding disturbance compensation algorithm includes the disturbance prediction based on the model estimates may be treated as the adaptive selective invariance approach.

For the purpose of disturbance compensator design consider at first the problem of dynamic system inversion, for this purpose supposes that $w_k \equiv 0$, at that u_k and y^1_k will be treated as the unknown input and measured output respectively. In the case under consideration using the UIO observer

$$\tilde{x}_{k+1} = F_1\tilde{x}_k + G_{11}y^1_k, \; \hat{x}_k = \tilde{x}_k + H_{11}y^1_k, \tag{24}$$

one can obtained the inverse models equation in the form

$$\begin{aligned} x_{k+1}^{I_1} &= F_1 x_k^{I_1}(t) + (G_{11} - F_1 H_{11}) u_k^{I_1}(t) + H_{11} u_{k+1}^{I_1}, \\ y_k^{I_1} &= B_1^{+}\left[x_{k+1}^{I_1} - A x_k^{I_1} \right], \end{aligned} \tag{25}$$

where $x_k^{I_1} = \hat{x}_k \in \mathbf{R}^n$, $u_k^{I_1} \in \mathbf{R}^{q_1}$, $y_k^{I_1} \in \mathbf{R}^{m_1}$ - inverse model state vector, input and output signals respectively, $u_k^{I_1} = y_k^1$.

If the parameters of the observer (24) satisfy the so-called "invariance conditions" [Kostenko, Lyubchik 1996]

$$(I_n - H_{11}C_1)F_1 - F_1(I_n - H_{11}C_1) = G_{11}C_1, \quad B_1 - H_{11}C_1B_1 = 0, \tag{26}$$

the unknown input u_k will be eliminate from the deviation vectors $e_k^x = x_k - x_k^{I_1}$, $e_k^u = u_k - y_k^{I_1}$ which will be given by following equations:

$$e_{k+1}^x = F_1 e_k^x, \quad e_k^u = -B_1^{+}(F_1 - A)e_k^x. \tag{27}$$

As it has been shown in [Kostenko, Lyubchik 1996], in general case $m_1 \le q_1$ the system of linear algebraic equation (26) has a solution

$$F_1(L_1) = \Pi_1 A - L_1 C_1, \quad H_1 = B_1 S_{11}^{+}, \quad G_{11}(L_1) = \Pi_1 A H_1 + L_1 \Omega_1, \tag{28}$$

where $\Pi_1 = I_n - B_1 S_{11}^{+} C_1$, $\Omega_1 = I_n - S_{11} S_{11}^{+}$, $S_{11}^{+} = (S_{11}^T S_{11})^{-1} S_{11}^T$, and L_1 is the arbitrary $(n \times q_1)$ matrix of free tuning parameters. Therefore if the pair $(\Pi_1 A, C_1)$ is observable (input observability conditions), the eigenvalues of $F_1(L_1)$ may be assigned by means of tuning matrix L_1 selection via suitable pole placement method.

Finally the parameterized state-space representation of the inverse model are obtained in the form

$$\begin{aligned} x_{k+1}^{I_1} &= F_1(L_1) x_k^{I_1}(t) + L_1 u_k^{I_1} + H_1 u_{k+1}^{I_1}, \\ y_k^{I_1} &= -C_1(L_1) x_k^{I_1} + B_1^{+} L_1 u_k^{I_1} + S_{11}^{+} u_{k+1}^{I_1}, \end{aligned} \tag{29}$$

where $C_1(L_1) = S_{11}^{+} C_1 A + B_1^{+} L_1 C_1$.

For example, using the special form of system (1), this may be obtained by nonsingular state-space transformation

$$A = \begin{pmatrix} A_{11} & A_{12} \\ A_{21} & A_{22} \end{pmatrix}, B_1 = \begin{pmatrix} B_{11} \\ B_{12} \end{pmatrix}, C_1 = \left(I_{q_1} \vdots 0_{q_1, n-q_1} \right), \tag{30}$$

the inverse models matrices may be represented as

$$\Pi_1 = \left(\begin{array}{c:c} \Omega_{B_{11}} & 0_{q_1, n-q_1} \\ -B_{12}B_{11}^{+} & I_{n-q} \end{array} \right), \quad F_1(L_1) = \left(\begin{array}{c:c} \Omega_{B_{11}} A_{11} - L_{11} & \Omega_{B_{11}} A_{12} \\ \tilde{A}_{21} - L_{12} & \tilde{A}_{22} \end{array} \right), \tag{31}$$

where $\Omega_{B_{11}} = I_{q_1} - B_{11}B_{11}^{+}$, $\tilde{A}_{1i} = A_{2i} - B_{12}B_{11}^{+}A_{1i}$, $L_1^T = \left(L_{11}^T \vdots L_{12}^T \right)$, $L_{11} \in \mathbf{R}^{q_1 \times q_1}$, $L_{12} \in \mathbf{R}^{n-q_1 \times q_1}$.

The minimal state-space realization of the inverse model may be obtained by means of reduced order UIO. Let $z_k = R_1 x_k \in \mathbf{R}^{n-q_1}$ be an aggregated auxiliary variables, where R_1 is the appropriate aggregate matrix such as $\operatorname{rank}\left(C_1^T \vdots R_1^T \right) = n$. Then the state vector estimate may be obtained as follows

$$\hat{x}_k = P_1 y_k^1 + Q_1 \hat{z}_k, \tag{32}$$

where $\hat{z}_k$ is given by minimal-order UIO

$$\bar{x}_{k+1} = \bar{F}_1 \bar{x}_k + \bar{G}_{11} y_k^1, \quad \hat{z}_k = \bar{x}_k + \bar{H}_{11} y_k^1 \tag{33}$$

and matrices $P_1 \in \mathbf{R}^{n \times q_1}$, $Q_1 \in \mathbf{R}^{n \times n-q_1}$ are defined as

$$\begin{gathered} \left(P_1 \vdots Q_1 \right) = \begin{pmatrix} C_1 \\ R_1 \end{pmatrix}^{-1}, \quad C_1 P_1 = I_{q_1}, \quad R_1 Q_1 = I_{q_1}, \quad P_1 C_1 + Q_1 R_1 = I_n \\ C_1 Q_1 = 0_{q_1, n-q_1}, \quad R_1 P_1 = 0_{n-q_1, q_1} \end{gathered} \tag{34}$$

The invariance conditions in such a case take on the form

$$\left(R_1 - \bar{H}_1 C_1 \right) A - \bar{F}_1 \left(R_1 - \bar{H}_1 C_1 \right) = \bar{G}_{11} C_1, \quad R_1 B_1 - \bar{H}_{11} C_1 B_1 = 0, \tag{35}$$

and a corresponding solution of (35) may be obtained as

$$\bar{F}_1(R_1) = R_1\Pi_1 A Q_1,\ \bar{H}_{11} = R_1 B_1 S_{11}^{+} = R_1 H_1,\ \bar{G}_{11}(R_1) = R_1\Pi_1 A(\bar{H}_{11} + P_1\Omega_1), \quad (36)$$

where matrices P_1, Q_1 are uniquely determined by R_1 selection.

Therefore the minimal-order inverse model is given by equations:

$$\begin{aligned} \bar{x}_{k+1}^{I_1} &= \bar{F}_1(R_1)\bar{x}_k^{I_1} + R_1\Pi_1 A P_1 u_k^{I_1} + R_1 H_{11} u_{k+1}^{I_1}, \\ y_k^{I_1} &= -\bar{C}_1(P_1)\left[C_1 A Q_1 x_k^{I_1} + C_1 A P_1 u_k^{I_1} - u_{k+1}^{I_1}\right], \end{aligned} \quad (37)$$

where $x_k^{I_1} = z_k \in \mathbf{R}^{n-q_1}$ - state vector of the inverse model, $\bar{C}_1(P_1) = S_{11}^{+} + B_1^{+} P_1\Omega_1$.

The deviation vectors $\bar{e}_k^x = R_1 x_k - x_k^{I_1}, e_k^u$ also are invariant with respect to u_k:

$$\bar{e}_{k+1}^x = \bar{F}_1(R_1)e_k^x,\ \ e_k^u = -C_1(P_1)C_1 A Q_1 \bar{e}_k^x, \quad (38)$$

and its dynamic properties is determined by tuning matrix R_1 selection.

Concretely define the matrices P_1, Q_1 choice, one can admit

$$(P_1 \vdots Q_1) = \begin{pmatrix} P_{11} & Q_{11} \\ P_{12} & Q_{12} \end{pmatrix},\quad P_{11} = I_q,\quad Q_{11} = 0_{q,n-q}, \quad (39)$$

in such a case $R_1 = Q_{12}^{-1}(-P_{12} \vdots I_{n-q})$ and P_{12}, Q_{12} are arbitrary matrices with $\det Q_{12} \neq 0$.

For system representation (15) from (16), (21) follows that

$$\bar{F}_1(R_1) = Q_{12}^{-1}(\bar{A}_{22} - P_{12}\bar{A}_{12})Q_{12}, \bar{A}_{12} = \Omega_{B_{11}} A_{12}, \bar{A}_{22} = A_{22} - B_{12}B_{11}^{+}A_{12}. \quad (40)$$

Thus the matrix Q_{12} defines the similarity transformation and doesn't change the spectrum of $\bar{F}_1(R_1)$ which completely determined by arbitrary matrix $P_2 \in \mathbf{R}^{n-q_1 \times q_1}$. The last may be chooses by pole placement method if pair $(\bar{A}_{22}, \bar{A}_{12})$ is observable. The aggregate matrix R_1 is determined up to an arbitrary nonsingular matrix Q_{12}.

Conclusions. The proposed UIO-based approach to selective invariance properties ensuring in multivariable systems leads to the decomposition of the problem on the disturbance state estimation and model identification. As it has been shown, the inverse models may be used for both disturbance estimation and compensation. Therefore the inverse model-based control method is seemed to be the most general approach to the disturbance decoupling problem in multivariable systems and may be consider as a basis for high accuracy control system design. The UIO theory may be used as a basis for inverse systems design; moreover, the non-minimum phase case may be treated in the same way. The reduced-order and regularized inverse models and multivariable model-based disturbance compensator has been developed and design method proposed using pole-placement method.

The advantage of the proposed method became brightly apparent in the case when disturbance model is strictly unknown and should be identified using only current measurements of output variables. In such a case for multivariable systems the problem of simultaneous disturbance state and model parameter estimation is appeared. The IMC approach ensures the decomposition of the problem into the separate disturbance state and model linear estimation realized by the well-developed algorithms.

References

Francis, B. (1987). *A course of H control theory. Lecture Notes in Control and Information Sciences*. Berlin: Springer – Verlag.

Hou, M., & Muller, P.C. (1992). Design of observers for linear systems wits unknown inputs. *IEEE Trans. on Automatic Control, 37*, 871-875.

Kelmans, G.K., Poznyak, A.S., & Chernitser, A.V. (1981). Adaptive locally optimal control. *Int. J. System Science, 12, 2*, 235-254.

Kostenko, Yu.T., & Lyubchik, L.M. (1996). *Dynamic model-based control systems. (in Russian)*. Kharkov: Osnova.

Kurek, J.T. (1982). Observation of the state vector of linear multivariable systems with unknown input. *Int. J. of Control, 36*, 511-515.

Lyubchik, L.M. (1995). Inverse model control and sub-invariance in linear discrete multivariable systems. *Proc. of the 3-rd European Control Conf., Roma, 4, 2*, 3651-3659.

Lyubchyk L.M. (2011). Disturbance Rejection in Linear Discrete Multivariable Systems: Inverse Model Approach. *Proceedings of 18th IFAC World Congress, Milan, Italy*.

Morari, M., & Zafirov, E. (1989). *Robust processes control*. New Jersey: Prentice Hall.

Seraji, H. (1989). Minimal inversion, command tracking and disturbances decoupling in multivariable systems*. Int. J. of Control, 49*, 2093-2191.

Silverman, L.M. (1969). Inversion of multivariable linear systems. *IEEE Trans. on Automatic. Control, 14*, 270-276.

Tsypkin, Ya. Z., & Holmberg, U. (1995). Robust stochastic control and internal model control. *Int. J. of Control, 61, 4*, 809-822.

Wolovich, W.A. (1995). *Automatic Control Systems: Basic Analysis and Design*, Philadelphia, PA: Saunders.

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SELF-REALIZATION IN SUSTAINABLY DEVELOPED SOCIETY IN VIEWS OF MODERN UKRAINIAN CONTEXTS

Abstract. In the article personal self-realization in modern Ukrainian society as a condition for sustainable development and embodiment by a personality of its own subject-creative project within the harmony of society and itself is researched. Interpretation of the self-realization as subject-level creative development of the individual in a society of sustainable development is proposed. Proved that the sustainable development of society in its underlying sources coincides with the moral perfection of human being, rooted in the spiritual depths of human life. Ukraine can only ensure sustainable development through the effective use of all its resources and fulfillment of every individual in society, social justice and gender equality, effective employment and environmental safety.

Keywords: self-realization of the person, modern society, a society of sustainable development, self-improvement, self-projecting, self-actualization, consumer society, ecological civilization.

Formulas: 0; fig.: 0; tabl.: 0; bibl.: 17.

Introduction. At the beginning of the third millennium, humanity looks for ways to implement the integration model of sustainable development. The transition to sustainable development has become an objective necessity, whose value is undeniable. Approved international documents and Sustainable development strategy "Ukraine-2020" [Stategiya 2015] finally determined the intention of all mankind and Ukrainians including switch to such development paradigm, which is central to the man, and key goals are intense and balanced economic development as well as responsible environmental management.

A place that takes every country in the world in the near historical perspective, will be determined primarily by the result of its own efforts, the degree of scientific validity and sensibility of its choice in an interdependent world. Ukraine, like other countries, has its own specific development problems which require urgent solutions, and their own possibilities of their solving.

Ukraine enters a new era of history and Ukrainian nation gets a unique chance to build a new Ukraine. By ratifying the Association Agreement between Ukraine on one hand, and the European Union, the European Atomic Energy Community and their Member States on the other hand, Ukraine received tools and roadmap for its transformation. Meeting the requirements of the Agreement allows Ukraine subsequently become a full member of the European Union. These requirements are matching the Copenhagen criteria - requirements to be met by the state-members of the European Union [Stategiya 2015].

At this stage man and his place in the world changes. Human capabilities and its resources are expanding. From the local national culture man moves into

the global information space becoming a cosmopolitan. A person has an opportunity to manipulate both the boundaries of his body and boundaries of his personality. A person can change their appearance, gender, create a virtual image, virtually live several lives. And in real life it turns into a bottomless sea of opportunities, in constant choice perspectives, building and implementing of endless self-projects.

Recent years have reflected around the world, including Ukraine, as a sharp kink in the political and socio-economic historical development. This brought a change in the fundamental principles on which society is based. New sociocultural processes are developing rapidly, lifestyles are dramatically changing and this presumes substantial changes in consciousness of the individual and society as a whole.

The importance of self-awareness, the ability to use these natural qualities, develop and apply them in practice grows. More and more people rely on themselves and do not expect help from others. In modern society choice of independent individual lifestyle is preferred and therefore bearing full responsibility for your own choice is a must.

Today, self-projecting is not subject to individual choice, but is a feature of modern life. Modernity replaces heteronomous determination of social status with self-definition as a must [Zabelin, Korten, Medouz 2003]. If a person wants to assert itself in the present unstable world, consisting of permanent risks and uncertainties, there is the only way - to meet the challenges and demands of the world and learn to change itself.

Self-realization has always belonged among the issues to varying degrees which were fundamental to society, to determine the nature, the essence of any historical model of that very society. Personality - founder of the most dynamic social reality that directly, every day develops itself and maintains their needs, abilities, knowledge, skills, strong-willed and emotional potential, in short, its own essential force. On how best organically and they will be fully involved in the social system depends not only the "face" of the system, but the prospects of its existence.

