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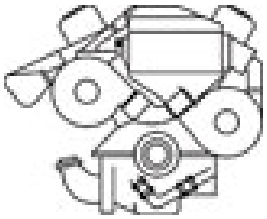

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Editorial on MEST Journal 2020-2

Prof. Dr. Dr. h. c. Zoran Čekerevac[1]
Editor-in-Chief
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Belgrade, July 15th, 2020

Welcome to the July issue of the MEST Journal, an international academic journal jointly published by MESTE, the Faculty of Business and Law of the "Union-Nikola Tesla" University in Belgrade and SZ & Associates in Toronto (Canada). MEST Journal is published online as well as in print (primarily for libraries and subscribers).

This issue of the journal is published in the specific conditions created by the pandemic of the coronavirus that threatens much of humanity. Many activities have been suspended, which drastically affects people individually and the world economy. The borders of many states are closed. People are advised to distance themselves and stay in their homes.

In these conditions, the importance of the Internet and communication via the Internet is obvious. For now, it works perfectly and allows people to stay connected and informed. Thanks to the Internet, work from home, our authors, and reviewers, we can offer our readers a new issue of the MEST Journal with twenty-two new works. We are sure that you will find some of the articles that will attract your attention.

We wish you good health and we invite you to publish your new works. Our journal is particularly interested in papers that can give your perspective on the economic and social changes caused by the COVID-19 pandemic. If you are inspired to write a paper, we will help you to publish it.

We invite you to publish your works, and we will help you!

Zoran Čekerevac

Prof. Dr. Dr. h. c. Zoran Čekerevac

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These are basic, but not exclusive themed areas.

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METHODICAL INSTRUMENTS OF STATE TAX REGULATION OF DEVELOPMENT OF SMALL AND MEDIUM BUSINESSES IN RUSSIA

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JEL Category: **H71**

Abstract

The article considers the features of the sector of small and medium business as an object of state tax regulation. The functions of state tax regulation are implemented not only in the level of mobilization of taxes and ensuring the country's expenses. Its effectiveness is also manifested in the impact on the economic situation, ensuring the country's GDP growth, profitability, and business development, especially in small forms, and the growth of the welfare of the population. A study of the effectiveness of state tax regulation of the development of small and medium-sized enterprises necessitates the consideration of the identification features of this sector as an object of regulation, justification why it is isolated from the totality of regulatory objects.

Keywords: *small and medium business, tax regulation, state regulation, taxation.*

1 INTRODUCTION

Small and medium-sized enterprises (SMEs) play an important role in ensuring the sustainable development of the Russian economy. The subjects of this sector are dynamic and highly adaptable, allowing them to respond quickly to market volatility, changes in consumer tastes and preferences, and to address the employment problem of the working population, especially during periods of shrinking large industries.

The current situation in this sector of the Russian economy in 2014-2019, as well as the need to ensure its dynamic growth, requires a significant intensification of government policy in support of

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SMEs and elimination of factors that hinder their development and contribute to the shadowing of their activities. Taxation of SMEs remains the most problematic area in the domestic system of state regulation and support

2 RESEARCH ISSUE

The term "small and medium-sized business entities" was introduced by Federal Law No. FZ-209 of 24 July 2007 "On the development of small and medium-sized business in the Russian Federation" (hereinafter referred to as the Federal Law-209) and includes both legal entities and individual entrepreneurs who meet the established criteria for qualifying as micro, small and medium-sized entities[1] (Table 1) (Duma, 2017).

Table 1 - Criteria for classifying economic entities as micro, small and medium in Russia (Duma, 2017)

Indicator / Subject group	Micro-	Small	Medium
Number of employees, persons	under 15	between 15 and 100	between 101 to 250[2]
Volume of annual revenue, million rubles	120	800	2000
Share of other legal entities in the charter capital of the organization, %	25	25	25

In our opinion, the criteria listed in Table 1 do not meet the current tasks of state regulation of the development of this sector of the economy and need further improvement. Thus, the abolition of differentiation of the limit-number of employees of small and medium-sized enterprises by types of activity has led to an excessive simplification of this criterion, which is not compensated by the relative ease of its use. For labor-intensive industries, this parameter will allow for a reasonable and correct classification of enterprises by size, since the number of employees largely determines the production capacity of enterprises belonging to them. However, for knowledge-intensive, innovative industries, this category may include enterprises that occupy an almost monopolistic position on local regional markets and, therefore, should not be the object of state protection (Ksanaeva, 2013, p. 27).

The presence of an objective need to preserve and develop the potential of the entrepreneurial sector makes it necessary to create the most favorable environment for entrepreneurship. Support of entrepreneurial activity by the state functionally assumes the use of a whole complex of measures, both stimulating and regulating influence in the sphere of budget and tax, monetary, legal, and social policy (Bykova, 2018).

The state regulation of enterprise activity represents the uniform mechanism in which elements are both state and enterprise structures, promoting optimum functioning of the market economy (Iziev & Izieva, 2018). At the end of the twentieth century, the prevailing view was that state interference in the national economy should be limited. However, the Russian economic practice of the last twenty years with its inherent crises of financial, monetary and banking systems, positive dynamics of unemployment growth, the decline in social production convincingly testifies to the necessity to strengthen the role of the state in regulating the national economy (Bykova, 2018, p. 15).

In the conditions of modern market economy the state regulation of entrepreneurial activity, especially in small forms, is one of the main ways of technical and product development of social reproduction, as well as the most optimal way of transformation of the national economy from raw materials to processing (Alikaeva & Ksanaeva, 2013, p. 22).

3 PURPOSE OF THE STUDY

The purpose of the study is to study the characteristics of SMEs as an object of tax regulation.

[1] Excluding business entities that meet the conditions specified in subparagraphs "b" - "e" of paragraphs 1.1. of Article 4 of the Federal Law-209 of 24.07.2007.

[2] The Government of the Russian Federation has the right to set a limit on the average number of employees for the previous calendar year in excess of the value set by subparagraph "b" of paragraph 2 of the Federal Law-209 of 24.07.2007.

4 RESEARCH METHODS

The study used generally accepted methods of cognition – comparative analysis, logical generalizations, tools of statistical and financial analysis.

5 PROBLEM ANALYSIS

The purpose of state regulation of SMEs is to create conditions for the stable functioning of the business environment, i.e. the task of the state to create optimal conditions for the functioning of all types of entrepreneurship (Solovyova, 2012, p. 19). Entrepreneurial activity functions under the influence of the external environment, being an integral element of the economic system in which it exists, develops, and interacts with other subsystems, including the state (fig. 1) (Bykova, 2018).

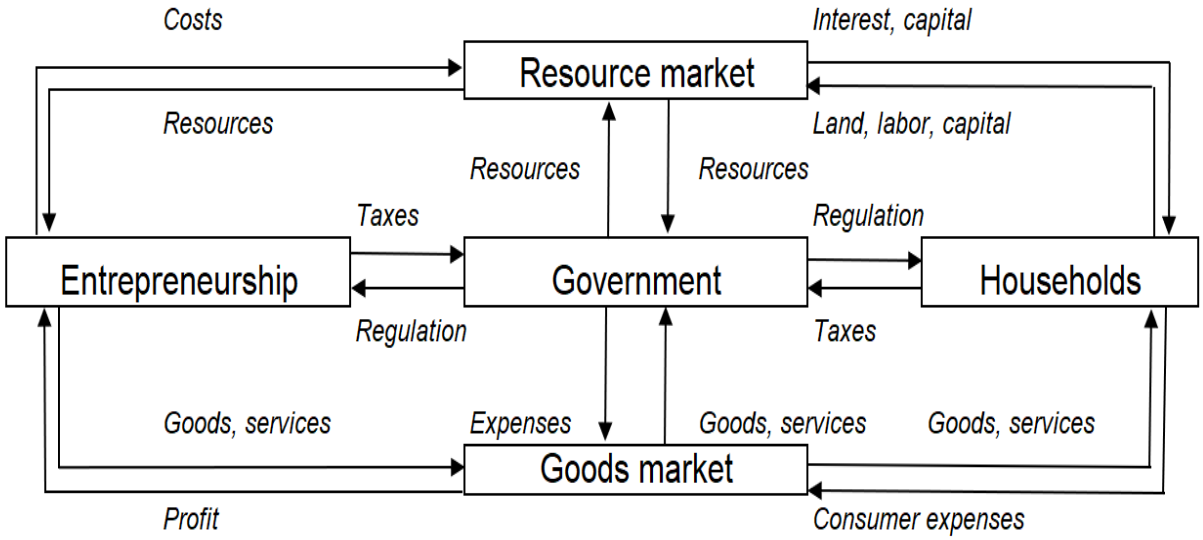

Figure 1 - Interrelation of business and state in the system of economic relations
Source: (Bykova, 2018, p. 30).