The situation of modern society is changing the content and meaning of such fundamental categories as self-knowledge and self-awareness, self-realization and self-projecting, reflecting the state of the person as a whole. It took fifteen years since within the framework of the dissertation: «Personal self-realization (social-phylosophical analysis)» the author conducted a comprehensive study of the self-realization phenomenon, but now we see the urgent need and relevance to turn back to the issue of self-realization with current Ukrainian realities of recent years when the revolution of dignity and struggle for the freedom of Ukraine have created new opportunities and conditions for individuals self-realization and realization of the idea of integration model of sustainable development society in Ukraine.

Literature review and the problem statement. The relevance and importance of the problems of self-realization and sustainable development provided them a prominent place in the study of domestic and foreign scientists.

A significant contribution to the analysis of the self-realization was made by: Maslow, according to his "pyramid of needs" self-actualization is the highest human need [Maslou 1999]. E.Fromm raises the problem of the individual self as a way of overcoming the "alienation syndrome", from which any modern society suffers [Fromm 1998], K. Rogers concluded that the basis of human behavior is

"attracted to updating", that it is inherent in every human desire to implement their potentialities to save lives and become stronger [Rodzhers 2000].

Among the others were O. Asmolov [Asmolov 1986], B. Ananiev [Ananiev 2001], O. Bodalev [Bodalev 1988], B. Gershunskyy [Gershunskyy 2003], S.Deryabo [Deryabo 1996], V.Lohvynenko [Lohvynenko 2013], O. Stegniy [Stegniy 2014], V.V. Lyakh [Lyakh 2014] and others.

The concept of sustainable development researchers are S.Zabelin [Zabelin 2003], D.Korten [Korten 2003], D.Meadows [Meadows 1972], A. Ursul [Ursul 2001], A. Bartlett [Bartlett 1998], R. Dunlap [Dunlap 1994] and others.

The purpose of the article is critically analyzing the concept of sustainable development and characteristics of individuals self-realization in modern Ukrainian society prove that the success of these processes, their compliance with the needs of individuals and society makes it possible to implement the idea of sustainable development.

Research results. For the self-fulfilling individual, desire for perfection is inherent, he/she does best is what he/she is capable of. Self-realization basic condition for the full development of the individual and maintaining health and achieving maturity process of "development" in which the individual accepts responsibility for planning the course of his life [Olport 2002].

Self-realization has several dimensions which take different forms, depending on the ultimate goal: to succeed in business, to become wealthy, make a career. Under this type self-realization is in a narrow segment of practical needs.

Another dimension of self-realization occurs when a person is focused on the transfiguration itself, this is "orientation nature inherent in all living beings, unless they are not emotionally affected" [Fromm 1998].

Factors contributing to the self-realization can be divided into two groups: first - personal (internal) or people-dependent (values, commitment to self-forming, flexible thinking, will, talent, ability, etc.). The man who is self-fulfilling has such characteristics: the ability to freely respond to the situation and freely experience their reactions (stress-proof); open any experience going to live a full human life in its every moment; the ability of man to listen more to their instincts and intuition than to the mind and thoughts of others (lack of conformity); a sense of freedom in thought and deed; a high level of creativity. Personal self-realization promotes spiritual growth of man, responsible for the development of personal potential, responsibility, curiosity, sociability, diligence, perseverance, initiative, knowledge, creativity, morality, etc.

Second - social (external) (social, political, economic situation, quality of life, economic opportunities, ecological environment, etc.). External focused on individual expression in different spheres of life: profession, art, sports, education, political and social activities.

Professional self-realization is a socialized way of harmonious development of personality combined with the acquisition of vocational practical and spiritual experience in the specialist qualification (training) and improvement in terms of professional growth in the process of performance of professional roles and responsibilities that are an inherent part of the implementation of personal and professional potential. Professional implementation includes: professional self-definition, development in their chosen field, professional growth and competence development.

For the benefit of individual self-fulfillment work such social factors as: «information socialization» - increasing degree of informational focus on social

sphere; "raising the cultural level" - the development of the information environment, a prerequisite for raising the cultural level (access in the networks to the treasures of libraries, museums, etc.); overcoming the "knowledge elite" - predetermination and polarization of knowledge in society and its accumulation in the narrow "upper" social stratum - the elite; "leveling the hierarchy of power", - attracting more people into politics, creating conditions to improve their social status; "capacity" and as an alternative to this - "deskilling"; "new professions and skills," on the one hand, and on the other hand, the possible disappearance of many jobs.

In the age of information situation regarding the requirements of socio-economic system to the individual is somewhat different than it was in the industrial society. This new world is driven mostly by people whose primary ability is to use the information. These are people whose welfare is achieved not by physical effort but as a result of ideas, knowledge, talent and creativity [Lyakh 2014].

M.Kastels in his work "Information society and the welfare state. Finnish model" notes that the development of innovative environment to work with people involved in both research and production technology, organizational management. Therefore, the problem of forming creative minded workers is urgent for the whole society, not for individuals obsessed with self-realization. The government should take care of an extensive system of universities, high quality education, which should provide the main source of the new economy - human talent [Kastels 2006].

For the benefit of individuals self-realization work the benefits of modern society such as: «information socialization» - increasing degree of informational focus on social sphere; "raising the cultural level" - the development of the information environment, a prerequisite for raising the cultural level (access in the networks to the treasures of libraries, museums, etc.); overcoming the "knowledge elite" - predetermination and polarization of knowledge in society and its accumulation in the narrow "upper" social stratum - the elite; "leveling the hierarchy of power", - attracting more people into politics, creating conditions to improve their social status; "capacity" and as an alternative to this - "deskilling"; "new professions and skills," on the one hand, and on the other hand, the possible disappearance of many jobs.

The topic of our research requires introducing the first and second group of factors self-realization. For this reason, by self-realization we mean implementation by the personality of its own subjective project within the creative harmony with society and himself. This determination of self-realization is required by our study. In our view, a prerequisite for self-realization is the harmony of the inner world and society. In any process of transformation and mobility changes can be uncertain, and implies the existence of borders. These value-borders advocate world as regulatory principle of human existence. In terms of "fluid modernity" [Bauman 2008] and consumer personalization human relations extremely complicate, leading to a serious crisis of moral values.

Civilization remains viable until the desire for a new ideal supports the spirit of novelty, while moral tasks correlate with a high ideal. And here we must recognize that the current consumption ideal is not meeting the requirements of progress. Along with it there were signs of fatigue, boredom and frustration that say that the ideal of perfection of a different type is required. From this we see civilizational appointment of sustainable development strategy that sets a higher goal of human society, rather than the consumption ideal. Future civilizational

shift implies a decisive break with the cult of consumption, a gradual change in priority of material wealth to spiritual values of sustainable development, including concern for future generations. We know that material force is capable of paving the way to death if spiritual wisdom does not make it an opposition. Thus, each step of growth of material power should meet the same level of spiritual growth. This pattern, called the principle of material and spiritual equilibrium characterizes philosophical meaning of sustainable development as an expression of cosmic harmony.

Sustainable development as a form of social and natural co-evolution, understood as a process of survival of civilization that goes to sustainable socio-economic development that does not violate its natural basis and provides continuous progress of society. From this perspective, any transformation in the international community, the state, in every region, in every industry sector and type of social activity should be determined not only past and present but also the future, not natural and spontaneous, but intelligently managed development. Taking this into account, it is necessary create a model of civilization of information type, state, region, society, persons, etc., which would meet the "necessary" future, ensuring the survival of humanity and preservation of the environment [Zabelin, Korten, Medouz 2003]. It is clear that the future sustainable development must combine ecology with social and economic development so that they continued to exist in biosphere-compatible form.

The concept of "sustainable development" combines the following values: development is supported, regulated, balanced, optimized, harmonized, continuous for indefinitely long series of human generations. All these features of sustainable development are to be achieved through close international cooperation to optimize all human activities (socio-economic, technological, political, cultural, etc.) and a comprehensive rationalization of nature in the interest of human survival.

In this article we will mean by the creation of sustainable development: 1) sustainable economy that will satisfy human needs, but the extraction of resources and production of waste at the same time should be in an amount not exceeding the regenerative capacity of the environment; 2) social institutions that can guarantee security and opportunity to the social, intellectual and spiritual growth [Ursul 2001].

The idea of sustainable development, put forward at the international congress in Rio de Janeiro in 1992. In June 2012, Brazil hosted the World Conference Rio-20+, where the majority of the political leaders of the world once again attempted to reconcile the views on the purpose and possibilities of the future of the global community. The relevance of this theme for every inhabitant of the Earth is no doubt as to the development of modern information society we all witnessed the collision of two planetary level global trends - strategy conquest of nature for poverty eradication in the name of minority wealth and the concept of sustainable co-existence and development of man, society and nature. The above mentioned acquires special relevance in modern science and philosophy because it is directly linked "to the search for and substantiation of constructive strategy for further development of our industrial civilization and attempts to overcome the socio-environmental anomalies that it has initiated and gave birth in the previous stages of its formation and deployment. Still, "opposition to new and old ideas, old and new ways of civilization existence aremanifested both at the national and global levels." And the fact is that in recent years the search for ways to move the international community to truly sustainable development has

been seriously slowed. The reasons are called different. Among them - the global economic and financial crisis, the political differences of different local civilizations.

It took twenty years after Rio, and today we have to admit the sad fact that today none of these objectives is achieved, moreover, rapidly deteriorating environment, growing poverty, widening gap between rich and poor countries still take place. But from this fact we should not and can not follow the conclusion to abandon the idea of sustainable development. This idea is as significant as, for example, the idea of democracy, the range related to the phenomenon of democracy is also very wide: from apologetic to absolutely negative. However, this situation does not reduce the value status of the ideal of democracy. Moreover, ambiguous and even cautious attitude to the ideal of democracy stimulates the search for new meanings and new edges of this phenomenon. Historical change of the content of a concept - something, generally speaking, quite normal. Life is different in choosing priorities of a concept.

Reflexive-critical understanding of sustainable development seems essential to us for the maintenance of its theoretical and practical value. By analogy with the evolution of the concept of democracy we can make the following assumption: status values of sustainable development firmly establish themselves in society only when it is perceived not as dogma but as a system of developing ideas about harmony, about the goals and values of social development. The idea of sustainable development is an expression of the deepest philosophical truth concerning the nature of things, namely Eidos of cosmic harmony. Sustainable development - a cosmic principle that expresses the dynamic balance of opposing entities and trends, balance, harmony and dimensional certainty of all things. Sustainable development of society is possible only if the harmonized relations within society and social relations with the environment. Sustainable development is the harmonious development and vice versa. In its quest for sustainable development humanity should organize social relations and relations of people to their natural environment, to get closer to the ideal environmental and social harmony. Although such harmony is unattainable in real life society ("eternal ghost"), it nevertheless is a strategic guideline ("eternal compass") for any human affairs; this moral ideal to which we should strive to implement the strategy of sustainable development.

The concept of sustainable development is generated at the level of ideas common to all mankind, is being actively promoted in every region, city, village and even house for its speedy implementation.

The international experience of the last decade shows that many countries have embarked on training its own, national concepts of sustainable development, where each in his own specified tasks of global and regional scale. For example, the United States, England, Netherlands, Belgium, Russia and Kazakhstan.

A powerful impetus to the development of Ukrainian own concepts, certainly, was the above-mentioned conference in Rio de Janeiro (1992), in which participated the Ukrainian delegation. At this point in Ukraine there is a gradually spreading wave of interest about the problems of sustainable development, amount of publishing materials on relevant issues grows significantly. The first draft of the national concept of sustainable development was published in Ukraine in 1997, the second - in 2000. The preamble of the document, first of all, notes "based on the basic ideas and principles declared at

the UN Conference on Environment and Development, Ukraine considers expedient transition to sustainable development, which ensures a balanced solution of socio-economic problems, maintaining a healthy state of the environment and natural resources to meet the vital needs of present and future generations" [Kontseptsiya 2000].

The latest Sustainable Development Strategy "Ukraine - 2020" approved by the President of Ukraine in 2015 and meets modern changes in Ukraine, when the revolution of dignity and struggle for the freedom of Ukraine created a new Ukrainian idea - the idea of dignity, freedom and future.

The aim of the Strategy is introduction of european standards of living in Ukraine and path to Ukraine's leading position in the world, will be implemented in the following vectors:

vector of development - a sustainable development of the state, structural reforms and, consequently, improve living standards. Ukraine must become a state with a strong economy and advanced innovations;

vector of security - a guarantee the security of the state, business and citizens, security investments and private property. Ukraine must become a country that is able to protect its borders and ensure peace not only on its territory, but also in the European Region.

vector of responsibility - is to guarantee that every citizen, regardless of race, color, political, religious and other beliefs, sex, ethnic or social origin, property, residence, language or other characteristics, will have access to high-quality education system health and other services in the public and private sectors;

vector of pride - is to ensure mutual respect and tolerance, pride for their country, its history, culture, science, sports.

Ukraine should take its rightful place among the leading nations of the world, to create adequate conditions of life and work for the education of their own talent and attracting the world's best specialists of various fields [Ukaz 2015].

Sustainable human development implies the harmony of the material and spiritual life. Today we see a clear advantage in our life factor materiality, as expressed in particular in the consumer lifestyle. Primitive utilitarianism becomes the value orientation of people. «We are not just passive victims of metapatology, - notes A. Maslow, - with deprivation caused by external valuation, we are afraid of higher values both in ourselves and outside us. They do not only attract - they also scare us». Free adherence to the highest values ensures human dignity and the opportunity to assess his higher purpose in the world. Only then people will be able to see his place in the universe as a representant higher form of existence.

Humanistic philosophy convinces us that true human self-actualization depends on its involvement in the world of higher existential values (to what exceeds it) [Maslou 1982].

Environmental, economic and other crises just exposed the depth of internal, spiritual crisis. Thus, humanity must spiritually heal first before it can cure the sick and wounded nature. Fatally mistakes the one who supposedly believes environmental problem can be solved regardless of the moral health of society.

A necessary condition for sustainable development is the presence of passionate, creative potential of individuals. The more powerful it is, the more abilities people will be able to develop for self-improvement and self-realization.

It is therefore important that all people have received equal access to benefits and resources that society has established the principle of fairness, that the rules of fair equality of opportunity compliance.

The concept of sustainable development extends the principle of justice for future generations, and this allows us to see the progress of the moral challenges that mankind sets for itself. The moral concern for future generations inseparably linked with the "environmental imperative" (M.Moiseyev), demanding such a lifestyle change people that would coordinate their needs with the possibilities of saving the biosphere.

Conclusions. Sustainable development of modern Ukrainian society is impossible without the support of dynamic equilibrium of individual and social, material and spiritual life. There is a functional dependence between resilience and moral spirit, between social stability and moral culture of society. In other words, sustainable development of society in its underlying sources coincides with the moral perfection of man, rooted in the spiritual depths of human life and is rising to the transcendental foundations of existence.

Our country can only ensure sustainable development through the effective use of all its resources and fulfillment of every individual in society, social justice and gender equality, effective employment and environmental safety.

Growth opportunities for self-realization in sustainably developed society still has some limitations, including the subordination of human needs and values of the information-technological production.

The problem lies in the fact that modern post-industrial civilization is not able to implement the ideals and values of sustainable development. In other words, the imperative of sustainable development is a requirement of civilizations change. We mean a gradual transition of mankind from technocratic to environmental civilization. Technocratic civilization "absorbing" space of nature and culture, causing unimaginable devastation. The increased instrumental and technical power of man combines with spiritual poverty of the "consumer society" it generated. Ecological civilization is apprehended as the ideal form of preserving the integrity of the whole system of life in order to ensure the sustainable future of humanity. Self-identity of the presonality regardless of its importance veing compregended by society and the individual, stands by this civilization progress.

The proposed interpretation of the self-realization as subject-level creative development of the individual in a society of sustainable development allows researchers to focus their attention on the self-realization not only of the individual but also groups of people. You can express the idea of preparation for self-realization at the level of public awareness of society that is developing.

References

Ananev, B. G. (2001). *O problemakh sovremennogo chelovekoznaniya*. SPb.: Piter.

Asmolov, A. G. (1986). *Psikhologiya individual'nosti. Metodologicheskie osnovy razvitiya lichnosti v istorikoevolyutsionnom protsesse*. Moskwa: Nauka.

Bartlett, A. (1998). Reflections on Sustainability, Population Growth and the Environment. *Renewable Resources Journal, Vol. 15, 4*, 6-23.

Bauman, Z. (2008). *Tekuchaya sovremennost*. Spb.: Piter.

Bodalev, A. A. (1988). *Psikhologiya lichnosti.* Moskwa: Izd-vo MGU.

Gershunskiy, B. S. (2003). Kontseptsiya samorealizatsii lichnosti v sisteme obosnovaniya tsennostey i tseley obrazovaniya. *Pedagogika, 10*, 3–7.
Deryabo, S. D., & Yasvin, V. A. (1996). Metodologicheskie problemy stanovleniya i razvitiya ekologicheskoy psikhologii. *Psikhologicheskiy zhurnal, 6*, 4–18.
Dunlap, R.E. (1994). The Nature and Causes of Environmental Problems: A Socio-Ecological Perspective. *Environmental and Development: A Sociological Understanding for the BetterHuman Conditions, Seoul*, 45–84.
Fromm, E. (1998). Imet ili byit?. *Kiev.*
Kastels, M., & Khimanen, P. (2006). *Informatsiine suspilstvo ta derzhava dobrobutu. Finska model.* Kyiv.
Kontseptsiya stalogo rozvytku Ukrainy. (2000). Kyiv: NAN Ukrainu.
Lohvynenko, V.I. (2013). Sotsialno-filosofskyi analiz poniattia "Samorealizatsiia". *Filosofiia ta politolohiia v konteksti suchasnoi kultury, Vyp.6. (III)*, 114-119.
Liakh, V.V. (2014). Svoboda samorealizatsii u konteksti informatsiino-komunikatyvnykh protsesiv. Retrieved from http://www.filosof.com.ua/ Jornel/M_73/Liah.pdf.
Maslou, A. (1999). *Motivatsiya i lichnost*. SPb.: Evraziya.
Maslou. A. (1982). *Samoaktualizatsiya*. Moskwa: Izd-vo MGU.
Meadows, D.H., Meadows, D.L., Panders, J., & Behrens. W.W. (1972). *The Limiting to Growth.* New York: Potomac.
Olport, G. (2002). *Stanovlenie lichnosti.* Moskva: Smusl.
Rodzhers, K. (2000). *Konsultirovanie i psihoterapiya. Noveyshie podhody v oblasti prakticheskoy raboty.* Moskva: EKSMO-Press.
Stegniy, O. G. (2014). Staluy rozvytok suspilstva: uyavlennya gromadskoi dymku v Ukraini. *Ukrainskiy sociym, 4(51)*, 86-95.
Strategiya stalogo rozvytku «Ukraina-2020». (2015). Retrieved from http://www.president.gov.ua.
Ukaz prezydenta Ukrainy №5/2015 «Pro stratehiyu stalogo rozvytku «Ukraina-2020». (2015). Retrieved from http://zakon2.rada.gov.ua.
Ursul, A.D. (2001). Strategiya ustoychivogo razvitiya i novyiy etap v uchenii o noosfere. *Bezopasnost Evrazii, 3*, 121-156.
Zabelin, S., Korten, D., & Medouz, D. (2003). Globalizatsiya ili ustoychivoe razvitie. *Sotsialno-ekonomicheskiy Soyuz*, *1*, 20.

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TRANSPARENCY AND CORRUPTION CONTROL IN BRAZIL

Abstract. This article makes a critical analysis of institutional changes that took place in the democratization process in Brazil in 1988, when the principles of transparency and administrative reform were implemented. It is based on a public opinion poll on the issue of corruption, and is critical to building a monopoly of bureaucratic transparency in Brazil. It notes the consequences of corruption for political legitimacy and public institutions in the Brazilian state. The article first deals with the construction of transparency in state reform in Brazil, then with the consequences of corruption and transparency in the implementation of Brazilian democracy, and finally with the relationship between reform and the normative principle of publicity, based on the idea that control of corruption should be state policy and not bureaucratic monopoly.

Key words: transparency, corruption control, administrative reform, publicity, public institutions.

Formulas: 0; fig.: 4, tabl.: 0, bibl.: 20

Introduction. Modern public management theory acknowledges the transparency principle in the state's actions towards society. There is a general agreement among politicians, bureaucrats, and opinion makers that public policy management has to be transparent, meaning that there are no secrets in the relationship between the state and society. The transparency principle generates expectation that public administration should be discussed and organized, accountability should be achieved, and thus corruption should be reduced.

The current agreement on transparency makes it an irrefutable truth, a fundamental principle of democratic governance. Its status of principle makes it almost unthinkable for transparency to be critiqued in contemporary democracies. Created by economists, the notion of transparency has the purpose of redeeming the public character of bureaucracies by considering the citizen a consumer of public services.

Often the concept of transparency is mingled with that of publicity. The concept of transparency in Brazil, born in the 1980s, is based on information economy and aimed at solving agency issues in contemporary public management. Despite the transparency and institutional innovations implemented in the administrative engines, a perception of corruption remains within the realm of public opinion. Despite the expectation generated by reform, institutional pathologies continue to exist, creating social uproar against corruption. There is an exacerbated moralism of the political, economic, and social elites concerning politics and the institutional life of democracy.

This article makes a critical analysis of the transparency policy currently implemented in the Brazilian democratic experience. It assesses the effects on public opinion of building transparency within the Brazilian democracy, with the purpose of discovering what challenges democratic governance faces in Brazil. The hypothesis is that state democratization and the construction of democratic

governance in Brazil require extrapolation of the concept of transparency toward a more comprehensive conception of accountability. This accountability is based on a discussion of public interest and on the centralization of public values in the management of the Brazilian state. Corruption control must be conceived as state policy rather than as a bureaucratic monopoly of public policies management.

Literature review and the problem statement. *Transparency and the Construction of Democratic Governance in Brazil.* The democratization process in Brazil required liberalization, extension of political competition, and growing demand concerning government powers. As the democratization process took place, public bureaucracy faded. There was a fiscal crisis, globalization, and the creation of thresholds for governmental intervention into society. In the 1990s, tensions between bureaucracy and democracy gave rise to several reforms in the Brazilian administrative engine. Studies from the public sector point to administrative disorganization and disarticulation, a lack of efficiency in public management, and a corrupt public administration in the 1980s. The outcome was a government incapable of producing efficient public policies for providing assets and services to society. Corruption became a recurrent practice in democracy, and the public believed that this corruption was born of democratization, rather than being inherited from the authoritarian regime.

The New Republic planned several reforms to honor the commitment of reconciling Brazil's republican history with modernization. To fight the legacy of the authoritarian regime, important changes were introduced within the Constitution of 1988, including a specific chapter concerning the political–administrative organization of the government. State democratization was prominent among the constituent activities, and public administration external control was strengthened, mainly through the role of public prosecution and civil society. The principles that rule Brazilian public administration are found in the 1988 Constitution, mainly concerning administrative legitimacy, publicity, and morality [Constituição da República Federativa do Brasil, article 37 2010]. The Constitution also sets forth a role of decentralization, and defines a commitment to civil service reform by means of acknowledgment and universalization of citizenship meritocracy and citizenship participation [Abrucio 2007].

During Fernando Collor's government (1990-92), an administrative reform aimed to recompose and organize the public management devices, and to fight the corruption that devastated Brazilian public service. Government roles performed by the indirect administration were reincorporated into the direct administration. *Brazilian public administration is divided into direct and indirect types. Direct administration is the set of organizations that conduct activities and functios typical of the state, without any delegation to entities or separate companies. Indirect administration is that where the state delegates functions to companies and institutions, such as state enterprises, public institutions, and foundations. For example, the direct administration makes health policies, while the development of research and vaccines is delegated to the Oswaldo Cruz Foundation. The organizations of indirect administration are governed by public law and also by private law.* State–owned companies and foundations without their own sources of resources were no longer allowed to proliferate, and were placed under stricter control. The main focus of administrative reforms during the Collor period was the disassembly of the state engine, with the idea of "shrinking" the personnel structure. To avoid a fiscal crisis, a volunteer resignation plan was proposed, as well as a reduction of public offical's wages,

actions discussed without the approval of the Federal Supreme Court (STF), which is unconstitutional. These changes were not made due to a corruption scheme that brought down the Collor government and to the fact that political conditions did not exist to implement them. Collor's impeachment proceedings and the failure of his government reforms showed that the governability issue would be the core issue in a broader reform of the Brazilian government [Skidmore 1999].

A worsened scenario of corruption required deeper reforms in Brazilian public administration. In Itamar Franco's government (1992-95), the only accomplishment was the creation of a Professional Ethics Code for the Federal Administration's Civil Public Servant, pursuant to Decree 1.171, dated June 22, 1994. Public administration reforms were implemented under Fernando Henrique Cardoso (1995-2002), with the Ministry of Administration and State Reform (MARE), created in 1995 under the direction of Minister Bresser-Pereira. Conditions of governability became more favorable to the implementation of the administrative changes agenda.

The administrative reform led by MARE sought to redefine state activity sectors, strengthening state democratization and management devices configured around the adoption of private administration models for the public sector. This reform strategy assumed a managerial model, whose purpose was to adjust Brazilian public administration to the needs arising from market globalization, the increased presence of international trade laws, and the enhancement of management devices. Changes were implemented according to the New Public Management model, which stated that government activities had to be based on management similar to that performed in the private sector, because a citizen is a client of the services rendered by the state [Bresser–Pereira 2001].

Multilateral agencies, mainly the International Monetary Fund (IMF), and the World Bank, limited this conception of the Brazilian administrative structure. These agencies demanded several changes in public management, assuming that democratic governance would depend on the implementation of managerial reforms. This assumption comes from the idea that institutional change in administrative structures creates democratic governance, taking into account the principles of decentralization, accountability, social inclusion, and fiscal efficiency. The managerial model assumes that public management must be based on professionalization of management, preference for quantitative indicators and explicit performance management standards, quantitative control of results, distribution of resources according to the politicians' performance, decentralization of bureaucratic activities, competition among government agencies, flexibility of management, discipline in resource expenditures, reduction of direct costs, and definition of limits to the transaction costs of the public bureaucracy with more transparency of the government's actions [Pollitt 2003]. This managerial postulate grants a central point to the idea of governance, which the World Bank conceives as the "exercise of political authority and use of institutional resources to manage the society's issues" [World Bank 1991]. However, the agreement reached by the two international agencies indicates that the state has a secondary role in this process. The use of microeconomic theories to understand the matter of reforms is based on the assumption that the state has to be reduced in view of agency issues, and that reform provides opportunity to the vices of inefficiency and corruption.

The managerial paradigm of government reform in Brazil has generated changes in the administrative structure. According to Fernando Abrucio, managerial devices have improved and a cultural change has been evidenced inside Brazilian public services since 1995 [Abrucio 2007]. Yet reforms faced several barriers, related to a strict economy–centered view, which hindered several institutional innovations, such as more autonomy to the regulating agencies for fear that the government would lose control over the agencies' financial expenditures [Abrucio 2007]. Furthermore, as highlighted by Flávio Rezende, such reform faced strong obstacles to implementing the changes, as the fiscal matter has been dominant in the composition of the strategic players' preferences. Strategic players in the decision–making process perceived the reforms as a threat to bureaucratic control over public policies, causing the reforms to be halted on the matter of fiscal adjustment [Rezende 2009]. In other words, changes were implemented, but construction of public policies continued to be submitted to the bureaucratic monopoly, and there was no decentralization process toward society or a construction of more effective control devices in the civil society sphere.

Abrucio indicates the following benefits from the managerial innovation implemented by the administrative reform: fiscal management of the state, which brought economic gains in the public sector; innovations at the subnational government level, which introduced the managerial paradigm in public policies; creation of more accurate devices to evaluate public policies, mainly in the social area, enabling the application of the best management of resources; adoption of planning in the public sector, not in the technocratic sense, but by the integration of government programs and projects; adoption of an electronic government, which advanced the most in the states upon the introduction of electronic auction and information organization [Abrucio 2007].

On the other hand, Abrucio indicates that support is missing for four central axes in the Brazilian public administration reforms. Cardoso's and Luiz Lula's (2003-2010) governments made little progress in: (a) professionalization of the Brazilian bureaucracy, mainly in positions deemed to be strategic; (b) efficiency of services rendered; (c) effectiveness of public policies; (d) accountability and strengthening of transparency in government–society relations. Despite the reforms and the advances, corruption continues to be a recurrent practice, maintaining a patrimonial aspect of the relations between the state and society [Motta, 2007]. Although several devices to increase transparency have been configured in Brazil, there continue to be corruption scandals.

The managerial perspective believes in centering transparency to foster the accounts–rendering principle. In the Brazilian public administration reforms, the transparency principle was very strongly introduced into the political lexicon. The core motto is that control over public policies and the fight against corruption, aimed at formulating democratic governance, depends on stronger transparency in the relations between the state and society. As the idea is to strengthen accountability, the concept of transparency serves to reduce delegation costs and problems within the agency and to extend the available information to the different political players [Stiglitz 1999]. Transparency is the principle through which control over public policies depends on information availabile to citizens and how citizens can base their choices on such information. According to the agency theory, the larger the volume of information available to

the citizens (*principals*), the lower shall be the delegation costs [Willianson 1985].

The concept of transparency is an essential value in contemporary public management, as its consummation means increasing society's information about civil servants' actions. For this reason, the concept of transparency is so popular in contemporary democracies [Etzioni 2010]. As asserted by Roumeem Islam, transparent governments govern better, because the extension of information enables the existence of a political market that has less corruption and is, therefore, more efficient [Islam 2003]. The concept of transparency is linked to the issue of information economy, where the citizen is seen as an investor and a consumer of public assets. *The agency theory basis is a theory of the firm. It is speculated that in the public arena there is the same problem of creating preferences in market dimension, considering a microeconomic conception of politics [Willianson 1985].* According to Ferejohn, the *principal* invests its resources in the action performed by the agent, expecting a return on the dedicated investment (public). The balance point in the relationship between the principal and the agent depends on the existence of more transparent institutions capable of reducing investment uncertainties [Ferejohn 1999]. In other words, accountability is implemented with increased transparency, considering the return citizens made on the investment in the civil servants' public action to reduce transaction costs. Transparency maximizes accountability by enabling a reduction of the asymmetry between the principal and the agent, assuring an accountability system derived by the revealing of the government's secrets. According to the management assumption, it is impossible to have political responsibility if institutions are not transparent to citizens in the same way that the deficit of information between the ordinary citizen and the democratic institutions is reduced. In the management perspective, transparency is an instrumental value to exercise accountability [Heald 2006].