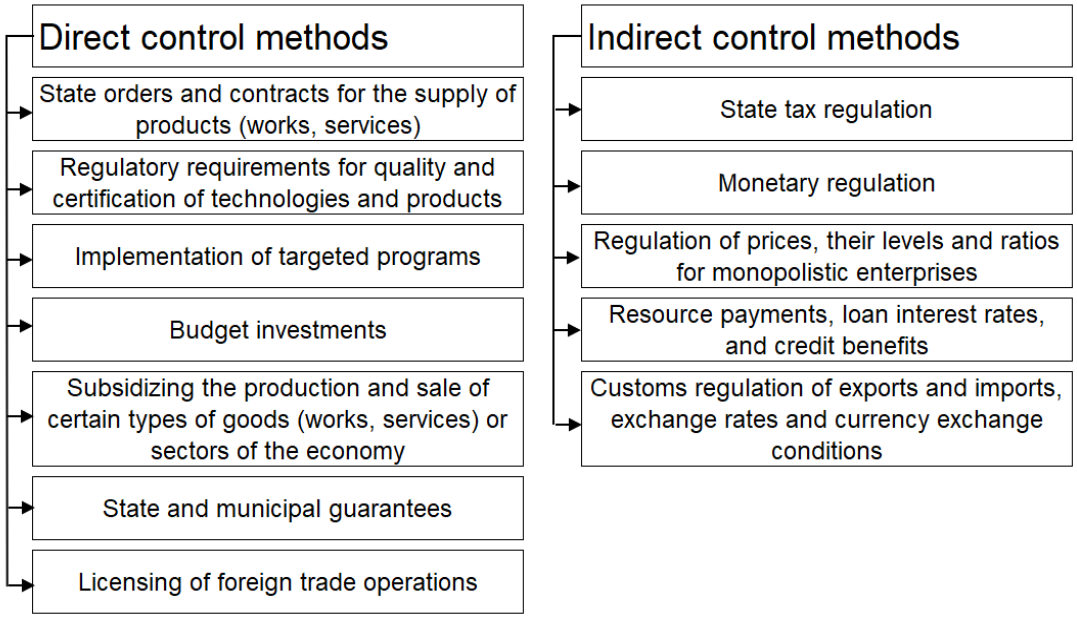

Figure 2 - Methods of state regulation of business activity.
Source: Developed by the authors

The main directions of state regulation of the development of this sector in Russia are determined by the goal set out in the strategy for the socio-economic development of the country -

to ensure sustainable economic development, which is achieved through a system of state regulation.

The definition of state regulation includes the process of purposeful influence of the state on social processes using various means and methods of the regulation (Bykova, 2018, p. 32).

The state influences the system of SME development using direct and indirect methods of the regulation (Figure 2).

The state, through its institutions, controls the development activities of SME subjects by applying the methods of direct and indirect influence shown in Figure 2. Their use should not exacerbate crisis phenomena in the economy and destroy the market basis.

In accordance with the budgetary structure of the Russian Federation in the system of state regulation of SME development three levels of management are distinguished: federal level, regional and municipal (Duma, 1998). At the federal level of state power, activities are carried out to regulate and support SMEs in the following directions (Iskenderova, 2018):

- determination of priority directions of rendering state support to SMEs.
- formation of unified principles of organization of state regulation and support of SMEs.
- development of the regulatory and legal framework for the development of the entrepreneurial activity.
- determination of sources of financing and development of principles for the distribution of budget funds among the subjects of the Russian Federation.
- coordination of activities of regional and municipal structures of state executive power.

The tasks of state regulation of SMEs at the regional level are (Iskenderova, 2018) (Malyshev, Belyaev, & Kashurnikova, 2018):

- creation of equal conditions for the participation of SME subjects in state support programs.
- creation of interdepartmental commissions at the regional administration to eliminate administrative barriers to the development of this sector.
- organization of interaction of small and medium enterprises with large industrial structures.
- development of a mechanism to involve SMEs in the execution of regional and municipal orders on a competitive basis.
- production and technical support to SMEs.
- organization of training, retraining, and professional development of personnel for small enterprises.
- support of foreign economic activity of SME subjects, including assistance in the development of their trade, scientific and technical, production, and information relations with foreign partners.

The tasks of the municipal level of state regulation are causally related to the regional level and do not contradict the policy of state regulation at the federal level. Thus, all levels of government are interconnected and interdependent, which requires a comprehensive approach to justifying and selecting measures of state support for SMEs and assessing their effectiveness (Malyshev, Belyaev, & Kashurnikova, 2018).

The development by government authorities of effective mechanisms for supporting small and medium-sized enterprises is an essential stage in improving government economic policy. Therefore, it is necessary to pay special attention to the tax regulation of this sector and to consider methodological tools of state management of SME development.

State tax regulation is the performance of purposeful activities on the part of both state authorities and local self-government bodies regarding the establishment of tax preferences and other measures of a tax nature in the provisions of the legislation on taxes and collection of tax preferences, which improve not only the property but also the economic situation of certain categories of taxpayers (Kostromina, 2018).

The Constitution of the Russian Federation (Duma, Part One of the Civil Code of the Russian Federation from 30.11.1994 N 51-FZ. Adopted by the State Duma on 21.10.1994. (in effect, ed.), 1994, p. Art. 71) establishes a decisive role in the legal regulation of taxation for the federal center. At present, according to the provisions of the Tax Code of the Russian Federation, the following

federal, regional, and local taxes are in force (Table 2) (Duma, 1998).

The norms of tax income distribution by levels of the budget system shown in Table 2 are reviewed annually and are relevant for the current financial year. For taxes paid during the transition to special taxation regimes, 100% of tax revenues are credited to the regional budget, excluding the production sharing agreement (Duma, 1998) (Duma, 2000) (Zakon, 2018) (Minfin, 2019).

Table 2 - System of federal, regional, and local taxes of the Russian Federation

Group	Name of tax		Distribution of tax income		
			federal	regional	local
Federal taxes	Value Added Tax		100%	-	-
	Excise taxes	On fuels and lubricants	12%	88%	-
		For alcohol products	50%	50%	-
	Personal income tax		-	85%	15%
	Income tax		3%	17%	-
	Mineral extraction tax		100%	-	-
	Water Tax		100%	-	-
	Fees for use of facilities	animal life	-	100%	-
		water resources	20%	80%	
	State Duty		-	100%	-
	Tax on additional income from hydrocarbon production		95%	5%	-
Regional taxes	Corporate property tax		-	100%	-
	Tax on gambling business		-	100%	-
	Transport tax		-	100%	-
Local taxes	Land tax		-	-	100%
	Property tax on individuals		-	-	100%
	Trade fee		-	-	100%

Source: developed by the authors based on the analysis of the provisions of the Tax Code of the Russian Federation, Budgetary Code of the Russian Federation.

Since the 2000s, consolidated budgets of the constituent territories of the Russian Federation have accounted for about 40% of tax revenues of the budget system, but the share of regional and local taxes is low (less than 10%), which means that regional authorities have a certain interest in the development of tax potential, remaining dependent on the federal center in the field of tax policy and interbudgetary relations (Alikaeva & Ksanaeva, 2013). In 2020-2021, it is planned to gradually reduce the share of sub-federal budgets in the tax revenues of the Russian Federation, which requires the government authorities of the constituent territories of the Russian Federation to intensify their work on building up the tax base for regional and local taxes (Zakon, 2018) (Minfin, 2019).

Tax exemptions in the Russian Federation are established by the Tax Code of the Russian Federation. Additional exemptions from regional and local taxes can be established by regional legislation and regulatory legal acts of local governments of municipal entities respectively (Duma, 1998).

The state most often applies certain methods in combination to achieve the greatest positive effect. First of all, it is necessary to determine for what purposes the procedure of tax stimulation is carried out, and only after the task is solved the introduction and practical application of methods on the procedure of stimulation of the subject of taxation is carried out.

Based on the study of various methods of tax regulation, the following main measures aimed at the development of entrepreneurship are highlighted (Alikaeva & Ksanaeva, 2013) (Degtyarev, 2009) (Iziev & Izieva, 2018) (Ksanaeva, 2013):

- reduction of tax rates. Thus, a gradual reduction of tax rates in comparison with the

generally established ones, first, is used for the stimulation of a certain branch of the economy or is mainly focused on the development of a certain region.

- tax holidays. This method of tax incentives is mainly applied only to newly established organizations and enterprises. Tax holidays allow the subject of taxation not to pay income tax, which certainly provides huge support to the taxpayer for gradual development and strengthening of its position in the Russian economy; - transfer of losses to the future. This measure of tax incentives in most cases is mainly focused on those activities in the process of formation of which, at the initial stage, certain losses are possible. For example, the purchase of high-tech equipment.
- accelerated depreciation. This method of tax incentives allows the subject of taxation to quickly write off a certain value of the capital investment to the cost price in the shortest possible time, rather than if the taxpayer would have used the generally established norms of taxation.
- an investment tax credit. This is the most promising method of tax incentives in the Russian Federation. The main positive result for any organization is its relative "cheapness" in comparison with an ordinary bank loan.
- Withdrawal of certain objects from the taxation procedure (withdrawal). This type is mainly aimed at reducing the tax burden on certain categories of taxes. In this case, the state is denied recognition of transactions in the process of sale, income, as well as the value of the property. This practice is quite widespread, as it is mainly focused on those areas and spheres in which there is interest from the state.
- special tax regimes. At present, the current tax legislation provides for the possibility to apply the following special taxation regimes:
  1. the taxation system for agricultural producers.
  2. simplified taxation system.
  3. the taxation system in the form of a single tax on imputed income for certain types of activities.
  4. taxation system when executing production sharing agreements.
  5. patent system of taxation.
  6. tax on professional income (by experiment) (Duma, 1998) (Duma, 2000).