In Brazil, the idea of transparency was presented with the management reforms in the 1990s. Its popularity is the work of the control institutions, mainly those in charge of performing public control of corruption, such as the Union's Accounts Court (TCU), and the Union's General Controlling (CGU). Academis and opinion makers also played a role in introducing the concept of transparency in Brazil. The concept of transparency has advanced in many sectors of the public administration, mainly upon the creation of the Transparency Portal and public disclosure of accounts rendering. A lot of information is available, allowing players outside the state bureaucracy, such as the media, to enforce control over the actions of politicians and bureaucrats. For example, accusations on the Trnasparency Portal in 2008 led to the scandal of the corporate cards. Adoption of the idea of transparency in Brazil resulted from innovations in the bureaucratic–administrative control of corruption, arising from the management reforms implemented after the 1990s [Filgueiras, Avritzer 2010]. In contemporary Brazil there is a strong agreement that fighting corruption depends on the extension of transparency.

In Brazil, transparency did not lead to improvements in corruption control, or to more accountability. Despite the advancements in information generation and the adoption of more transparent public policies, budgets, and expenditures, corruption continues, and there is little accountability on the part of public and private agents toward society. In the scope of the state reform project, the concept of transparency has risen as a universal theoretical proposition, without taking into account different cultural, political, economic, and institutional

realities. This means that transparency is not a universal remedy for the evils provided by corruption. It should be framed in the different cultural and institutional realities of different democratic states. In Brazil, transparency is susceptible to instrumental use of the available information because institutions of accountability fail in that they stress the reputational aspect of corruption scandals and do not punish the cases. There is a disconnection of corruption control devices, and transparency alone does not result in stronger accountability of the players before the laws. Institutional innovations in corruption control have focused special attention on the administrative structure, without concomitant innovations in judicial and non–state public control [Filgueiras, Avritzer 2010].

Rather than represent gains in efficiency of public management, transparency in Brazil feeds the policy of scandal that victimizes democratic institutions, mainly the parties and the national Congress. The slow pace of the Judiciary Power produces a feeling of impunity, mainly concerning cases that involve major corruption. As highlighted by Taylor, construction of accountability in post–1988 Brazil depends on the bureaucracy's monopoly over public policies, making core matters, such as the Judiciary and the civil society action towards corruption control, poorly efficient [Taylor 2009]. In other words, the bureaucratic monopoly continues to control corruption over public management, thus hindering institutional innovations beyond the fiscal adjustment. As noted by Taylor and Buranelli, control disconnection in Brazil generates poor performance of the institutions in charge of accountability [Taylor, Buranelli 2007]. The outcome is a lack of efficient sanctions on corruption, despite the better transparency currently evidenced in Brazil.

Transparency and the institutional construction of its terms present issues toward the matter of democracy. Public control of corruption was centered on bureaucratic–administrative innovations, with few changes in judicial control and non–state public control [Filgueiras, Avritzer 2010]. The result is that transparency feeds the policy of permanent scandal, whose consequences are not felt by the regime's government, but in the legitimacy of the institutions. The outcome of the transparency policy in Brazil is that the bureaucratic monopoly over public policies results in low accountability, which in turn maintains the profusion of corruption scandals.

Research results. *Transparency and Policy of Scandal in Democratic Brazil.* The problem with transparency in Brazil is a lack of a more critical perspective of bureaucratic monopoly over the control of public policies. The way transparency is implemented in Brazil feeds a policy of permanent scandal, which affects the legitimacy of the political system and the efficiency of public policies. Managerial reforms, with the assumption that changes in the administrative structure in and of themselves produce beneficial effects on the management of public policies, are based on a restrictive assumption toward the policy, creating narrow view of public controls of corruption and the notion of accountability.

If accountability is related to agency problems, we can formulate several objections to the idea of transparency. First, it comes from a narrow, minimalist concept of citizenship, whereby the citizen is seen only as a client of public services in the market–relations threshold. Second, the concept of accountability, as approached by the theory of agency, disregards the public processes of creation of interests, lacking a normative ground more strongly connected to the policy [Philp 2009]. The notion of transparency derived from this concept of accountability means a rule related to the opening of information and processes

in the dimension of government and the market. *David Heald notes that the notion of transparency is not limited to politics, but is also a rule of market behavior, with the purpose of reducing uncertainties in business investments [Heald 2006].* The concept of transparency assumes that the reduction of information asymmetry contributes to reducing investment uncertainties, enabling a way to control the behavior of public servants. However, if centered on bureaucracy monopoly, transparency does not contribute to strengthening accountability, but to producing a policy of permanent scandal, where the result does not affect the political system of government, but the institution's legitimacy.

As indicated by Amitai Etzioni, the importance of transparency is the possibility of its ideological use, where the citizen is conceived as a consumer [Etzioni 2010]. Once the concept arises within the proposal for organizational changes in public management, guided by multilateral agencies and international opinion makers, transparency results as a new surveillance technology that does not distinguish private life from public life. This new surveillance technology inhibits good initiatives in public services, strengthens the power of the bureaucracy over public controls of corruption and of public policies, and directly affects the political system's legitimacy. Corruption control becomes a surveillance technique that creates defensive and weakly creative managements, overcentralization of the decision–making process, few incentives for interinstitutional cooperation, and deviation from the purposes of the actual bureaucratic body. Instead of emphasizing the virtues of the public body, transparency emphasizes the institutional pathologies, among them, corruption.

In Brazil, this can be easily evidenced by how corruption is punished. Corruption controls in Brazil give privilege to the reputational punishment, with few cases where the judicial control has proven efficient to control corruption. Only one political authority has been convicted in the Federal Supreme Court (STF) for an accountability crime. *Federal Congressman Zé Gerardo was sentenced on May 13, 2010, to two years and two months prison time, which was converted into payment of fifty minimum wages and community service. The congressman was convicted of improperly using resources from a federal agreement with the city of Caucaia, in Ceará State, to build dams to protect against drought. Resources were used to build wet bridges, which deviated from the purpose set forth under the agreement with the Ministry of Environment.* As indicated by Taylor, this creates a paradox of disconnection between the perception of corruption and the perception of accountability in Brazil (Taylor, 2009). Such disconnection is born of a hope for more transparency from the bureaucratic monopoly over public policies. Corruption control devices are less effective because there are few institutional innovations in the matter of judicial control and non–state public control, in other words, the Judiciary's role in ascribing criminal liability to corruption acts, and civil society's role in controlling public policies. The Brazilian citizen perceives that corruption has increased in Brazil, as is evidenced in fig 1.

More transparency without a broader view of accountability, and without effective control institutions fosters a gradual perception of corruption in Brazil. Brazilian public opinion does not accurately see the control agencies' actions, considering their public activity and legitimacy landmark. Brazilians' perception concerning the agencies' activities varies widely, as the media guides the matter of corruption. Figure 2 indicates corruption control institutions' visibility and legitimacy, according to public opinion.

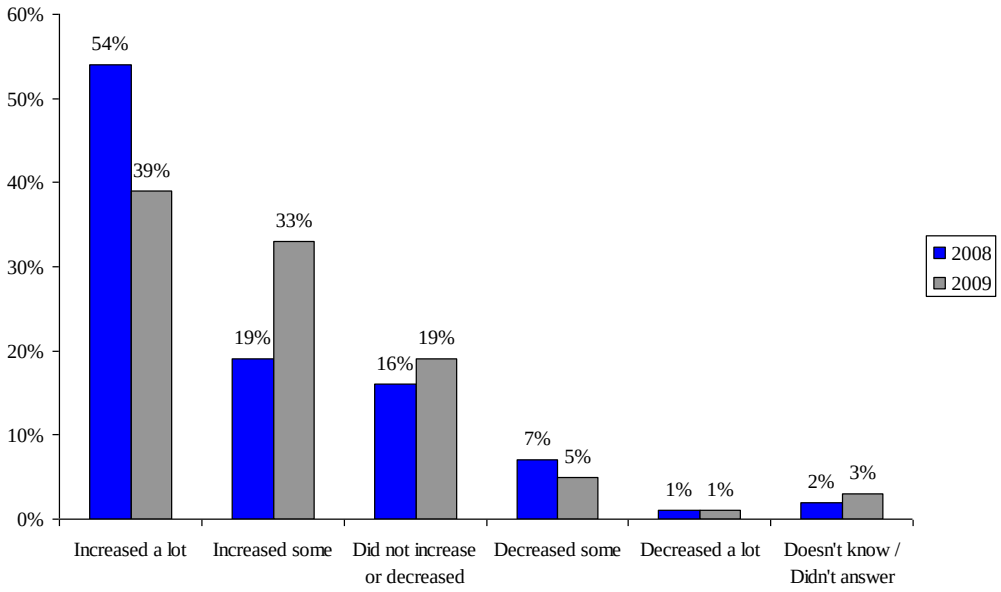

Figure 1 – Evolution of Corruption in the Last Five Years (%) *)

Source: Centro de Referência do Interesse Público/Vox Populi, 2008, 2009

*) Data presented on this charge and in the following charts and tables are based on the survey "Corrupção e interesse público" ("Corruption and public interest"), conducted by the Center for Public Interest Reference (CRIP) from Federal University of Minas Gerais (UFMG), in association with Instituto Vox Populi. The survey applied a structured questionnaire to a sample of the Brazilian population. The sample was made up of 2400 individuals, stratified by household status, gender, age, education, family income, and status towards employment. This stratification process is prorated according to data from the IBGE Demographic Census, year 2000, and by the National Survey for Household Sampling, year 2006. The sample has reliability interval of 95 percent, and a margin of error calculated at 2 percent.

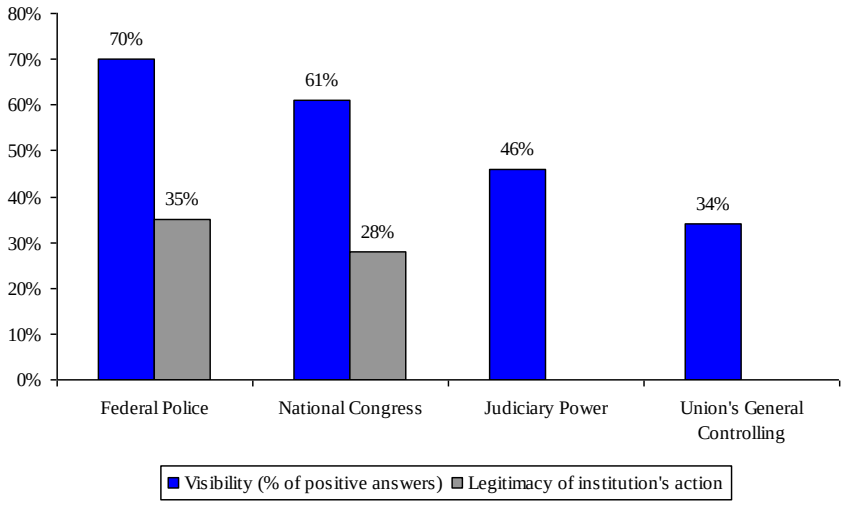

Figure 2 – Visibility and Legitimacy of Control Institutions (%) *)

Source: Centro de Referência do Interesse Público/Vox Populi, 2009

*) Legitimacy of the Judicial Power and CGU's actions has not been assessed.

There was a high perception of acts carried out by the Federal Police, mainly after Lula's first term in office. This is due to the high visibility the media assigned to operations that destroyed several corruption schemes. The Federal Police's work is assessed as negative in legitimacy. The increase of the Federal Police's discretionary power is followed by actions that are often outside of the parameters of legitimacy, which has led to the Federal Police's subverting its own

legitimacy, especially in Daniel Dantas case. According to Etzioni, transparency emphasizes the old matter of who controls the controller (Etzioni, 2010). There is an innovation in state administrative structures, and an increase in the police's discretionary powers under control of the government bureaucracy. More transparency supposedly means the production of information and the rendering of accounts under the control of bureaucratic bodies.

In Brazil, instead of solving the issue of corruption, transparency emphasizes institutional pathologies, and public opinion has a perception of increased corruption. According to the precepts of transparency, information produced by the bureaucratic–administrative control bodies does not set the bounds for the citizens' choices of public policies. As emphasized by Etzioni, the concept of transparency and its use in contemporary public management is not based on cognitive capacities of citizens. The citizens do not have the capacity to deal with available information on public policies. Moreover, it is a crucial to realize that the available information is subject to manipulation [Etzioni 2010]. The manipulation of information refers to differences in access to primary information. As the data must be manipulated, transparency continues to be under the control of bureaucracies. In addition, different institutions provide information differently, dependeding on interests and forces in the political arena. A more accurate judgment is not allowed, and those involved in corroputions scandals are members of the bureaucracies.

Transparency feeds a permanent policy of scandal. These scandals do not necessarily improve the citizen's access to information, which would enable him to make better choices. Scandals feed a defensive positioning of the citizenship toward political institutions, mainly toward representative institutions. As the transparency implemented by the control bodies is a bureaucratic monopoly, and not state policy, it has a more direct impact on the citizen's trust in the democratic order. As it is not a state policy, transparency leads naturally to vices. Public opinion sees the Brazilian state as corrupt, creating hindrances to democratic legitimacy. When asked if people who hold high government positions would accept entering a corruption scheme or not, the public corroborates a high number of positive answers, as shown in fig 3.

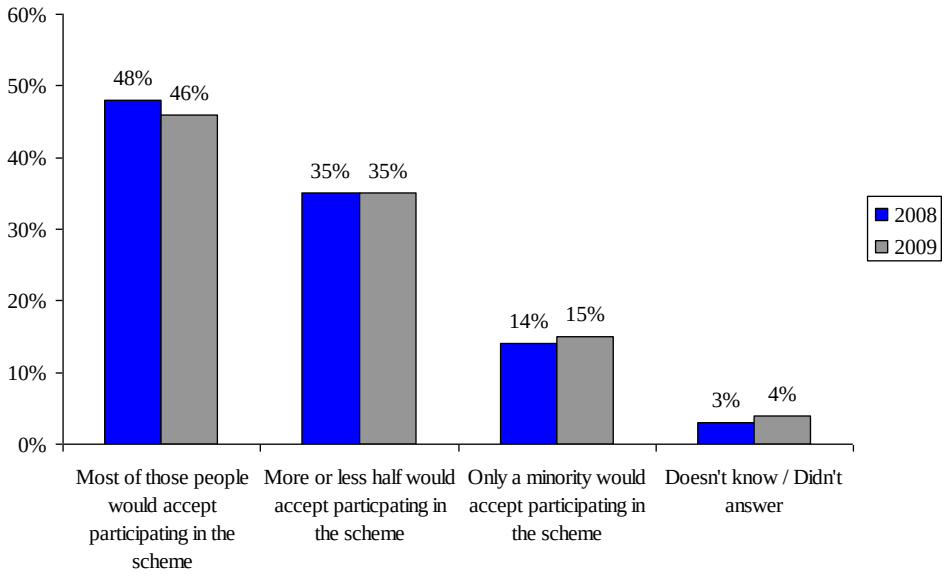

Figure 3 – Perception of High Government Positions and Their Relationship with Corruption (%)

Source: Centro de Referência do Interesse Público / Vox Populi, 2008 / 2009.

Transparency in Brazil feeds the policy of scandal and distrust from the citizen toward its own action. Transparency and corruption control are bureaucratic monopolies, and despite the managerial innovations resultant from the administrative reform, the conflict between bureaucracy and democracy continues. There is no systemic integration between the bureaucratic control, the judicial control, and the non–state public control exercised by civil society. Despite the institutional innovations in bureaucratic control, corruption continues to afflict Brazilian institutions. Control has increased, sanction continues to be low, and corruption reproduces itself and continues to negatively direct public opinion. Due to the disconnection of public corruption controls, corruption affects the state and its operational capacity for managing public policies [Filgueiras, Avritzer 2010].