The above measures regarding the incentive effect are basic, but their list is open, so the state, using the tax policy, achieves the set national goal. The state, which is interested in the progressive, systematic development of the regional economy, should develop such a tax policy, in which the interests of local authorities and business representatives are reflected in the final result, namely, to ensure conditions for the effective progressive development of SMEs.

6 CONCLUSIONS

To improve the efficiency of tax regulation of SMEs, in our opinion, it is necessary:

- ensure the formation of an effective policy of tax regulation of the SME sector at the local level.
- increase the limit values of the criteria of revenue and the residual value of fixed assets up to 800 million rubles.
- provide individual entrepreneurs who pay the single tax on total income with the right to use social and property deductions from personal income tax within the limits of the amounts paid tax.
- expand the practice of professional income tax on subjects in the North Caucasus Federal District.
- abolish tax benefits with low or zero efficiency.
- qualitatively implement municipal and private partnership in the sphere of tax regulation of business activity.

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METHODS OF KEY PROBLEMS DIAGNOSTICS IN THE SYSTEM OF CRISIS MANAGEMENT

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JEL Category: **B41, M10**

Abstract

The content of anti-crisis management, based on the opinions of leading scientists, is revealed in a scientific article. Own interpretation of this concept, which covers all the advantages of the most famous statements of leading scientists has been made. Practical aspects of crisis management with an orientation to its basic sections and anti-crisis programs are identified. Understanding these sections allows managers to generate timely measures that will meet the level of the crisis of the enterprise. Emphasis is placed on crisis forecasting and bankruptcy methods. To gain a better understanding of the methodological support of crisis management, its basic methods and methods have been systematized and classified. The general division of classical techniques involves the selection of techniques using multifactorial models and evaluation using estimates. According to the status of regulation, it is advisable to group the methods of crisis diagnosis into mandatory (state) and recommended (scientific). The most popular multifactorial models of crisis management analysis are identified with their advantages and disadvantages. All considered models are adapted for enterprises of economically developed countries and do not consider the peculiarities of the functioning of economic entities in Ukraine. The article defines the directions of further improvement of methodological support of crisis management at domestic enterprises, among which the strengthening of the information base for analysis, clearer formulation of the goals of analysis, the unification of the assessment of the financial condition of enterprises of all forms of ownership and organizational and legal forms of management are

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highlighted. The authors define further directions of scientific researches in the sphere of crisis management of the enterprise under difficult market conditions.

Keywords: *crisis management, crisis, bankruptcy, diagnostics, analysis, management methods, problems, anticrisis, business systems*

1 INTRODUCTION

Difficult market conditions, severe competition, high levels of uncertainty significantly complicate the functioning of most businesses, resulting in huge crises, and bankruptcies. Often the reason for this situation for business entities is the lack of management skills, which are not able to timely identify a crisis and adequately respond to it, and take effective measures. That is why it is important today to create a holistic system of tools that will allow managers to effectively eliminate troublesome phenomena and prevent potential bankruptcy.

In the scientific community, the issue of crisis management is widely studied and discussed. This is evidenced by the huge number of works of famous scientists, among which it is worth noting: Lihonenko, L. (2005), Hradov, A., & Kuzyn, B. (1996), L. Sytnyk (2000), L. Skibitka (Skibits'ka, L., Matvieiev, V., Schelkunov, V., & Podrieza, S., 2014), Hriaznovoj, A.(1999), V. Vasylenko, V. (2003), Minaev, E., & Panahushyn, V. (1998), Afanas'ev, H. (1998), Patterson, B., (1993), Madsen, K., & Platz, N. (2005), Green, P., (1992) and others. But the dynamic environment in which businesses operate is constantly demanding the consideration of new factors and conditions, revision of existing theoretical foundations of crisis management, improvement of existing methods and approaches for timely identification and elimination of problem situations and places in the activity of the enterprise.

The main purpose of the research is to consider the existing theoretical and methodological foundations of crisis management and to form a system of methods of forecasting and identifying crises, adapted to the modern realities of the economic life of the enterprise, with further development of effective measures.

2 THEORETICAL BASIS OF ANTI-CRISIS MANAGEMENT

The prerequisite for the emergence of crisis management is due to simple and logical reasons, including the emergence of a wide range of diverse problems faced by enterprises in the course of management, and the development of management as a science and a separate management function.

The term crisis management or crisis management is a fairly new term that entered the domestic scientific space in the mid-1990s. As a rule, the substantive content of this economic definition encompasses the practical application of a system of techniques and methods in overcoming a crisis for any business unit.

However, to understand in more detail this area of practice, it is necessary to trace the basic context, which was embedded in the concept of "crisis management" in Western countries, which are rightfully its founders.

All Western scholars trying to uncover the essence of anti-crisis management are conditionally divided into several groups:

1. view it as measures aimed at crisis prevention.
2. understand the directions and methods that help the business structure to overcome the crisis.
3. integrate the ideas of the previous two groups, revealing crisis management as a direction of management activities aimed at preventing, eliminating, and responding to crisis effects and maximizing and effectively eliminating their consequences.

The results of a detailed and critical analysis of the statements of leading Western economic and domestic scientists are summarized in Table 1.

Table1 Disclosure of the term "crisis management" by leading scientists

Author, source	Definition of **crisis management**	Comments
Mitroff, I., 1994	A consistent interdependent assessment of the various types of crises and forces that may pose a threat to the organization	Such determination is oriented only to the assessment of existing crisis phenomena without their possible prediction or development of measures for their elimination
Humphreys, C., 1992	The direction of management aimed at minimizing losses and other negative results with the further support of trust in the company, its management, and corporate image among employees, customers, shareholders, and the general environment	The main focus is on finding ways out of the crisis and maintaining a good reputation. The downside is no mention of evaluating the causes of crisis phenomena to further prevent them
Head, G., 1990	Crisis management is designed to provide a coordinated, effective response to the crisis through planning, management and control of the organization and its assets immediately before, during, and after the organization has suffered losses as a result of the crisis to conserve the resources it needs to the fullest possible recovery of the pre-crisis level in the future	Such a context of crisis management most characterizes it, paying attention to which management functions are involved, time of their use and targeting. On the positive side, the author focuses on not only getting out of the crisis but also preventing it, the direction of action at the time of being in crisis.
Korotkov, E., & Beliaev, A., & Valovoj, D., 2000	Management, which is predetermined in some way to predict the threat of a crisis, analyze its symptoms, measures to reduce the negative effects of the crisis and use its factors for the next sustainable development of the organization	The authors define this concept as a permanent management style, providing a daily assessment of all factors that may lead to a crisis, as well as situations in which businesses are located and bear signs of problematic phenomena.
Vasylenko, V., 2003	Management, which foresees the danger of the crisis, analysis of its symptoms, measures to reduce the negative effects of the crisis and use its factors for positive development	
Skibitska, L., & Matvieiev, V., & Schelkunov, V., & Podrieza S., 2014	The main goal of anti-crisis management is to develop and prioritize measures aimed at neutralizing the most dangerous factors that lead to a crisis.	Given disclosure of the term is focused solely on the formulation of strategic measures that should eliminate the impact of the crisis factors, but the assessment of the current situation remains without attention.
Lihonenko, L., 2005	Special, permanently organized management, aimed at the most prompt detection of signs of crisis and creation of appropriate prerequisites for its timely overcoming to ensure the restoration of the viability of an individual enterprise, preventing the situation of its bankruptcy	The interpretation states the day-to-day need to implement such specialized management to prevent bankruptcy and properly maintain the viability of the enterprise. A sufficient and inclusive definition

Author, source	Definition of **crisis management**	Comments
Hradov, A., & Kuzyn, B., 1996	Set of consecutive general measures: analysis of the state of macro- and microenvironment, selection of the appropriate mission of the enterprise; study of the economic mechanism of emergence of crises and creation of a system of scanning of the external and internal environment of the enterprise for early detection of weak signals about the crisis; strategic control of the enterprise activity and development of a strategy for preventing its insolvency; prompt assessment and analysis of the financial state of the enterprise, identifying the possibility of insolvency (bankruptcy); developing a crisis response system to deal with the crisis; constant accounting of risk of business activity and development of measures for its reduction	The author expands the context of the concept of "crisis management" as a step-by-step algorithm of actions and tools that prevent bankruptcy and avoid the factors that trigger crisis phenomena.
Sytnyk, L., 2000	Management system aimed at solving problems of intensive development of the enterprise by mobilizing and intensifying all resources as opposed to extensive development	The peculiarity of such a statement is the disclosure of the content of anti-crisis measures. According to the author, to prevent bankruptcy is to "mobilize and intensify all resources as opposed to extensive enterprise development"
Minaev, E., & Panahushyn, V., 1998	Not only management focused on withdrawal of the enterprise from the state of crisis, but also management, which should anticipate and prevent the insolvency of the enterprise in advance following the strategic program of enhancing competitive advantages and financial recovery	Positive in this statement is not only the retrospective aspect of anti-crisis management but also the orientation on the prediction and prevention of problem situations in the activity of the enterprise.
Cherniavs'kyj, A., 2006	Management capable of preventing or mitigating crises in production and economic activity, as well as maintaining the functioning of the enterprise in the survival mode in times of crisis and leaving the crisis with minimal losses	The definition is threefold: a) Crisis prevention. b) Survival of the enterprise in crisis. c) Exit from the crisis with minimal losses.

Based on all existing definitions it is possible to form the most complete and comprehensive one. Crisis management is an enterprise management system with a complex, systematic nature and aimed at preventing or eliminating unfavorable business phenomena by using the full potential of modern management, developing, and the implementation of a special program at the enterprise. It is strategic and eliminates temporary difficulties, maintains and improves the market position of the enterprise in any way s circumstances, mainly using its resources.

3 PRACTICAL TOOLS OF CRISIS MANAGEMENT

A clear organization of crisis management requires an understanding of all theoretical and practical aspects. Today, in the scientific community, they are all organized into separate sections, namely: three classical sections (CM) and a special part - CA. However, if these sections are aimed at crisis management, then the section and its contents are slightly corrected, and the letter A. supplements the abbreviation itself.

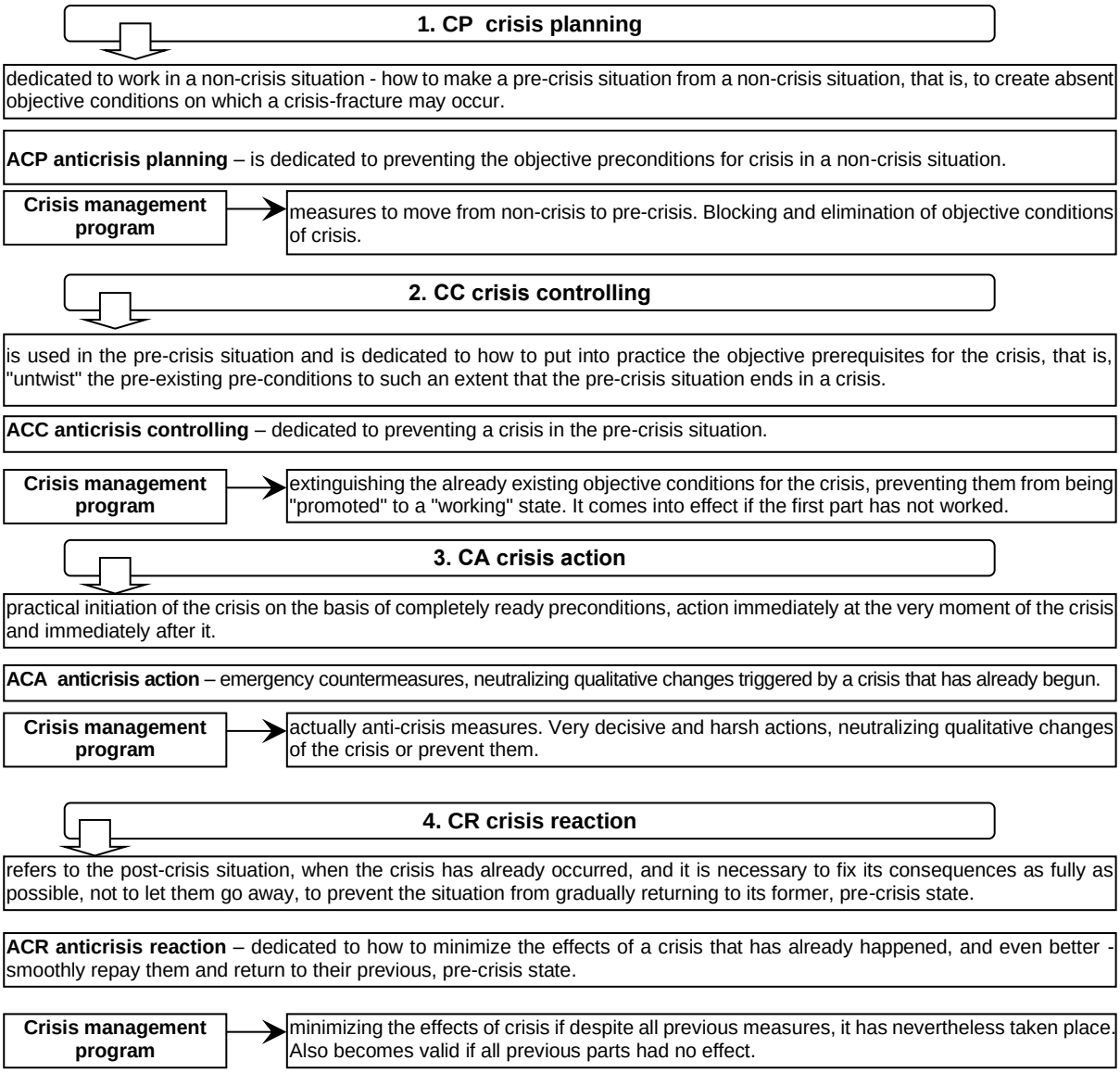

Fig. 1 Sections and programs of crisis management (developed by the authors)

A special crisis management program is formed for each individual situation. The description of such parts of anti-crisis management is systematized in Fig. 1.

The choice of a particular system of measures depends on the situation in which the enterprise is located. In practice, there are events where no decisive action is required, but only to prevent the adverse effects of a changing external environment. An example would be a situation where a business is going well and management should only support the positive trends.

4 METHODS OF FORECASTING PROBLEM SITUATION

Crisis management should be oriented not only to the assessment of the pre-existing crisis but also to a great extent prevent the influence of factors that can lead to problems in the activity of an individual enterprise. Nowadays, scientists have

differently defined areas of analysis aimed at diagnosing a crisis in an entity's activity or forecasting it in the near future. However, the most popular among them are: identification of problems that are negative consequences of enterprise management (Balashov, A., 2004); performance of targeted financial analysis (Green, P., 1992); assessment of the current situation according to the criteria of presence or absence of crisis (James, E., 2009); study of the goals of the enterprise and ways to achieve them (Afanas'ev, H., 1998).

In general, it should be noted that the diagnosis and forecasting of crisis at the enterprise is a set of economically sound methods and techniques of financial and economic analysis. When they are systematically applied at certain intervals (depending on the size, characteristics, type of activity, etc.) will allow identifying the crisis on time and evaluating potential functioning and development opportunities. Therefore, a special place in such a crisis management system is assigned to methodological support.

The current practice of crisis management has a wide arsenal of methods and techniques, which for their qualitative selection and application requires proper systematization (Fig. 2).

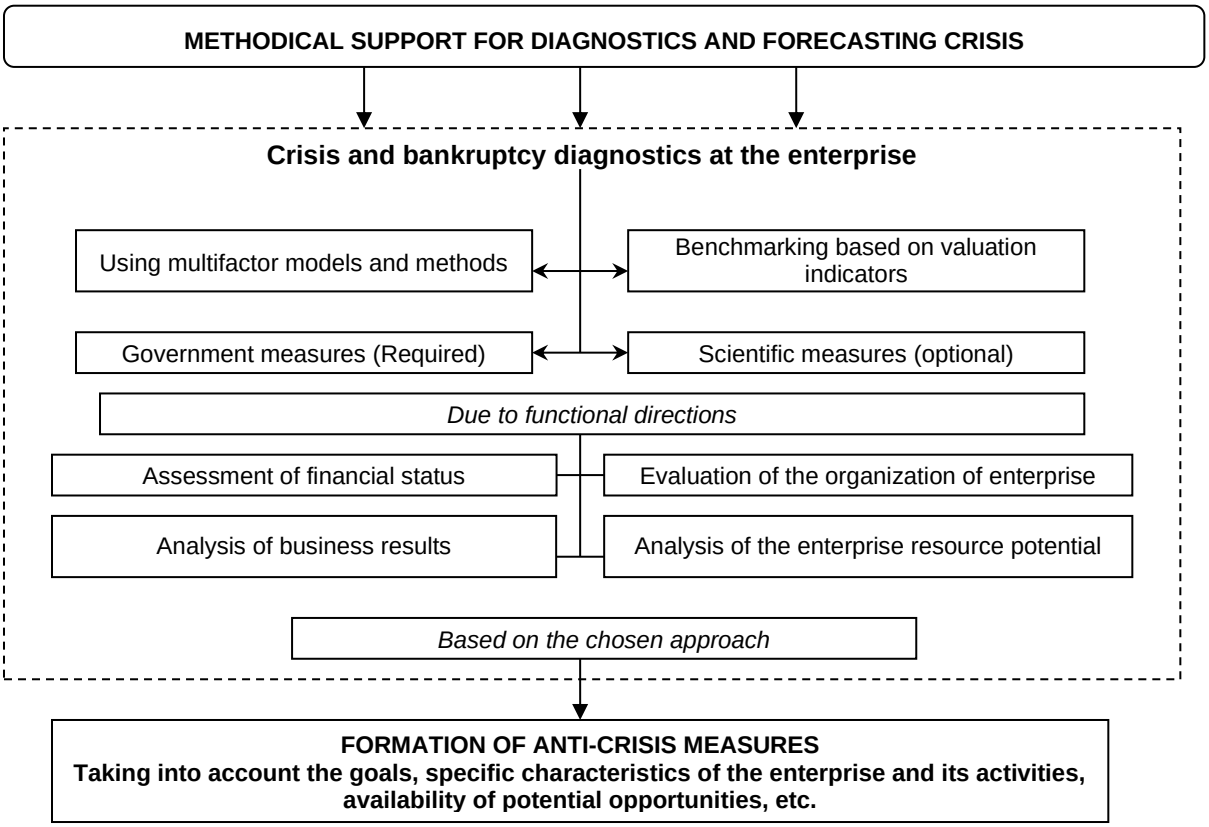

Fig. 2 Contents of methodological support of crisis and bankruptcy diagnostics and forecasting
Source: (developed by the authors)

All methods that formulate methodological support for crisis diagnostics have the same purpose - to provide the management of employees with the appropriate information, which will help to make sound and effective decisions that will help to form a satisfactory balance sheet structure and to create an adequate level of solvency of the enterprise.