Corruption affects the state because citizens mistrust politicians. More transparency does not guide the citizen's choices more accurately. In Brazil, despite the scandals that have swept different political parties and damaged their reputation, candidates have no constraint against running as a candidate again, and can potentially win. In several cases, politicians who lost their terms of office returned in subsequent elections, for instance, José Roberto Arruda, Jader Barbalho, and others. In other words, corruption is not relevant to the election processes, and transparency does not mean the best information is given or that the citizens exercise wisely. Taylor observes that there is a disconnection between perception of corruption and perception of accountability [Taylor 2009]. Non–integration of public controls leads to little information for the citizens to make their choices. Etzioni highlights the cognitive issue of transparency, which generates this sort of problem in democracy. Second, non–integration of public corruption controls foster a condition of institutional dispute, as in the recent case of the conflict between the Judiciary Power and the Federal Police, and in Daniel Dantas' case, the dispute between the National Congress and the Public Prosecution after the "law of gag" project, whose author was Federal Congressman Paulo Maluf, and the dispute between the Union Accounts Court and bodies from the direct administration.

The state is negatively impacted by transparency, mainly the representative institutions. When the Brazilian citizen is asked to identify corruption in different areas of society, it is clear how representative and state institutions are seen as a natural environment for vices. The result of the priority of the bureaucratic–administrative control is to enlarge the autonomy of the administrative structure and its legitimacy granted as a representative of social interest, in prejudice of democratic representation. In other words, corruption in Brazil is better noticed in the representative institutions, whose legitimacy arises from of the voting machines, than in the administrative structure and in the private environment, and the state is the main character of this process. As shown in fig. 4, the Brazilian citizen perceives corruption as more present in representative and public institutions and less present in social and private institutions. Transparency naturalizes corruption in the state range, producing a process of decentralization of democratic order.

Despite the institutional innovations generated by the administrative reform, the bureaucratic monopoly over public policy control and over corruption control is maintained in post–1988 Brazil. The main victim of corruption in Brazil is democracy itself, mainly the representative institutions.

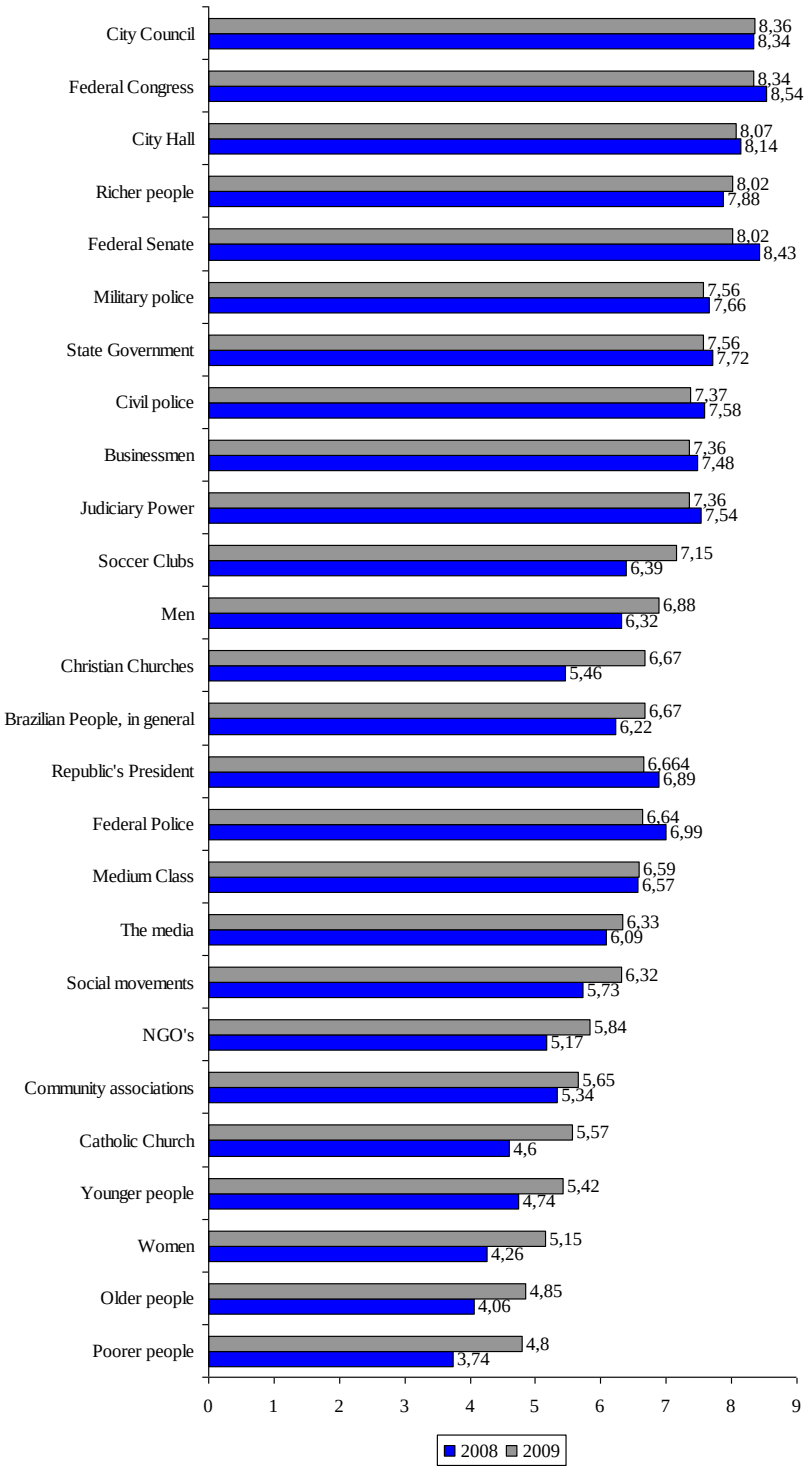

Figure 4 – Presence of Corruption in Institutional and Social Environments *)
Source: Centro de Referência do Interesse Público / Vox Populi, 2008, 2009.

*) This chart includes an analysis of the averages assigned by the citizens to the presence of corruption in these political and social institutions. The respondent was asked to assign a grade from zero to ten to each of these institutions, zero corresponding to no corruption and ten to a lot of corruption. For 2008, the average of the averages is 6.80, and for 2009, the average of the averages is 6.47.

The outcome of this process is the strengthening of a narrow economy–centered perception that change in the administrative structure causes more efficient public management and is less susceptible to corruption, and also strengthens the perception that to fight corruption Brazil needs more technology and less politics. The effects of transparency in Brazil, as implemented by the bureaucratic–administrative control bodies, fosters an incapacity of systemically integrating public control, creating obstacles to forming an integral system to gather state bureaucracy, judiciary power, and civil society. The result is that the Brazilian experience of increasing transparency has not resulted in an increase in accountability. This is in large part due to the introduction of a narrow perception of accountability, the theory of agency, and the role of the bureaucratic–administrative control upon its implementation.

Such diagnosis allows understanding that the development of accountability in Brazilian state institutions is still a challenge to democracy. This is in large part due to a permanent agenda of unfinished reforms that would allow the building of an integrated system guided by the integration of the bureaucratic–administrative control, judicial control, and non–state public control. Changes in Brazilian public management must go beyond transparency. It is necessary to recover a stronger notion of publicity that will allow Brazilians to configure effective democratic governance capable of controlling corruption and producing more open and democratic management of public policies.

Conclusions. *In Defense of Publicity to Create Democratic Governance.* Based on this analysis, we conclude that transparency cannot be an end in of itself. Once it is under the bureaucratic monopoly, transparency emphasizes institutional pathologies and contributes to a political culture poorly identified with the public world. In the Brazilian experience, the principle of transparency has been implemented without breaking the bureaucratic monopoly over public policies, which makes it susceptible to corruption in bureaucratic controls expanded without parallel strengthening of other accountability institutions, at the judicial control and non–state public control levels.

This sort of dynamic in building public corruption control in Brazil emphasizes institutional pathologies, as it creates a politically unstable environment, a political culture of little trust in the institutions, and a feeling of impunity within society, leading to a direct impact on the state's legitimacy. Corruption in Brazil contributes to decentralizing democratic legitimacy, as there is poor identification with the public, a growing process of judicialization of public policies, poor identification at the political representation level, and a separation between the general will in public business management.

In other words, corruption in Brazil not only costs money, but also directly affects democracy, as it undermines the development of democratic authority. Corruption does not require only economic expenditures, but also very expensive political expenditures. Transparency under the bureaucratic monopoly cannot cope alone with the corruption controlling Brazil. It is necessary to extrapolate the notion that democratic governance is conquered only by the postulate of managerial changes to the administrative structure of the Brazilian state and by increased transparency. It is essential that corruption control matter become a state policy and not only an innovation in the public administration range. As a state policy, it is crucial that corruption control extrapolate the notion of transparency toward the broadest notion of accountability, where it is not conceived only as institutional engineering, but is based on a systemic dimension

of public integrity. It is essential to extrapolate the notion of transparency with the purpose of recovering a broader notion of publicity of the state's actions.

Going beyond transparency toward publicity means to recover the relevance of public values and the public interest [Bozeman 2007]. It means considering a dimension of the integrity systems that would incorporate and coordinate the state powers and produce commitments with society toward public controls of corruption. It means thinking of accountability not only with a relational perspective, but also as a process that involves civil society and the state–constituted powers. In Brazil, there is a need to proceed with institutional reforms, aimed at producing larger participation of the civil society in the public forums, reducing the interinstitutional conflicts of the Brazilian state, and building an integrity system based on public values.

Democratic governance cannot be based on a narrow economy–centered view, but on valuing the politics and representation as centers for building public integrity and good management of public policies. In Brazil, publicity can be accomplished only through more transparency. Propositions presented herein do not mean to throw away or set aside what Brazil has accomplished so far. They mean thinking beyond managerial innovations, considering the claim that public values are relevant to build democracy. Corruption control, as a matter of the state, has to assure civil society's commitment toward public policy management, where civil society has an active voice and is capable of being heard. This also means institutional adjustment to build the empire of law.

Democratic governance does not depend exclusively on political system governability. It is the full exercise of the democratic authority, pursuant to equal consideration of the interests of different players. Publicity rule requires that, beyond transparency, it is essential that the state and society walk together. Corruption control is the result not only of state bureaucracy, but also a republican commitment of societies as a whole.

References

Abrucio, F. L. (2007). Trajetória recente da gestão pública brasileira: um balanço crítico e a renovação da agenda de reformas. *Revista de Administração Pública, 41*, commemorative special edition.

Bozeman, B. (2007). Public values and public interest. *Counterbalancing economic individualism.* Washington: Georgetown University Press.

Bresser-Pereira, L. C. (2001). Gestão do setor público: estratégia e estrutura para um novo Estado. *Reforma do Estado e administração pública gerencial.* Luiz Carlos Bresser Pereira, Peter Spink (Eds.). Rio de Janeiro: FGV Publisher.

Centro de Referência do Interesse Público. *Relatório de Pesquisa Projeto Corrupção e Interesse Público.* Belo Horizonte: Universidade Federal de Mins Gerais, 2009.

Constituição da República Federativa do Brasil. (2010). Brasília: Imprensa Oficial.

Etzioni, A. (2010). Is transparency the best disinfectant? *The Journal of Political Philosophy, 18(4)*, 389-404.

Ferejohn, J. (1999). Accountability and authority. *Democracy, accountability, and representation.* Adam Przeworski, Susan Stokes, Bernard Main (eds.). Cambridge: Cambridge University Press.

Filgueiras, F., & Avritzer, L. (2010). Corrupção e controles democráticos no Brasil. *Estado, instituições e democracia.* José Celso Pereira Cardoso (Ed.). Brasília: IPEA.

Heald, D. (2006). Transparency as an instrumental value. *Transparency: the key of better governance.* Christopher Hood, David Heald (eds.). Oxford: Oxford University Press.

Islam, R. (2003). Do more transparent governments govern better? *Policy Research Working Paper*. Washington, DC: The World Bank.

Motta, P. R. (2007). A modernização da administração pública brasileira nos últimos 40 anos. *Revista de Administração Pública, 41*, commemorative special edition.

Philp, M. (2009). Delimiting democratic accountability. *Political Studies, 57(2)*, 28-53.

Pollitt, C. (2003). *The essential public manager.* London: Open University Press; McGraw-Hill.

Rezende, F da C. (2009). Desafios gerenciais para a reconfiguração da administração burocrática brasileira. *Sociologias, 11(21)*, 344-365.

Skidmore, T. (1999). A queda de Collor: uma perspectiva histórica. *Corrupção e reforma política no Brasil. O impacto do impeachment de Collor.* Keith S. Rossen; Richard Downes (eds.). Rio de Janeiro: FGV Publisher.

Stiglitz, J. (1999). On liberty, the right to know, and public discourse: the role of transparency in public life. Oxford Amnesty Lectures, Oxford.

Taylor, M. (2009). Corruption, accountability reforms, and democracy in Brazil. *Corruption and democracy in Latin America.* Charles H. Blake, Stephen Morris (eds.). Pittsburgh: University of Pittsburgh Press.

Taylor, M., & Buranelli, V. C. (2007). Ending up in pizza: accountability as a problem of institutional arrangement in Brazil. *Latin American Politics and Society, 49(1)*, 59-87.

Willianson, O. E. (1985). *The economic institutions of capitalism.* New York: Free Press.

World Bank. (1991). *Managing Development - The Governance Dimension*. Washingon: DC.

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РАЗДЕЛ XX ОСОБЕННОЙ ЧАСТИ УКРАИНЫ: ПРОБЛЕМЫ КЛАССИФИКАЦИИ ПРЕСТУПЛЕНИЙ И ИХ РЕШЕНИЕ В ТЕОРИИ УГОЛОВНОГО ПРАВА

Аннотация. Статья посвящена системно-структурному анализу Особенной части УК Украины и месте в этой иерархии построения Особенной части УК Украины преступлений против мира и безопасности человечества. В статье рассматривается классификация преступлений, которые относятся к преступлениям против мира, и к преступлениям против безопасности человечества, предлагается авторское видение поднятой проблемы, с учетом международных нормативно-правовых актов, ратифицированных Украиной. Исследована позиция украинских ученых относительно классификации преступлений против мира и безопасности человечества.

Ключевые слова: мир, безопасность человечества, уголовный кодекс, международный правопорядок, преступление, Украина, классификация преступлений.

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SECTION XX OF THE SPECIAL PART OF THE CRIMINAL CODE OF UKRAINE: PROBLEMS OF CLASSIFICATION OF CRIMES AND THEIR SOLUTIONS IN THE THEORY OF CRIMINAL LAW

Abstract. The article is devoted to a systematic-structural analysis of the Special part of the Criminal Code of Ukraine and the place in the hierarchy of construction of crimes against peace and security of mankind in the Special Part of the Criminal Code of Ukraine. It is considered the classification of crimes that relate to crimes against peace and crimes against the security of mankind, it is proposed the author's vision of the raised problem, taking into account

international legal acts ratified by Ukraine. Studied the position of Ukrainian scientists concerning the classification of crimes against the peace and security of mankind.

Keywords: peace and security of mankind, the Criminal Code, international legal order, crime, Ukraine, classification of crimes.

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Вступление. Раздел XX Особенной части УК Украины состоит из трех самостоятельных родовых объектов: преступления против мира; преступления против безопасности человечества; преступления против международного правопорядка. «Фундамент», который их объединяет то, что эти преступления имплементированы на основании ратификации Украиной международных нормативно-правовых актов, в которых те или иные деяния определены в качестве международных преступлений. Вместе с тем однозначного понимания относительно вопроса о месте раздела XX Особенной части в иерархии построения УК Украины и классификации этих преступлений нет.

Анализ исследований и постановка задачи. Анализ научных подходов, проведенный нами, дает основание утверждать, что в теории уголовного права Украины нет единого мнения относительно понимания родового объекта указанных преступлений и их классификации. Такое состояние дел в теории уголовного права Украины, дает основание провести дискуссию касательно подхода законодателя Украины в определении родового объекта преступлений, закрепленных в XX разделе Особенной части УК Украины.