It should be noted that for the best results of forecasting problem situations in the activity of the enterprise it is appropriate to apply a combined approach, which would simultaneously cover the assessment of both financial condition and results of management, resource potential, etc. This will summarize the impact of both the individual component of the activity and its entire complex on the possibility of a crisis and its subsequent course. The use of purely financial metrics significantly limits the overall understanding of the existing picture and does not identify the main causes of problems for an entity.

Quite often, scientists identify the diagnosis of the solvency of the enterprise with the prediction of its bankruptcy. You can agree with this view since a protracted crisis can lead to a deterioration of the parameters of solvency and gradual bankruptcy. Modern science has dozens of models that allow determining with certain accuracy the likelihood of a crisis. The most popular of them are considered in Fig. 3.

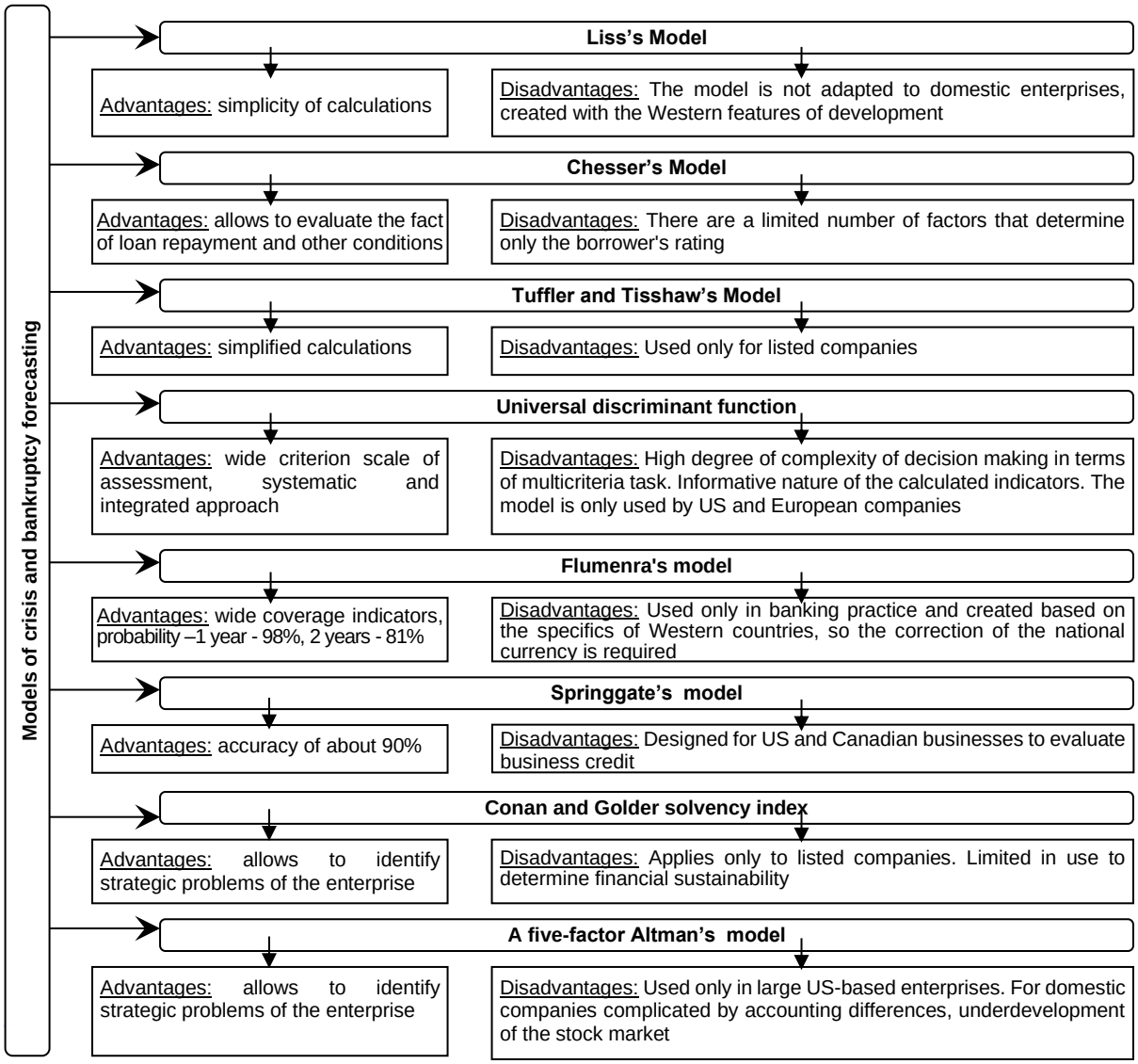

Fig. 3 Comparative characteristics of models of forecasting the crisis of the enterprise
Source: (developed by the authors)

Among the models presented in Fig. 3 it is difficult to distinguish the most versatile models. First of all, it has to do with adapting them to different conditions of functioning and development. If we talk about business units in the West, the models of economists Lis, Taffler, Tisshaw, etc., will be optimal for them, since they take into account the peculiarities of the legislative and legal field, state regulation, competition conditions inherent in the USA, Great Britain and more. For enterprises from less developed countries, the application of multifactor models has some difficulties, which is caused by the following factors:

a. instability and imperfection of the regulatory framework;
b. poor quality and informative content of the reporting documents;
c. biased statistics and their limited potential for bankruptcy.

That is why all the described models do not allow us to take into account the absolute majority of

conditions of functioning of the domestic enterprise.

5 CONCLUSIONS

To summarize the above, we believe that Ukrainian financial analysts should develop their model, which would allow estimating the financial status and other parameters of the absence of crisis manifestations with full integration into its algorithm of national accounting standards and reporting, use different information sources that would reveal all industries in which businesses operate.

As possible directions of adaptation of existing models of crisis diagnostics at Ukrainian enterprises it is possible to distinguish:

a. provision of sufficient database for diagnostics both at the macro level and at meso and macro levels;
b. creation of proper conditions for an objective assessment of the financial condition of enterprises of all forms of ownership and organizational and legal forms;
c. a clear definition of the objectives of the subjects and objects of analysis, taking into account the characteristics of enterprises and their conditions of operation.

All these points can significantly help to improve the methodological tools of crisis management for domestic enterprises in the market. Such a comprehensive approach to strengthening the effectiveness of methods and models for assessing the prerequisites of the crisis and the direction of its exit will significantly strengthen the competitive position of domestic enterprises.

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CURRENT RUSSIAN POLICY IN THE AREA OF COUNTER-OFFICIAL CRIMES

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Annotation

Service activities are carried out in various spheres of public life and affect all the diversity of rights, freedoms and other socially important goods, relations and values. Therefore, the interests of the service are protected by legal means of different sectoral nature, including criminal law. At the same time, clarity in distinguishing between crimes and misconduct in the service is extremely important for law enforcement. However, the issue of distinguishing between official crimes and misdemeanors is one of the poorly developed ones in doctrine and practice. A clear distinction between crimes and misdemeanors in the service involves specifying the objective features of the composition of official offenses. The concretization here is justified by the need to exclude subjectivity on the part of practitioners, both their mistakes and outright abuses. It is also important to take into account the peculiarities of service crimes. These are mostly multi-object attacks. The range of their objects is so wide that it embraces almost all law enforcement interests and relationships. On this basis, some legal scholars even concluded that these crimes do not have their own "own" object, that they are qualified types of "common" crimes. The multi-object nature of crimes is expressed in the diverse nature of the harm caused by them, i.e. it causes a multiplicity of socially dangerous consequences. Official crimes generate a variety of negative changes in various areas of public life. The multiplicity of consequences is a distinctive feature of these attacks. It should be taken into account in the legislative process. In unification categorial apparatus existing criminal legislation on liability for service of crime I propose to discuss another issue about transformation is enshrined in the first articles 201, 201.1 and 202 of the criminal code provisions "caused significant harm to rights and legitimate interests of citizens or organizations or legally protected interests of society or the state" to design "significant violation of rights and legitimate interests of citizens and (or) organizations or legally protected interests of society or state." The socio-economic and political grounds for criminalizing violations of the interests of the service in commercial and other organizations are understood as transformations that occurred at the turn of the XX-XXI centuries in the sphere of economy and political system, which determined the emergence of new types of legal entities in the form of primarily private commercial and non-profit organizations with their own management apparatus.

Keywords: *criminal policy, criminal law, official crimes, corruption*

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1 INTRODUCTION

Service activities are carried out in various spheres of public life and affect all the diversity of rights, freedoms and other socially important goods, relations and values. Therefore, the interests of the service are protected by legal means of different sectoral nature, including criminal law. Over time, certain problems of systematization of Russian criminal legislation on responsibility for crimes against the interests of the service and regulation of criminal responsibility for official crimes become more pronounced. The most acute problem is the dispersion of independent groups of regulations on official crimes in different chapters and sections of the criminal law, which does not always fit into the social and legal essence of the object of these attacks, which requires the placement of the main components of the norms on official crimes within one structural part of the criminal code of the Russian Federation. Special attention is drawn to the gaps in the system of norms on crimes against the interests of the service in commercial and other organizations and on responsibility for abuse of authority in the sphere of activity of commercial and other organizations. The scientific analysis of this problem is also determined by the search for ways to optimize the practice of applying criminal law norms on responsibility At the same time, clarity in distinguishing between crimes and misconduct in the service is extremely important for law enforcement.

2 ANALYSIS

Previously, it was easier to remove such uncertainty by relying on the priority of criminal law, which followed from the exclusive isolation of this industry in the legal system. Clarity in distinguishing between crimes and misconduct in the service is essential for law enforcement. However, the issue of distinguishing between official crimes and misdemeanors is one of the poorly developed ones in doctrine and practice. Moreover, the unclear legal relationship between official (official) crimes and official (official, disciplinary) offenses is one of the trends indicated in the development of norms on official offenses. After all, our current law also does not know the strict distinction between official crimes and misdemeanors. The legislative ratio of crimes and other offenses in the field of service interests is still in a sense a ratio of uncertainties, which in itself is "corrupt". At the same time, it should be borne in mind that official misconduct often borders on an official crime of moderate severity, which further exacerbates the problem indicated. Previously, it was easier to remove this uncertainty by relying on the priority of criminal law, which followed from the exclusive isolation of this industry in the legal system. This priority was enshrined in the law. Article 1 of the Fundamentals of the disciplinary legislation of the USSR and the Union republics of 1929 stated: violation of the duties of the service, in particular labor discipline, not prosecuted, entail disciplinary responsibility. This approach is now being superseded by another, according to which the primacy of criminal law is denied. The rejection of the priority of criminal law in the sphere of inter-sectoral interaction is explained by the fact that criminal law is an integral part of the unified legal system, is applied in the system with other branches of law and, in particular, operates on an equal (parity) basis with the disciplinary and administrative legislation. It is obvious that a clear distinction between crimes and misdemeanors in the service involves specifying the objective features of the composition of official offenses. The concretization here is justified by the need to exclude subjectivity on the part of practitioners, both their mistakes and outright abuses. This approach fits in with the provisions of management theory. According to the latter, the modern trend of management activity is to minimize the human factor. With the development of management technologies, the backlash for the official's personal discretion should become smaller, and the unjustified amount of subjective official discretion should be reduced.

It should be noted that "a significant violation of the rights and legitimate interests of citizens or organizations or the interests of society or the state protected by law" is an imperfect legal construction in the part in which it ignores the hierarchy of values protected by law. By embracing all sorts of harms, this construction does not help to differentiate liability depending on the nature of socially dangerous consequences. In this sense, specifying the content of objective signs of official crimes is a positive approach. However, it cannot be absolutized. Nimia certitudinem ipsam destrucit (too certain a

certainty destroys itself). It is important to take into account the peculiarities of service crimes. These are mostly multi-object attacks. The range of their objects is so wide that it embraces almost all law enforcement interests and relationships. By the way, on this basis, some legal scholars even concluded that these crimes do not have their own "own" object, that they are qualified types of "common" crimes. The multi-object nature of crimes is expressed in the diverse nature of the harm caused by them, i.e. it causes a multiplicity of socially dangerous consequences. Official crimes generate a variety of negative changes in various areas of public life. The multiplicity of consequences is a distinctive feature of these attacks. It should be taken into account in the legislative process.

In light of this wise legislator in determining the consequences of a crime under part 1 of article 203 of the criminal code, recognizing such "substantial violation of the rights and legitimate interests of citizens and (or) organizations or legally protected interests of society or the state" and, simultaneously, transforming the sign of "the use of violence or threat of use" of the design in the qualifying (part 2 of article 203 of the criminal code). Thus, article 203 of the criminal code, as article 293 of the criminal code, was provided with security much wider range of socially significant attitudes and values.

In unification categorial apparatus existing criminal legislation on liability for service of crime I propose to discuss another issue about transformation is enshrined in the first articles 201 and 202 of the criminal code provisions "caused significant harm to rights and legitimate interests of citizens or organizations or legally protected interests of society or the state" to design "significant violation of rights and legitimate interests of citizens and (or) organizations or legally protected interests of society or state."

The formation of new relations in the life of Russian society in the last quarter of the twentieth century raised the question of reforming the rules on criminal responsibility for official crimes. In fact, the concept of official crime reflected in the Soviet criminal law and the official as the subject of this crime developed in the conditions of the existence of a planned economy with absolute domination of state ownership of the main means of production and the functioning of the command and administrative management system.

The imperfection of the existing system of norms on official crimes in relation to the socio-economic and political conditions that arose at the end of the twentieth century, did not cause any doubts. The relevance and expediency of optimizing legislation on official crimes were generally recognized. Moreover, the improvement of this criminal law institution required new theoretical and applied approaches and legislative solutions that were adequate to the state that was developing during the radical transformations of the socio-economic system and the political system of Russia at the turn of the century.

Criminal code of the Russian Federation was first recognized as criminal, penal, and referring to the group of acts of socially dangerous forms of behaviour in the interests of service in commercial and other organizations (excluding public authorities and organizations with state participation). Attributing encroachments on service in commercial and other organizations to an independent type of crime and describing them in a separate Chapter of the criminal law (Chapter 23 of the criminal code of the Russian Federation) is a legislative approach not previously known to Russian criminal law. Domestic legislation of the pre-Soviet period did not consider violations of the interests of the service in private organizations as a special type (group) of criminal encroachments and did not combine the rules about them into a separate structural part of the criminal law. In Soviet criminal law, there were no rules about these violations at all. This was quite natural in the conditions of denial of private property institutions, private law, and, accordingly, private organizational and legal forms of legal entities.

Modern Russian criminal law provides for strict differentiation of responsibility for official attacks on the interests of public and private organizations. This differentiation is based on the distinction between private and public services, as well as on the distinction between private and public law, the distinction between private and public interests, and the drawing of a watershed between business and government. In my opinion, the exercise of state and municipal power differs from the performance of managerial functions in organizations in terms of its nature, power, and

consequences. Managing the Affairs of the state and managing the Affairs of a private enterprise or institution are different types of management relationships. The first ones are external, and the second ones are internal. Is it appropriate to rebuild the architecture of the institution of "service crimes", ensuring uniform responsibility for diverse areas of manifestation of illegal acts? I don't think this is necessary. Life itself proves the expediency of legislative differentiation of service interests, on the one hand, in state bodies, local self-government bodies, state and municipal institutions, the Armed Forces of the Russian Federation, other troops and military formations of the Russian Federation, and, on the other hand, service interests in commercial and other organizations that are not a state body, local government body, state or municipal institution or unitary enterprise, state Corporation, state company, as well as a joint-stock company, the controlling stake of which belongs to the Russian Federation, the subjects of the Russian Federation or municipalities. As for internal corporate governance in commercial and other organizations and organizations with the participation of the state (state or municipal institutions or unitary enterprises, state corporations or companies, as well as joint-stock companies in which a controlling stake belongs to the Russian Federation, subjects of the Russian Federation or municipalities), there is also a difference. In this case, the form of ownership of the legal entity (public or private) in whose interests the powers are exercised is of particular importance. Thus, crimes against the interests of the service in commercial and other organizations are an independent type of service crimes committed in the sphere of internal corporate management by the relevant legal entities.

Criminal code of the Russian Federation was first recognized as criminal, penal, and referring to the group of acts of socially dangerous forms of behaviour in the interests of service in commercial and other organizations (excluding public authorities and organizations with state participation). Attributing encroachments on service in commercial and other organizations to an independent type of crime and describing them in a separate Chapter of the criminal law (Chapter 23 of the criminal code of the Russian Federation) is a legislative approach not previously known to Russian criminal law. Domestic legislation of the pre-Soviet period did not consider violations of the interests of the service in private organizations as a special type (group) of criminal encroachments and did not combine the rules about them into a separate structural part of the criminal law. In Soviet criminal law, there were no rules about these violations at all. This was quite natural in the conditions of denial of private property institutions, private law, and, accordingly, private organizational and legal forms of legal entities.

The social and legal nature of crimes against the interests of the service in commercial and other organizations is expressed in their duality: in economic and managerial features. The economic feature is related to the fact that violations of the interests of the "private" service cause harm or threaten not only economic relations, but also social relations of a non-economic nature. The management feature is that management in private organizations is directly related to the implementation of the powers of management bodies and authorized persons in the interests of private legal entities.