Любое международное преступление посягает на общий объект – это интересы мирового правопорядка. При этом, общий международный правопорядок состоит из различных родовых групп юридических интересов и благ. Международный правопорядок является глобальным понятием, поскольку им охватываются и вопросы обеспечения мира и безопасности человечества в целом, а также охраны прав и свобод личности, обеспечение экологической безопасности и т.д. В принципе, международный правопорядок – это совокупность всех интересов, взятых под защиту всеми отраслями права.

В науке уголовного права Украины существуют различные подходы к определению родового объекта преступлений, предусмотренных разделом XX Особенной части УК Украины. Так, распространено понимание мира, безопасности человечества и международного правопорядка как составных частей родового объекта всех указанных преступлений [Bazhanov, Baulin, Borisov 2002]. И. Хохлова и О. Шемьяков определяют родовой объект этой группы преступлений как установленные, регулируемые и охраняемые международным правом общественные отношения, обеспечивающие мирное сосуществование стран. Н. Хавронюк, А. Савченко, В. Кузнецов отмечают, что международный правопорядок является наиболее широким понятием, охватывающим и порядок, установленный в целях обеспечения мира на планете, и порядок, установленный для обеспечения безопасности человечества. Все названные исследователи выделяют в пределах родового объекта три видовых объекты: мир; безопасность человечества; международный правопорядок.

Различия имеют место лишь в вопросе отнесения конкретных преступлений к тем или иным видам. В частности, в доктрине уголовного

права Украины ученые, проводят классификацию преступлений по видовым объектам на следующие группы: А. Загика преступления: 1) против мира (ст.ст. 436, 437, 447, 438, 445, 439, 440 УК Украины); 2) против безопасности человечества (ст.ст.441, 442 УК Украины); 3) против международного правопорядка (ст.ст.443, 444, 446 УК Украины) [Streltsov 2002].

В. Киричко преступления: 1) против мира (ст.ст.436-438, 447 УК Украины); 2) против безопасности человечества (ст.ст.439-442 УК Украины); 3) против международного правопорядка (ст.ст.443-446 УК Украины) [Bazhanov, Baulin, Borisov 2002]. Н. Хавронюк преступления: 1) против мира (статьи 436, 437, 447 УК Украины); 2) против безопасности человечества (статьи 439-442 УК Украины); 3) против международного правопорядка (статьи 438, 443-446 УК Украины) [Oleksandrov, Dudorov, Klimenko 2004]. А. Савченко, В. Кузнецов, А. Штанько преступления: 1) против мира (ст.ст.436, 437, 447 УК Украины); 2) против безопасности человечества (ст.ст.439-442 УК Украины); 3) против международного правопорядка (ст.ст.438, 443-446 УК Украины) [Maharin, Baranenko 2001].

Отдельного внимания заслуживает позиция профессора С.Яценка, который исходил из того, что раздел XX Особенной части УК Украины охватывает международные преступления и часть преступлений международного характера. В международных преступлений (преступления против мира и безопасности человечества) он относит те, ответственность за которые предусмотрена ст.ст.436-442 УК Украины, а к преступлениям международного характера (преступления против международного правопорядка) - ст.ст.443-447 УК Украины [Yatsenko 2006]. Однако, придерживаясь такого подхода, указанное выше понимание родового объекта преступлений, предусмотренных разделом XX Особенной части УК Украины как состоящего из трех указанных составных частей, не является достаточно обоснованным.

Ясность, в вопросе определения родового объекта преступлений против мира и безопасности человечества и определение отдельных составов преступления к тому или иному виду, следовало бы ожидать от монографии С.Мохончука «Преступления против мира и безопасности человечества: генезис, эволюция, современная регламентация в уголовном праве и законе», однако в главе 3 параграфа 3 «Система преступлений против мира и безопасности человечества по уголовному праву Украины» и главе 4 параграфа 2 «Современные подходы к определению объекта преступлений против мира и безопасности человечества» автор не дает конкретики относительно четкой классификации преступлений, предусмотренных XX разделом Особенной части УК Украины. Текст работы не дает также ясности, какие преступления ученый отнес к преступлениям против мира, какие против безопасности человечества [Mohonchuk 2013].

Вопрос о родовом объекте преступлений против мира, безопасности человечества и международного правопорядка в теории уголовного права Украины останется дискуссионным, поскольку в уголовно-правовой доктрине Украины не существует однозначного понимания объекта преступления. Высказанные учеными по этому вопросу мысли можно выделить в две группы позиций. Первая из них говорит о том, что родовым объектом этих преступлений является общий мир и безопасность человечества, вторая – международный правопорядок.

Целью статьи является исследование проблем классификации преступлений и их решение в теории уголовного права.

Результаты исследования. Устав Международного военного трибунала для суда и наказания главных военных преступников европейских стран от 08.08.1945 г., является стержнем построения системы преступлений, предусмотренных разделом XX Особенной части УК Украины. Прежде всего это Устав Нюрнбегського трибунала, в ст.6 четко определяет примерную форму такой системы, а именно: *а) преступления против мира* – в таких преступлений следует отнести пропаганду войны (ст.436), планирование, подготовка, развязывание и ведение агрессивной войны (ст.437), применение оружия массового уничтожения (ст.439), разработка, производство, приобретение, хранение, сбыт, транспортировка оружия массового уничтожения (ст.440), посягательство на жизнь представителя иностранного государства (ст.443), преступления против лиц и учреждений, имеющих международную защиту (ст.444); *б) военные преступления* – к таким преступлениям следует отнести мародерство (ст.432), насилие над населением в районе военных действий (ст.433), плохое обращение с военнопленными (ст.434), нарушения законов и обычаев войны (ст.438), наемничество (ст.447); в) *преступления против человечности* – в таких преступлений следует отнести незаконное использование символики Красного Креста, Красного Полумесяца, Красного Кристалла и злоупотребление ими (ст.435), экоцид (ст.441), геноцид (442), незаконное использование символики Красного Креста и Красного Полумесяца, Красного Кристалла (ст.445), пиратство (ст.446).

В науке международного права преступления против человечности и военные преступления часто объединяют в более широкую группу преступлений против безопасности человечества [Trainin 1952].

Проведенное автором исследование позволяет сделать вывод о целесообразности раздел XX Особенной части УК Украины изложить в редакции: «Преступления против мира и безопасности человечества», поскольку такое название унифицируется с соответствующими международными нормативными актами.

Рассмотрим родовой объект преступлений XX раздела Особенной части УК Украины, исходя из того, что мир и безопасность человечества являются видовыми объектами упомянутых преступлений. На мир как видовой объект посягают преступления, ответственность за которые предусмотрена в ст. 436, 437, 439, 440, 443 и 444 УК Украины.

Отдельно следует обратить внимание на целесообразность отнесения к преступлениям против мира ст.265-1, ст.258-5 и ст.333 УК Украины, поскольку действия направлены на незаконное изготовление любого ядерного взрывного устройства или устройства, рассеивающего радиоактивный материал или излучает радиацию и может через свои свойства повлечь гибель людей, ущерб здоровью людей, имущественный ущерб в крупном размере или значительное загрязнение окружающей среды наносят вред интересам охраны мира. Отнесение финансирования терроризма к преступлениям против общественной безопасности крайне необоснованным.

К военным преступлениям в соответствии с международными нормативно-правовыми актами следует отнести – мародерство (ст.432), насилие над населением в районе военных действий (ст.433), плохое обращение с военнопленными (ст.434), нарушения законов и обычаев войны

(ст.438), наемничество (ст.447). Размещение законодателем военных преступлений в разделе XIX УК Украины непонятно, поскольку по особенностям их родового объекта, который обобщает охраняемые уголовным законом интересы, обеспечивающие безопасность человечества и соблюдения общепризнанных правил ведения войны и других вооруженных конфликтов, их место должно быть в разделе XX УК Украины.

Вызывает дискуссию и определения объекта пиратства. Считаем, что видовым объектом этого преступления является безопасность человечества, исходя из выбранной автором классификации, основанной на международных нормативно-правовых актах.

Российский законодатель отнес пиратство к преступлениям против общественной безопасности. Такое решение не соответствует международным нормативно-правовым актам, а также не имеет фундаментальных оснований, которые основываются на теории уголовного права (советского в том числе) и международного уголовного права. В этой связи интересным будет обратиться к законодательству РФ, где в ст. 1 Закона РФ «О безопасности» понятие «безопасность» определяется как состояние защищенности жизненно важных интересов личности, общества и государства от внутренних и внешних угроз. К основным объектам безопасности российские ученые относят: лицо – ее права и свободы; общество – его материальные и духовные ценности; государство – его конституционный строй, суверенитет и территориальную целостность [Lebedev 2011].

«Общественная безопасность» – сложная социальная категория, и до сих пор не выработано единого определения этого понятия в науке уголовного права. Академик В. Тихий определяет общественную безопасность в широком смысле слова как гарантированность прав и свобод человека, законность и правопорядок в обществе, и проявляется она в правоохранительной деятельности, в защите правопорядка от правонарушений, в борьбе с ними [Tyhyi 2006]. Вместе с тем отмечается, что общественная безопасность в широком понятии не может быть родовым объектом преступлений, потому что, как следствие, это не окажет возможности разграничить между собой преступления, ведь общественная безопасность в широком смысле этого понятия охватывает значительный круг общественных отношений, среди которых являются отношения – объекты опасных посягательств против государства, правосудия и тому подобное. Так, по мнению академика В. Тихого, законодатель использует общественную опасность как понятие, которое включает в себя только безопасность от источников повышенной опасности, среди которых выделяется безопасность от общеопасных источников, а именно оружия, взрывчатых веществ и т.п., применением которых и характеризуется пиратство.

Обоснованно изменение названия раздела XX Особенной части УК Украины – «Преступления против мира и безопасности человечества», поскольку родовым объектом преступлений, предусмотренных 436-447 УК Украины являются жизненно важные интересы международного сообщества (социальные ценности всего человеческого сообщества), а мир и безопасность человечества, как разновидности таких интересов, следует считать видовыми объектами преступлений. Особенность таких преступлений заключается в том, что они являются много объектными, и причиняют вред одновременно нескольким непосредственным объектам. Современный

международный правопорядок является целостной системой общественного порядка в мире, то есть мировой порядок, которого должны придерживаться, и в основном уже практически придерживаются, все участники современных международных отношений. Международный правопорядок – это совокупность всех интересов, взятых под защиту всеми отраслями права, он охватывает охрану интересов мира и безопасности человечества.

Проведенное исследование предоставило возможность сделать вывод, что к международным преступлениям следует отнести три категории: преступления против мира, военные преступления, преступления против человечности, последние два объединены в группу – преступления против безопасности человечества.

К преступлениям против безопасности человечества относятся: *военные преступления* – мародерство (ст.432 УК Украины), насилие над населением в районе военных действий (ст.433 УК Украины), плохое обращение с военнопленными (ст.434 УК Украины), нарушения законов и обычаев войны (ст.438 УК Украины), наемничество (ст.447 УК Украины) и *преступления против человечности* – незаконное использование символики Красного Креста, Красного Полумесяца, Красного Кристалла и злоупотребление ими (ст.435 УК Украины), экоцид (ст.441 УК Украина), геноцид (ст.442 УК Украины), незаконное использование символики Красного Креста и Красного Полумесяца, Красного Кристалла (ст.445 УК Украины), пиратство (ст.446 УК Украины).

К *преступлениям против мира* следует отнести: незаконное изготовление ядерного взрывного устройства или устройства, рассеивающего радиоактивный материал или излучает радиацию (ст.265-1 УК Украины), финансирование терроризма (258-5 УК Украины), нарушение порядка осуществления международных передач товаров, подлежащих государственному экспортному контролю (ст.333 УК Украины), пропаганда войны (ст.436 УК Украины), планирование, подготовка, развязывание и ведение агрессивной войны (ст.437 УК Украины), применение оружия массового уничтожения (ст.439 УК Украины), разработка, производство, приобретение, хранение, сбыт, транспортировка оружия массового уничтожения (ст.440 УК Украина), посягательство на жизнь представителя иностранного государства (ст.443 УК Украины), преступления против лиц и учреждений, имеющих международную защиту (ст.444 УК Украины).

Выводы. Мы предлагаем расположить указанные преступления в соответствии с их принадлежностью к двум группам: преступления против мира и преступления против безопасности человечества. Системно-структурный анализ Особенной части УК Украины позволил определить имеющую место непоследовательность и в отдельных случаях хаотичность построения его разделов. Если за основу построения Особенной части УК Украины принимать иерархию ценностей, то трудно согласиться с тем, что преступления в сфере хозяйственной деятельности находятся впереди преступлений против правосудия, а преступления против мира, безопасности человечества и международного правопорядка вообще занимают последнее место. В перспективе структура Особенной части УК Украины должна быть построена по принципу распределения всех преступлений в зависимости от их посягательства на интересы личности, общества и государства. В этой иерархии построения Особенной части УК Украины преступления против мира и безопасности человечества следует отнести к преступлениям против интересов государства.

Литература

Злочини проти миру та безпеки людства: генезис, еволюція, сучасна регламентація у кримінальному праві та законі : монографія / С.М. Мохончук. – Х.: Право, 2013. – 528 с.

Комментарий к Уголовному кодексу Российской Федерации / отв. ред. В.М. Лебедев. – 11-е изд., перераб. и доп. – М.: Издательство Юрайт, 2011. – 1334 с.

Кримінальне право України: Загальна частина: Підручник для студентів юрид. спец. вищ. закладів освіти /М.І. Бажанов, Ю.В. Баулін, В.І. Борисов та ін.; За ред. професорів М.І. Бажанова, В.В. Сташиса, В.Я. Тація. – Київ – Харків: Юрінком Інтер – Право. – 2002. – 416 с.

Кримінальне право України: Особлива частина: Підручник. (Ю.В.Олександров, О.О. Дудоров, В.А. Клименко та ін.) / За ред. М.І.Мельника, В.А.Клименка. – К.: Юридична думка, 2004.

Науково-практичний коментар до Кримінального кодексу України / С.С.Яценко (ред.). – 4-е вид., перероб. та доп. – К.: А.С.К., 2006. – 848 с.

Суб'єкт злочину за новим кримінальним законодавством України: монографія / Магарін М. С., Бараненко Д. В. / Під ред. д-ра юрид. наук, проф. Є. Л. Стрельцова. – Одеса : Астропринт, 2001.

Тихий В.П. Коментар до статей 258-1, 258-2, 258-3 та 258-4 Кримінального кодексу України / В.П.Тихий // Кримінальне право України. – 2006. – № 11. – С. 11.

Трайнин А.Н. Терроризм как метод подготовки и проведения войн // СГП. 1952. № 13.

Уголовное право Украины. Общая и Особенная части: Учебник / Под ред. Е.Л. Стрельцова. – Х.: ООО «Одиссей», 2002.

References

Bazhanov, M.I., Baulin, Yu.V., Borisov, V.I. ta in. (2002). *Kriminal'ne pravo Ukraini: Zahalna chastina*. Kiiv – Kharkiv: Yurinkom Inter – Pravo.

Lebedev, V.M. (2011). *Kommentarii k Uholovnomu kodeksu Rossiiskoi Federatsii: 11-e yzd., pererab. y dop.* Moskwa: Yzdatelstvo Yurait, 2011. – 1334 s.

Maharin, M. S., & Baranenko, D. V. (2001). *Sub'iekt zlochinu za novim kriminalnim zakonodavstvom Ukraini*. Odesa: Astroprint.

Mohonchuk, S.M. (2013). *Zlochini proti miru ta bezpeki liudstva: henezis, evoliutsiia, suchasna rehlamentatsiia u kriminalnomu pravi ta zakoni.* Kharkiv: Pravo.