The socio-economic and political grounds for criminalizing violations of the interests of the service in commercial and other organizations are understood as transformations that occurred at the turn of the XX-XXI centuries in the sphere of economy and political system, which determined the emergence of new types of legal entities in the form of primarily private commercial and non-profit organizations with their own management apparatus. Crimes against the interests of the service in commercial and other organizations are an independent type of service crimes committed in the sphere of internal corporate management by the relevant legal entities - corporate organizations and non-profit unitary organizations (with the exception of state and municipal institutions, state corporations, state companies, state and municipal unitary enterprises, joint-stock companies whose controlling interest belongs to the Russian Federation, subjects of the Russian Federation or municipalities). In light of the above, we propose to amend the title of Chapter 23 of the criminal code and call it "Crimes against the interests of the service in corporate and non-profit unitary organizations". The specific object of crimes against the interests of the service in corporate and non-commercial unitary

organizations is public relations to ensure the legitimate interests of the service in corporate organizations and non-commercial unitary organizations, with the exception of state and municipal institutions, state corporations, state companies, state and municipal unitary enterprises, joint-stock companies whose controlling stake belongs to the Russian Federation, subjects of the Russian Federation or municipalities[1].

The interests of the service in corporate and non-commercial unitary organizations are understood as an ordered set of legitimate interests that are realized in the course of the organizations ' activities. The interests of the service in terms of Chapter 23 of the criminal code:

1. derive from the interests of the organization itself;
2. directly related to the interests of the founders, members, and employees of the organization;
3. in contact with the interests of investors, creditors, customers and other third parties, whose activity is connected with the activities of the organization.

This set of legitimate interests is based on a good-faith order of service - the proper exercise of the powers assigned to them by representatives of the management bodies of a legal entity (Egorova, 2006).

In light of the above discussion on the question of recognition in the long term interests of the service generic object service crimes and the allocation of a section of the criminal code "Crimes against interests of service". The new section is proposed to include two chapters:

1. "Crimes against the interests of public service and service in local self-government bodies" and
2. "Crimes against the interests of service in corporate and non-profit unitary organizations".

It is also advisable to discuss the inclusion of abuse of authority in the Chapter on crimes against the interests of the service in commercial and other organizations. Thus the excess of powers should be understood the Commission by a person performing managerial functions in commercial or other organization, of action beyond its powers and have entailed essential infringement of rights and legitimate interests of citizens or organizations or legally protected interests of society or state.

The obvious main trends of systematization of rules concerning official crimes in modern criminal law, that is, a natural stable form of systematization of rules concerning official crimes: the expansion in the criminal code regulations about office crimes, including in connection with anti-corruption measures; the convergence of the two systems of norms on service offences. Thus, on the basis of historical and legal analysis, features of the mechanism of causing harm by official (official) crimes, as well as in order to strengthen the preventive potential of the current legislation, it is proposed to reconstruct the composition of "inaction of the authorities" in Russian criminal law and thereby Orient law enforcement practice to consistently counteract passive forms of deliberate official behavior of a socially dangerous nature. According to these legal scholars, it is advisable to Supplement Chapter 30 of the criminal code provisions on "failure to perform official duties," i.e., the deliberate non-performance (or improper performance) of an official of his duties, which entailed substantial violation of rights and legitimate interests of citizens or organizations or legally protected interests of society or the state. An aggravating circumstance of deliberate non-performance of official powers should be recognized as official inaction for the purpose of extracting benefits and advantages for yourself or others. It is advisable to include such an aggravating circumstance in the system of qualifying signs of abuse of power. However, all this will require the exclusion from the criminal code of the Russian Federation of the abuse of official powers in order to eliminate the redundancy (duplication) of criminal law prohibitions of socially dangerous official behavior. According to another scientific concept, it is advisable to include an article on deliberate non-performance of official duties by officials in the draft § 1 "Crimes against public authority, interests

[1] Compare: (Shnitenkov, 2006)

of public service and service in local self-government bodies" and "Crimes against public authority, interests of public service, service in local self-government bodies and management in commercial and other organizations". The article on deliberate failure to perform managerial duties is proposed to Supplement the draft § 2 "Crimes against the interests of management in commercial and other organizations" of the Chapter "Crimes against public authority, the interests of the public service, service in local government and management in commercial and other organizations". While willful failure to perform managerial duties proposed to be defined as willful failure to perform by a person performing managerial functions in commercial or other organisation, of his duties contrary to the legitimate interests of this organization and in order to extract benefits for themselves or others or harming other persons, if the offense caused substantial harm to rights and legitimate interests of citizens or organizations or legally protected interests of society or the state (Korostelev, 2015).

It appears that the addition of the criminal law provisions of intentional or willful failure to perform, improper performance by a person performing managerial functions in commercial or other organisation, of his duties, possibly with mandatory symmetric addition of Chapter 30 of the criminal code and the legislative solution to the issue of a clear distinction between designated "triad": "the abuse of authority - abuse of authority - willful dereliction of authority."

The classification of crimes against the interests of the service in commercial and other organizations, in particular, as well as the classification of official crimes is not based on a single criterion at all and does not have a single basis for construction. When systematizing the rules on official crimes, the legislator uses several criteria, one giving a major role, the other a secondary importance. Traditionally, when building a system of official crimes, three criteria are used that are associated with the special danger of these attacks: the object of the crime (the main object of the crime, an additional object of the crime or object), the method of committing the crime (or another component of the act), the subject of the crime. Another classification of official crimes, including those provided for in Chapter 23 of the criminal code, is based on a complex basis, which simultaneously includes the interrelated content of the object, the objective side and the subject of the crime. According to this complex basis, there are General, special and alternative service crimes. Classification of crimes against the interests of the service in private organizations is closely related to the processes of speciation of the relevant criminal law norms. Therefore, the classifications of these crimes do not remain unchanged, they are modified and transformed, determining the prospects, trends and strategies for the development of the entire named norm formation.

3 CONCLUSION

In light of the above, you need a clear legislative the ratio of norms on criminal responsibility for crimes against interests of private organizations and crimes against interests of public service and service in local governments; ensuring, on the one hand, convergence of legal rules on responsibility for crimes against interests of service in private and public organizations, and with another - a strict differentiation of criminal liability for these related criminal assault; clarification of the notion of the person performing managerial functions in commercial or other organization, in order to exclude from the criminal legislation of Russia of discrepancies, for example in terms of legislative language on the implementation of a special subject called managerial functions "in a commercial or other organization" (part 1 of article 201, part 1 of article 201.1, paragraphs 1 and 5 of article 204 of the criminal code) and "in a commercial or other organization, as well as in non-profit organization" (note 1 to article 201 of the criminal code); improving the structure of regulations that provide for criminal liability for the analyzed crimes, in the light of the allocation of General and special types of the corresponding type of official encroachments and the location of regulations on them in a certain sequence.

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INFLUENCE OF AN SME'S SIZE ON THE INTEGRATION OF DIGITAL TECHNOLOGIES AND INTERNET USAGE

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Abstract

This paper presents an overview of a part of the research performed in order to define the ways and criteria for determining the degree of success of the digitalization of SMEs. During this research, a new Index of the Digitalization of SMEs was defined. It enables a fast assessment of the digitalization level for each SME. The index itself includes four dimensions, of which the third and fourth, Integration of digital technologies and Internet usage, were considered in this paper. The first considered dimension describes the level of digital technology use and electronic commerce. The second dimension focuses on Internet communications and Internet transactions. Considering the importance of using the Internet in the business of most SMEs, the paper presents an analysis of the relationship between the use of the Internet and the connection of SMEs to the Internet. After presenting the methodology of the research, there are shown the results of the research obtained using this methodology. Three research questions supported by appropriate hypotheses, null and alternative, are discussed. Particular emphasis in the research is placed on determining the impact of the size of SMEs on Internet usage. Based on the research, it was established that there is a correlation between the size of SMEs and the level of integration of digital technologies, but there is no correlation between the size of SMEs and the dimension "Internet usage". This work can usefully serve anyone involved in the digitalization of SMEs and/or in the re-engineering of SMEs' business processes.

Keywords: *digitalization, SME, Internet, IDSME index, business process, reengineering.*

1 INTRODUCTION

In the last decade of the XX century, and at the beginning of this century, the entrepreneurship and the micro, small and medium-sized enterprises (SMEs) have appeared as possible ways of survival for many people. The small, legal entities with precisely defined goals can be established with small investments. They can successfully operate, but in case of their failure, there will be no major earthquakes. The next good fact is that SMEs can quickly adapt to new business conditions. But, their size often can cause problems because of their limited

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resources, both, the material and human resources. SMEs are discussed in a number of literary sources, such as, for example, (Chang, 2014), (Curran & Keynes, 1999), (Bolton, 1971), (Champaneri, 2017), (Schumpeter, 1934; 1983; 2008), etc. So, we will not deal with this topic here.

Considering available data, the current level of technology and trends in development, and the importance of SMEs, and bearing in mind the ubiquity of information technologies, digitalization is imposed as an undeniable influence on the functioning of SMEs. Digitalization is a term that is widely used nowadays.

Many indices have been created to point out to the level of digitalization of individual economies and countries, e.g. DESI - Digital Economy and Society Index (Benini, 2018), I-DESI International Digital Economy Index (Foley, Sutton, Wiseman, Green, & Moore, 2018), EDI - Enabling Digitalization Index (Hermes, 2018), GCI - Global Connectivity Index (Huawei, 2018), and others, but the area of SMEs remained neglected. No index is focused on SMEs. In order to alleviate this deficiency, we created a new index, the Index of Digitalization of SMEs (IDSME).

2 INDEX OF DIGITALIZATION OF SMEs (IDSME)

The IDSME index represents a contribution to the exploration of the impact of digitalization on individual SME. It allows SMEs to carry out self-evaluation and determine to what level they are digitalized and on what they need to pay attention to in their development plans.