Oleksandrov, Yu.V., Dudorov, O.O., Klimenko, V.A. ta in. (2004). *Kriminalne pravo Ukraini: Osobliva chastina.* Kyiv: Yuridichna dumka.

Streltsov, E.L. (2002). *Uholovnoe pravo Ukraini. Obshchaia y Osobennaia chasti.* Kharkiv: Odissei.

Trainin, A.N. (1952). Terrorizm kak metod podhotovki y provedeniia voin. *SHP. № 13*.

Tyhyi, V.P. (2006). Komentar do statei 258-1, 258-2, 258-3 ta 258-4 Kriminalnoho kodeksu Ukraini. *Kriminalne pravo Ukraini, 11,* 11.

Yatsenko, S.S. (2006). *Naukovo-praktichniy komentar do Kriminalnoho kodeksu Ukraini: 4-e vid., pererob. ta dop.* Kyiv: A.S.K.

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PRZETWARZANIE CZŁOWIEKA JAKO PILNA POTRZEBA WE WSPÓŁCZESNYCH PESYMISTYCZNYCH REALIACH

Streszczenie. Artykuł ukazuje potencjał przeżycia człowieka w nowych warunkach pesymistycznych, w których człowiek próbuje znaleźć jedyny sens życia, przeżyć za pomocą produkcji obrazów, którzy zamiast osób żyjących, uosabiają zasady życia nieszczęśliwego człowieka, Życie którego płynie w modelu nieludzkim.

Autor analizuje alternatywy przeżycia poprzez transformację człowieka w stworzonym środowisku, konsekwentnie wyodrębniają się i interpretują się obrazy: "cyborg", "marzyciel", "elf" i "simulacrum", które określają poglądy na świat i sposób przeżycie człowieka. Zauważono, że szereg możliwych zmian człowieka jest wynikiem wolnego wyboru i nałożonej ideologii lub mediów. Udowodniono, że ludzkie przeżycie wymaga zmiany myślenia, które polega na zmianie sposobu myślenia, aktualizacji wartości i działaniach człowieka współczesnego. Przedstawione i uzasadnione przepisy stanowiące, że osoba w sytuacji, gdy jej przetrwanie zależy od priorytetów najbliższej przyszłości, więc obecny stan społeczeństwa można określić jako społeczeństwo przetrwania.

Słowa kluczowe: przetwarzanie, identyczność, Cyborg, wirtualna rzeczywistość, simulacrum.

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SURVIVAL OF HUMAN AS A HIGH PREORITY REQUIREMENT IN THE PESSIMICTIC REALITY

Abstract. In the article the potential of human survival in the new pessimistic conditions in which human tries to find the meaning of life, survive with the help producing images, that instead of living individuals, are implementation the norms of life of miserable human is reviewed. The author analyses alternatives of survival by transforming of the human in the man-made environment, gives and makes an interpretation of images: “cyborg”, “dreamer”, “elf” and “simulacrum”, that determine a view of the world and way of survival.

The variety of possible changes of human as the result of free choice and imposed ideology or mass media is noted. The human survival demands a change of view of world, that involves changing the way of thinking, values and activity of modern man is proved.

Keywords: survival, identity, cyborg, virtual reality, simulacrum.
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Wstęp. Era nowoczesności stwierdziła pesymistyczne perspektywy dla dalszego istnienia człowieka nie mogła przeciwdziałać powstawaniu kryzysów, zróżnicowanych pod względem pochodzenia i nasilenia skutków. Niepewność przyszłości wraz z scenariuszami dalszego rozwoju ludzkości wskazują, że człowiek jest na krawędzi, gdzie jego przetrwanie zależy od priorytetów najbliższej przyszłości.

Jeszcze A. Camus zauważył absurd i grozę istnienia człowieka, pisał, że człowiek jest w ciągłym procesie przetrwania. Jednak pod przetwarzaniem zrozumieją zjawisko tworzenia człowiekiem najbardziej optymalnych warunków dla jego istnienia. Oczywiście, żyjemy w tragicznej epoce, ale nie trzeba identyfikować tragiczne jako beznadziejne. Dzisiaj należy rozmawiać także o pewnych zdarzeniach, warunkach przezwyciężenia globalnego kryzysu, blokowaniu i usuwaniu uniwersalnego zagrożeni od ludzkości.

Przetrwanie ludzkości w całości jest możliwe nie tylko dzięki skutecznej realizacji nowych modeli rozwoju cywilizacyjnego, polegających na co-ewolucyjnej ludzkiej interakcji z otoczeniem. Wielkie znaczenie ma ludzki potencjał przeżycia w warunkach pesymistycznych perspektyw dla dalszego istnienia ludzkości na Ziemi.

Analiza badań i formułowanie problemu. W badaniach społeczno-filozoficznych problem przetrwania człowieka w warunkach transformacji nowoczesności zajmuje ważne miejsce w pracach takich autorów, jak J.Baudrillard [Бодрійяр 2004], J. Derrida [Деррида 2005], G. Deleuze [Делез 1998], D. Bell [Белл 1999], W.Beck [Бек 2000], K. McNeill [McNeill], E. Stephen [Stephen 2005], M.Fukuyama [Фукуяма 2004], J.Habermas [Хабермас 2002], a także w pracach lokalnych autorów O.H. Białorus [Билорус 2002], O.E. Wysocka [Висоцька 2009], A. A. Horiachkovska [Горячковская 2007], M.I. Khylko [Хилько 2008] i innych naukowców współczesnego społeczeństwa, którzy wskazują, że nowy związek człowieka ze światem przyczynił się do powstania nowego sztucznego środowiska, które jest bardzo agresywne w stosunku do przyrody i kultury duchowej.

Celem artykułu jest ujawnienie zmian, z jakimi osoba powinna spotkać się aby przeżyć w świecie, gdzie istnieje problem utraty nie tylko identyczności, ale także tożsamości osobistej.

Do wdrożenia tego celu należy przyciągnąć dość szeroki kontekst kulturowy – od badań dotyczących antropologii filozoficznej do dzieł fantastycznonaukowych, które mają zdolność do akumulacji i do wyjątkowo tragicznego opisywania istotnych marzeń i obaw współczesnych ludzi.

Wyniki badań. Możliwość ewolucji, przystosowania się do nowego środowiska jest ważną podstawą dla dalszego przetrwania cywilizacji i kontynuacji historii.

Człowiek przekształcił środowisko na tyle że sam stał się zakładnikiem zmian, które uniemożliwiają ochronę istniejących parametrów istnienia człowieka, on już "nie umieści się w granicach istniejącego bytu natury i

społeczeństwa. Stąd - jego ciągłe pragnienie do samoodnowy" [Горячковская, s.12].

Przeczuciem tych wydarzeń była pełna filozofia irracjonalizmu. Friedrich Nietzsche przewidywał nieuchronność zmian, wyczerpanie potencjału tradycyjnej religii, moralności i kultury w ogóle. W nowym tysiącleciu, wyrażenie "człowiek jest czymś, co trzeba przezwyciężyć" [Ницше 1990, s.10], nie jest wyzwaniem dla społeczeństwa, które utknęło w martwym punkcie, ale odzwierciedla nacisk czasu.

Ponadto doświadczenie tworzenia obrazów przyszłości oparte jest na egzystencjalizmie, ze względu na to że wyjątkowość tej tradycji polega na tym, że egzystencjalizm, po pierwsze protestuje przeciw osobistej kapitulacji, przed "globalnymi problemami", po drugie, próbuje nauczyć się z apokaliptycznych doświadczeń historii nowe ogólnie ideologiczne postulaty. Egzystencjalizm, zaprzeczając obiektywność, teoretyzowanie rzeczywistości i orientację na poznanie esencji, które są charakterystyczne dla filozofii klasycznej, skupia uwagę na doświadczeniach podmiotu , a więc pretenduje do statusu filozofii prawdziwego humanizmu.

Stosując fundamentalną nieprzewidywalność rozwoju takiego skomplikowanego systemu, jak społeczeństwo trzeba skoncentrować się na dwóch ważnych punktach: po pierwsze, integralną częścią przyszłości są zróżnicowane pod względem pochodzenia i stopnia ciężkości kryzysy, po drugie, współczesna kultura narzuca pewne ograniczenia dotyczące możliwości modelowania przyszłości w ogóle i człowieka w szczególności. Chodzi o fundamentalnych opozycjach "scjentyzm - antyscjentyzm", "tehno-centryzm - przyrodo-centryzm" [Пригожий 1991]. W takich ramach, alternatywy przetrwania człowieka są ograniczone do następnych obrazów.

Pierwszy obraz - cyborg. Termin "cyborg" wprowadzili Manferd E. Clynes i Nathan S. Kline ze względu na ich koncepcję rozszerzenia możliwości ludzkich, do przetrwania poza ziemią. Ta koncepcja jest wynikiem rozmyślań na temat konieczności zacieśnienia stosunków między człowiekiem a maszyną, w zależności od rozwoju badań kosmicznych.

Cyborg - główny bohater cyber utopii, człowiek-maszyna stworzony w odpowiedzi na wyzwania związane z high-tech końca XX wieku, pokusa która uosabia nowy sposób pragnienia. On jest hybrydem, który uosobi najbardziej nieludzkie fantazji naukowców apokaliptycznego kierunku i ucieleśnia idee post-ludzkiego wymiaru, nad-przyrodniego i sztucznego zjednoczenia człowieka. Cyborg to znak towarowy biotechnologii, inżynierii genetycznej, wszczepionych narządów, które dekonstruują kontrast między naturą a cywilizacją [Женщина и визуальные знаки 2000, s.56].

Obraz cyborga, który został ustanowiony w świadomości społecznej przez kulturę popularną, jest podwójny i sprzeczne. Z jednej strony, cyborg - maszyna, która niszczy, powoduje przerażenie jej mocą, z drugiej strony - nowy Mesjasz, który ratuje ludzkość, spersonalizowany obraz "humanitarnej" nauki. w powodu transformacji ciała w bezproblemową i wydajną maszynę, człowiek ma nadzieję przetrwać w najbardziej niesprzyjających warunkach, które są przewidywane w przyszłości.

W kategoriach egzystencjalnych obraz cyborga jest logiczną kontynuacją cywilizacji poprzez pokonanie uzależnienia od natury, która ma formę kompletnego braku komunikacji z naturalnością, kultywację pełnej "sztuczności" w człowieku oraz identyfikację z rzeczywistością techniczną. Transformując w cyborga i utraciwszy "naturalną" cielesność człowiek jest w stanie przetrwać w

nieprzyjaznym i wrogim środowisku. Jednocześnie, nadczłowiek mechaniczny może stracić potrzebę jedności z naturą, zostać niezależny, a problemy środowiskowe stracą wszelki sens, świat przekształci się w dużą maszynę, cudzą dla świata [Белялетдинов 2006].

Alternatywa techno-centryzmu "od człowieka do cyborga" w swojej konstruktywnej, optymistycznej interpretacji, jest w stanie zapewnić poprawę przetrwanie za pomocą doskonalenia środków technicznych i głębszej integrację z ludzkim ciałem. W rezultacie postępu technologicznego człowiek nie tylko zmienia świat, ucząc się nowych stopni swobody, ale otrzymuje możliwość własnego uporządkowania.

Drugi obraz - elf. Ten obraz nie jest wewnętrznie sprzeczny, jak obraz człowiek-maszyna, ale on wchodzi w konflikt z istniejącymi normami masowego społeczeństwa konsumpcyjnego. Elf skupia w sobie elementy naturalno-centrowej alternatywy przetrwania człowieka.

W XX wieku, pojawia się nowy gatunek w literaturze - fantastyka. Założycielem i klasykiem tego gatunku jest angielski pisarz John Reuel Tolkien, autor słynnej pracy "Władca pierścieni" [Толкиен 2000]. Istnieją powody, aby uznawać świat elfów stworzony przez Tolkiena za wcielenie może nie świadomych oczekiwań współczesnych ludzi na harmonijny związek z naturą i stabilność społeczną.

Ważne cechy elfów w fantastycznej rzeczywistości - mądrość, nieśmiertelność, miłość do natury, głęboki szacunek dla życia, nie właściwa im chciwość i chęć do gromadzenie [Толкиен 2000]. Ten zestaw cech, można uznać za istotny ideał społeczny, który jest integralną częścią wyobrażeń o przetrwanie.

Na uwagę zasługuje ten fakt, że liczba elfów znacznie mniejsza niż liczba ludzi i przedstawicieli innych ras, zamieszkujących bajkowy świat. Utrata każdego jest dla elfów prawdziwą tragedią. Być może stosunkowo niewielka liczba pełni funkcję rozsądnej nagrody za harmonijne istnienie [Толкиен 2000]. Jest oczywista popularna we współczesnej nauce idea depopulacji w celu obniżenia ciśnienia antropogenicznego na biosferę.

Fantastyka jest popularna z powodu idei transformacji człowieka, które są nadawane przez graficzne obrazy elfów i innych mądrych stworzeń, bliskich ludziom współczesnym, którzy oczekują więcej od świata przyszłości, niż od środowisko. Obraz elfa jest integralną częścią współczesnego kontekstu kulturowego, to nie tylko wynalazek pisarzy, ale również ukryta motywacja pracy naukowej, model transformacji współczesnego człowieka i warunków jego istnienia.

Przyrodniczo centrowa alternatywa "od człowieka do elfa" opiera się na możliwości przetrwania poprzez radykalne zmiany światopoglądu współczesnego człowieka, doskonalenie moralnych podstaw jego istnienia. Chodzi o przezwyciężaniu depersonalizacji, zniszczeniu tożsamości, unifikacji psychologicznych cech społeczeństwa i o ludzkiej wyjątkowości.

Trzeci obraz - marzyciel. Tan obraz odzwierciedla istotną jakość człowieka, a mianowicie zdolność do ucieczki od rzeczywistości w światy, wyprodukowane przez wyobraźnię - wirtualne rzeczywistości, do których sprowadza się rzeczywistość jako taka dzięki projektowaniu w percepcji obiektu. W zależności od stopnia rozwoju marzenia przyczyniają się do przeżycia i adaptacji do warunków środowiska. Oprócz tego marzenia formują kontemplacyjną orientację charakteru i pomagają w rozwoju wewnętrznego świata człowieka.

Nowoczesne technologie komputerowe znacząco zmieniają treść filmu i telewizji, wszystkich sfer życia społecznego (od sztuki do ekonomii, polityki i

moralności). Głównym efektem wpływu cyfrowych środków komunikacji elektronicznej jest przejście od nowoczesnych do postmodernistycznych wytyczne globalizacji, w wyniku czego tworzą się liczne mozaiki kulturowe, podporządkowane logice post-racjonalnej komunikacji jak sieciowej formie wirtualnej spójności wspólnot. Rzeczywistość wirtualna służy zatem jako idealna, przykładowa, wyższa rzeczywistość, na którą skierowane są pragnienia przedmiotów komunikacji, samookreślenie których wynika dzięki za pośrednictwem stworzonych przez środki komunikacji elektronicznej symulacji symulacyjnych obrazów "ja" i "świat", gdzie "przedmiot" jest zawsze quasi podmiotem działania komunikacyjnego [Висоцька 2009, s.140].

We współczesnym świecie sztuka tworzenia złudzeń przez radio, kino, telewizję, Internet i programy komputerowe osiągnęła taką doskonałość, że powoduje zagrożenie rozróżnienia realnego i wirtualnego, iluzorycznego.

Co ważne, techno-centryczna alternatywa rozwoju człowieka "marzyciel" jest nierozerwalnie związana z zagrożeniem całkowitego zerwania z pierwotną rzeczywistością, czyli światem przyrody. Jeśli wirtualna rzeczywistość ze sposobu przetrwania przekształca się na substytut życia, to ludzkość ryzykuje zejść z historycznego dystansu.

Obraz "marzyciela" może być traktowany jako możliwość do przezwyciężenia kryzysu za pomocą rzeczywistości, stworzonej przez wyobraźnię i środki techniczne i pełni w byciu człowieka wiele ważnych funkcji [Wysocka 2009].

Po pierwsze, wirtualne światy mogą być wykorzystywane w procesie edukacyjnym. Komputerowa symulacja zniszczenia biosfery powoduje ogromne publiczne oburzenie i i przyciąga ludzi do analizy problemów społecznych i środowiskowych. Używanie programów interaktywnych może być środkiem do kształtowania świadomości noosfery i rozszerzyć wyobrażenia ludzi o procesach wartości uniwersalnych.

Po drugie, przestrzeń wirtualna jest ważnym elementem dialogu kultur. Komunikacja pomiędzy przedstawicielami różnych państw, narodów, religii pozytywny wpływa na upowszechnianie koncepcji przetrwania i przyczynia się do ich praktycznej realizacji. W globalnej sieci Internet jest duża ilość różnorodnych materiałów z istotnych kwestii środowiskowych i społecznych, istnieje wiele specjalistycznych stron internetowych organizacji ekologicznych, fundacji charytatywnych, które łączą ludzi z różnych krajów w walce o przetrwanie.

Po trzecie, iluzja, stworzona w wyobraźni człowieka podczas czytania książek, oglądania telewizji, pracy z zasobami internetowymi i innymi formami integracji w sztuczne "środowisko życia" może służyć w dużej mierze jako ratunkowy „wtrysk dla cywilizacji” (S.Lem), kompensując straty psychiczne spowodowane niezadowoleniami i obawami przed zbliżającymi się kryzysami.

Tak więc, w ramach techno-centrycznej alternatywy "marzyciel" uważany jest za możliwość przetrwania ludzkości poprzez tworzenie i funkcjonowanie wirtualnej rzeczywistości jako rzeczywistości symulowanej komputerem. Absorpcja przedmiotu w ten sposób wirtualną rzeczywistością prowadzi do wielu konsekwencji, zarówno fizycznego i psychicznego charakteru. Przede wszystkim dotyczy to pewnej nierównowagi światopoglądu przedmiotu i problematyzacji jego tożsamości, co przewiduje zaprzeczenie związków między ciałem i osobowością.

Czwarty obraz - simulacrum. Ten obraz przedstawiono w koncepcjach francuskich postmodernistów – G.Bataille, J. Baudrillarda i G.Deleuze. Kulturologiczny model postmodernistycznej filozofii przyczynił się do zniknięcia

osoby uznawszy humanizm za meta-narrację i pozostawiwszy człowieka bez boskości, stworzył nowy antropologiczny obraz człowieka. Taka perspektywa reprezentuje procesu symulacji jako nieustające odrodzenie simulacrum poprzez bezpośrednie doświadczenie bycia, a simulacrum jako znak i narzędzie rozumienia bycia, które zawsze ucieka.

Lekką ręką G. Bataille "simulacrum" został przedmiotem badań wielu naukowców. Koncepcja symulacji J.Baudrillard zdobyła największą popularność. W swojej pracy "Simulacra i symulacja" [Бодрийяр 2004] twierdzi, że symulacja jak mimika żeby przetrwać i symulacja jako strategia hiper-realności jest podporządkowana zasadom doświadczenia.

Doświadczenie-kontemplacja na poziomie symulacji ustępuje miejsce doświadczeniu-działalności, które dość abstrakcyjnie można określić jako „walkę z niezdolnością do życia … walkę przeciwko śmierci w życiu" [Бодрийяр 2004, s. 78].

„Simulacrum (w języku łacińskim) - duch lub bliźniak, czyli coś podobne do realnej rzeczy, ale jest tylko duchem i zastąpi tę rzecz, i jest jej sztuczną imitacją. To znaczenie jest podobne do łacińskiego słowa "Symulatory", które podkreśla znaczenie żywej gry, co jest naturalnym, bo sztuczna imitacja żywego może być rozegrana tylko istotą żywą, czyli człowiekiem” [Мамардашвили 2000].

Ożywiając simulacrum człowiek jest w stanie znaleźć sens bycia, a tym samym i śmierci. Symulacja jako doświadczenie-działanie ma na celu pokonanie różnych problemów w życiu, to jest rzeczywisty proces, podczas którego możliwe różne związki pomiędzy doświadczeniem a rzeczywistością: zniekształcenia, dostosowanie, idealizacja rzeczywistości, zmysłowo-praktyczne przekształcanie rzeczywistości.

Człowiek występuje w roli medium doświadczenia w ciągu całej swojej historii. Niemożliwość "przekazać" doświadczenia, kontynuować go, zachęca człowieka do nienaturalnych sposobów wyrażania. W ten sposób powstała przestrzeń symboliczna, symboliczne środowisko człowieka. Najważniejsze momenty ludzkiego życia (narodziny, śmierć) z dawnych czasów przeżywają razem. Kolektywne przeżywania i współudział przekształcały i w dalszym ciągu przekształcają simulacrum w symbol - szczegółowy znak stanu chwilowego, który jest w stanie nurkować do sensu [Горячковская 2007, s.89].

Równie interesująca jest interpretacja simulacrum w związku z problemem tożsamości, zaoferowanym G. Deleuze. Simulacrum charakteryzuje się badaczem jako pozbawiony podobieństwa, który ukrywa brak podobieństwa i nierównowagi wewnętrznej. G.Deleuze koncentruje się na definicji simulacrum jako "kopie kopii." Taka definicja eliminuje rozróżnienie między charakterem kopii a charakterem simulacrum.

G. Deleuze oferuje dwa wzory: "różni się tylko to, co jest podobne" i „tylko różne może być podobne do siebie". Dwa sposoby przeczytania świata określają świata kopii i świat simulakrów. Kiedy myślimy o różnicy pod względem poprzednich podobieństw, pod względem tożsamości, to definiujemy świat jako obraz - świat kopii lub reprezentacji. Wyobrażając sobie podobieństwo jako wynik niespójności i nieporównywalności definiujemy świat jako fantazmat, przestrzeń simulakrum. Taka decyzja eliminuje problem istoty i podobieństwa, modeli i kopii. Simulacrum "staje przytułkiem pozytywnej mocy, która zaprzecza oryginał i kopię, model i reprezentację" [Делез 1998, s. 226].

W ten sposób, w ramach postmodernistycznej alternatywy "simulakrum" oferuje możliwość przeżycia za pomocą symulacji, jako możliwości oderwania się

od poziomu refleksyjnego, zgodnie z zasadami istniejącego społeczeństwa, po otwarciu na świat egzystencjalnych doświadczeń, świat sensu, który zawsze ucieka.

Wnioski. Nowoczesność z jej kryzysowym społeczeństwem zniekształconej rzeczywistości produkuje takie same zniekształcone formy public relations, tworzy nowy typ człowieka, który rozpada się na obrazy, który, aby przetrwać, aby uratować się, przełącza się na inną rzeczywistość - świat gry, teatralnej warunkowości z własnymi wartościami i układami. W warunkach pesymistycznych perspektyw człowiek stara się znaleźć jedyny sens życia, w którym obrazy są sposobem przetrwania człowieka. Obrazy, zamiast prawdziwych twarzy, są przestrzeganiem zasad bycia człowieka nieszczęśliwego, życie którego płynie nieludzkimi modelami, które mogą być wynikiem wolnego wyboru, lub ideologii czy media.

To wszystko wymaga zmiany tradycyjnych sposobów i rodzajów myślenia, tworzenia świadomości opartą na połączeniu wartości ludzkich i narodowych.

Najistotniejszymi zasadami tej świadomości powinny być: ustanowienie zasady niestosowania przemocy i demokracji w wewnętrznej i zewnętrznej polityce państw, w relacjach interpersonalnych i grupowych, konieczność przejścia od kultu siły do dialogu, kompromisu, konsensusu; konieczność procesów integracyjnych w życiu duchowym - zarówno religijnym i świeckim, znalezienie sposobów zbliżenia ideologicznego, wzajemnego zrozumienia między krajami i narodami; priorytet wartości ludzkich nad regionalnymi, narodowymi, klasowymi itp.; priorytet ogólnie-cywilizacyjnej odpowiedzialności, jaka powinna wejść do uniwersalnej praktyki.

Współczesny człowiek poszukuje wsparcia duchowego, które niczym i nikim nie można zastąpić, ostrożnego optymizmu - przyszłość ludzkości ma alternatywy, dzisiejszy kryzys cywilizacji może się zmienić, na nowy rozwój, nowe postępy, ja zdarzało się wiele razy w historii. Analizowane alternatywy nie wyczerpują wszystkich różnorodnych możliwości, otwartych dla ludzkości w dążeniu do przetrwania, ale z kolei zawierają najbardziej aktualne trendy w nowoczesnym społeczeństwie, naukowe prognozy naukowców i ważne oczekiwania społeczne.

Literatura

Бек У. Общество риска. На пути к другому модерну / У. Бек // пер. с нем. В.Седельника и Н. Федоровой; послесл. А. Филиппова. - М.: Прогресс-Традиция, 2000. - 384 с.

Белл Д. Грядущее постиндустриальное общество. Опыт социального прогнозирования / Д. Белл // перевод с англ.; под ред. В.Л. Иноземцева. – М.: Academia, 1999. – 661 с.

Белялетдинов Р. Р. Кибер-человек: взгляд в будущее / Р. Р. Белятдинов // Человек. – 2006. – № 6. – С. 128-131.

Билорус О. Мы могли бы быть среди лидеров. Возможно ли устойчивое развитие в Украине? / О. Билорус, Ю. Мацейко // Голос Украины. – 2002 - № 44.

Бодрійяр Ж. Симулякри і симуляція / Ж. Бодрійяр // пер. з фр. В. Ховтун. – К.: Видавництво Соломії Павличко «Основи», 2004. – 230 с.

Висоцька О.Є. Ефекти впливу електронних засобів комунікації на суспільні процеси / О. Є. Висоцька // Практична філософія. – Київ : ПАРАПАН, 2009. - №1 (№ 31). – С. 134-141.

Горячковская А. Человек и симулякр / А. Горячковская // Вісник Харківського національного університету імені В.Н. Каразіна. Серія: Теорія культури та філософія науки. – Х.: ХНУ, 2007. – №776. – С. 83-90.
Гусейнов А. А. Что мы такое? / А. А. Гусейнов // Человек. – 2001. – № 2. – С. 5-19.
Делез Ж. Платон и симулякр / Ж. Делез // пер. с фр. Е.А. Наймана. Интенциональность и текстуальность. Философская мысль Франции XX века. – Томск: Издательство «Водолей», 1998. – С. 225-241.
Деррида Ж. Наконец-то научиться жить (последнее интервью) / Ж. Деррида // Вопросы философии. – 2005. – № 4. – С. 133-144.
Женщина и визуальные знаки / Коллект. автор.; под ред. А. Альчук. – М.: Идея-Пресс, 2000. – 280 с.
Мамардашвили М. К. Беседы о мышлении / М. К. Мамардашвили // Режим доступа: http://www.psychology.ru/library/00055.shtml.
Ницше Ф. Так говорил Заратустра. Книга для всех и ни для кого / Ф. Ницше // пер. с нем. В.В. Рынкевич. – М.: Интербук, 1990. – 301 с.
Пригожий И. Философия нестабильности / И. Пригожий // Вопросы философии. – 1991. – № 6. – С. 46-57.
Толкиен Д.Р.Р. Властелин колец. / Д.Р.Р. Толкиен // пер. с англ. Н. Грирорьева, В. Грушецкий. – М.: Азбука, 2000. – 1100 с.
Фукуяма Ф. Наше постчеловечское будущее: последствия биотехнологической революции / Ф. Фукуяма // М.: ООО «Издательство АСТ», 2004. – 352 с.
Хабермас Ю. Будущее человеческой природы: на пути к либеральной евгенике? / Ю. Хабермас // пер. с нем. М.Л. Хорькова. – М.: Из-во «Весь мир», 2002. – 144 с.
Хилько М. І. До питання про дієвість суб'єктів екополітики / М.І. Хилько // Практична філософія. – 2008. – № 4 (30). – С. 39-51.
McNeill K. Survivology: How to save the world and have fun What does survival mean? / K. McNeill //Режим доступу: http://www.survivology. blogspot.com.
Stephen E. Braude. Personal Identity and Postmortem Survival / Braude E. Stephen // Social Philosophy and Policy. - 2005. - 22 (2/3) - P. 226-249.

References

Beck, U. (2000). *Obshhestvo riska. Na puti k drugomu modernu.* Moskwa: Progress-Tradicija.
Bell, D. (1999). *Gryadushhee postindustrial'noe obshhestvo. Opyt social'nogo prognozirovaniya.* Moskwa: Academia.
Beljaletdinov, P. P. (2006). Kiber-chelovek: vzglyad v budushhee. *Chelovek, 6*, 128-131.
Bilorus, O. (2002). My mogli by byt' sredi liderov. Vozmozhno li ustoychivoe razvitie v Ukraine? *Golos Ukrainy, 44*.
Bodrijar, Zh. (2004). *Simulyakri i simulyaciya.* Kyiv: Vidavnictvo Solomiї Pavlichko «Osnovi».
Braude, Stephen E. (2005). Personal Identity and Postmortem Survival. *Social Philosophy and Policy, 22 (2/3),* 226-249.
Delez, Zh. (1998). *Platon i simulyakr: per. s fr. E.A. Naymana. Intencional'nost i tekstual'nost. Filosofskaya mysl' Francii XX veka.* Tomsk: Izdatel'stvo «Vodolej».

Derrida, Zh. (2005). Nakonec-to nauchit'sya zhit (poslednee interviyu). *Voprosy filosofii, 4*, 133-144.
Fukujama, F. (2004). *Nashe postchelovechskoe budushhee: posledstviya biotehnologicheskoy revolyucii*. Moskwa: OOO «Izdatel'stvo AST».
Gorjachkovskaja, A. (2007). Chelovek i simulyakr. *Visnik Harkivs'kogo nacional'nogo universitetu imeni V.N. Karazina. Serija: Teoriна kul'turi ta filosofiya nauki, 776*, 83-90.
Gusejnov, A. A. (2001). Chto my takoe? *Chelovek, 2,* 5-19.
Khilko, M. I. (2008). Do pitannya pro dievist' subyektiv ekopolitiki. *Praktichna filosofiya, 4(30)*, 39-51.
Habermas, Ju. (2002). *Budushhee chelovecheskoy prirody: na puti k liberal'noy evgenike?: per. s nem. M.L. Hor'kova*. Moskwa: Iz-vo «Ves' mir».
Mamardashvili, M. K. (2000). *Besedy o myshlenii*. Retrieved from http://www.psychology.ru/library/00055.shtml.
McNeill, K. (2000). Survivology: How to save the world and have fun What does survival mean? Retrieved from http://www.survivology.blogspot.com.
Nicshe, F. (1990). *Tak govoril Zaratustra. Kniga dlya vseh i ni dlya kogo: per. s nem. V.V. Rynkevich*. Moskwa: Interbuk.
Prigozhij, I. (1991). Filosofiya nestabil'nosti. *Voprosy filosofii, 6*, 46-57.
Tolkien, D.R.R. (2000). *Vlastelin kolec: per. s angl. N. Grirorjeva, V. Grusheckij*. Moskwa: Azbuka.
Visotska, O. E. (2009). Efekti vplivu elektronnih zasobiv komunikacii na suspilni procesi. *Praktichna filosofiya, 1 (31)*, 134-141.
Zhenshhina i vizual'nye znaki. (2000). Kollekt. avtor.; pod red. A. Al'chuk. Moskwa: Ideja-Press.