Table 1 The structure of IDSME dimensions Integration of digital technologies and Internet usage

Dimension	Sub-dimension	Indicator	Criterion	min	max
3. Integration of digital technologies (w = 45%)	3a. Use of digital technologies (w=50%)	3a1. Possession of an own website	Possession of an active website	0	1
		3a2. Possession of an or more accounts on social networks	Possession of an or more active accounts on social networks	0	1
		3a3. Keeping records electronically	Possession of dedicated software	0	1
		3a4. Using of B2B e-business models	Internet activities in the last three months	0	1
		3a5. Using of B2G e-business models	Internet activities in the last year	0	1
		3a6. Using cloud computing	Possession of an active Cloud account	0	1
		3a7. Using some decision support tool	Possession of dedicated software	0	1
		3a8. Using automation	Possession of equipment	0	1
	3b. Electronic commerce (w=50%)	3b1. Online selling	Sales made online	0	1
		3b2. E-commerce turnover	% of the total turnover	0	33
		3b3. Cross-border online sales	% of the total turnover	0	25
4. Internet usage (w = 25%)	4a. Communication (w=50%)	4a1. Individual video calls or video conferences	Internet activities in the last year	0	1
		4a2. Use of e-mail	% of e-mails in total correspondence	0	90
		4a3. Participation in social networks	Frequency of using social networks (never, rarely, at least once a month, weekly, daily)	0	4
		4a4. Intranet possession	Network possession	0	1
	4b. Transactions (w=50%)	4b1. E-banking	% of electronic- in total banking- transactions	0	90
		4b2. Purchasing over the Internet	% Internet shopping in total purchases	0	25

Source: (Bogavac & Čekerevac, 2019)

The IDSME can also measure the progress of SMEs in the digitalization process. As such, it brings a combination of relevant indicators weighted within sub-dimensions and dimensions.

The IDSME index allows four main types of analyses (Bogavac, 2019):

- *Overall Impact Assessment:* to achieve the general performance characteristics of an SME by observing its overall index and results of the main dimensions of the index.
- *Zooming:* to identify areas where the performance of SMEs could be improved by analyzing the results of the sub-dimensions of the index and the individual indicators.
- *Tracking:* to assess if there is progress over time.
- *Comparative analysis:* to compare the successes of SMEs according to index results, comparing SMEs in similar activities to identify the need to improve the business environment.

The structure of the IDSME index is explained in detail in (Bogavac, 2019) and (Bogavac & Čekerevac, 2019), so only the part that relates to this research will be presented here.

The structure of these two dimensions is shown in Table 1. In the table, the weights of the corresponding sub-dimensions and dimensions are indicated by w. The weighting is explained in more detail in sub-section 3.2.

3 RESEARCH

This research was conducted on SMEs in Russia, Serbia, and Slovakia. The aim was to measure the significance of the digitalization of business processes to SMEs individually and globally. In this paper, the accent is placed on two dimensions, Integration of digital technologies in SMEs and Internet usage.

3.1 Methodology

This research is exploratory with elements of explanatory and descriptive. Within the research, relevant research objects were identified and explained. Within the descriptive analysis, the phenomena are broken down into sections sufficient for the analysis to be successfully carried out and that proper legality can be observed. In doing so, both deduction and induction were used.

The research used an empirical method as an analytical method that enables reliable conclusions on the interdependence of certain observed elements and trends in individual phenomena. The statistical analysis covered the relevant data that enabled the detection of the legality of mass events covered by this analysis. In doing so, one should be aware that the statistics are not almighty and that the results obtained should always be accepted with the reserve. The statistically obtained results give a quantitative determination of some phenomenon, but not qualitative. The qualitative determination is obtained by the induction method. The conclusions thus obtained, from the individual to the general, can depend on the one who performs the analysis. A particular problem in statistical data processing is the size and credibility of the sample. This analysis was done based on a survey conducted in Russia, Slovakia, and Serbia. Although the samples should be randomly selected, it was not possible to provide absolute randomness of the samples in this survey. The reasons are numerous, starting from the incomplete data from the databases with SME addresses that were used to select the sample, to the level of those who filled out the survey. Since the SMEs and their addresses were mostly obtained by Internet mining, the results are probably somewhat more favorable than those that would be obtained if in the survey they were included and those companies that are not in any form present on the Internet. However, this did not adversely affect the results, because the topic of work is focused on studying the impact of digitalization on the work of SMEs that use the Internet in some way.

The research was carried out by checking hypotheses. The basic goals of setting the hypotheses are directing to the problem and the connecting theoretical assumptions with the experiential reality. Hypotheses have been tested based on relevant data using modern mathematical tools in the following way (Bogavac & Čekerevac, 2019):

1. *Defining the boundary of significance;*
2. *Writing hypotheses, zero and alternative;*

3. *Selection of sample or samples, and calculation of parameters;*
4. *Determination of the limits of rejecting the zero hypotheses;*
5. *Determining whether the zero hypotheses can be rejected; and*
6. *Defining and presenting conclusions according to tested hypotheses.*

3.2 Normalization, weighting, and aggregation

Based on the structure shown in Table 1, it is seen that the dimensions are composed of sub-dimensions and that the sub-dimensions include many indicators. To obtain useful results, it is necessary to normalize the indicators and weighting of the indicators and sub-dimensions. To determine the value of the IDSME index, we need also to carry out the weighting of dimensions. Normalization of the indicators was performed using the min-max method by the linear projection of each indicator on a scale in the range 0 to 1. The zero corresponds to the minimum value and one to the maximum value. The criteria and limit values of the indicators are shown in Table 1, the last three columns. The same min-max method was used for sub-dimensions normalization. Thus, each of the sub-dimensions was ranged from zero to one, which allowed the dimensions to have values between zero and one after weighting.

It is difficult, practically impossible, to choose dimensions, sub-dimensions, and indicators so that they reflect the state and to have the same impact. To overcome this challenge, weighting appears as a very useful method. As written in chapter 2, the applied correction coefficients are marked with w, and their values are shown with the corresponding dimensions and sub-dimensions in Table 1. The values of the indicators are not weighted.

The aggregation of indicators in IDSME dimensions was done on the way that the indicators were aggregated into the sub-dimensions (step 1), and then the weighted values of the sub-dimensions were aggregated into dimensions (step 2) as follows:

$$C = 0{,}5 \cdot C'_{3a} + 0{,}5 \cdot C'_{3b}$$

where

C – a value of dimension *3, Integration of digital technologies*

C'_{3a} – the normalized value of the sub-dimension *3a. Use of digital technologies* = $\frac{\sum_{i=1}^{i=8} C_{3ai}}{8}$

C'_{3b} – the normalized value of the sub-dimension *3b. Electronic commerce* = $\frac{C_{3b1}+C'_{3b2}+C'_{3b3}}{3}$

Similarly, the values D of the dimension *4, Internet Usage*, have been obtained:

$$D = 0{,}5 \cdot D'_{4a} + 0{,}5 \cdot D'_{4b}$$

D'_{4a} – the normalized value of the sub-dimension *4a. Communication* = $\frac{D_{4a1}+D'_{4a2}+D'_{4a3}+D_{4a4}}{4}$

D'_{4b} – the normalized value of the sub-dimension *4b. Transactions* = $\frac{D'_{4b1}+D'_{4b2}}{2}$

Normalized values are marked by accents, and the other tags correspond to the tags in Table 1.

In all cases, the min-max normalization was made according to the general formula

$$x' = \frac{x - \min(x)}{\max(x) - \min(x)}$$

3.3 Sample

In this research, E-mails with the survey forms were sent to 847 addresses in Serbia, Russia, and Slovakia. E-mail surveys provided the opportunity to fill in the poll online or to return the completed form to the sender's address. Respondents were given the opportunity to fill in the survey anonymously. The number of employees, which is a key figure for all subsequent calculations, was an obligatory data. In addition to this, a three-language survey was set up using the Google Forms platform. A total of 236 useful answers were obtained. The response rate in the survey was 27.98% which can be considered as an excellent response since the survey was voluntary and unpaid. Nevertheless, it should be noted that the survey was supported by the Institute of Humanities in St. Petersburg, the Majkop State Technological University in Maykop, both from the Russian Federation and the School of Economics and Public Administration in Bratislava, Slovakia. The research in Serbia was conducted with the

help of the Serbian Chamber of Commerce in Belgrade.

3.4 Dimension – Integration of digital technologies

Dimension the Integration of digital technologies focuses on the degree to which SMEs are ready to use digital technologies in their business regardless they are used on the Internet, or they are part of the intranet or even they are used on individual computers. Therefore, the dimension is divided into two sub-dimensions (Bogavac & Čekerevac, 2019):

- *The use of digital technologies, and*
- *Electronic commerce*

The "The use of digital technologies" sub-dimension consists of eight indicators that indicate whether the SME has its website, social network accounts, whether it keeps its records electronically, and uses B2B and B2G business models, cloud computing, tools for the decision support, and automation.

The "Electronic commerce" sub-dimension includes online selling; e-commerce turnover; and cross-border online sales.

Before calculating the value of the dimension *Integration of digital technologies*, an analysis was made, and it was established that this dimension is normally distributed as shown in Figure 1.

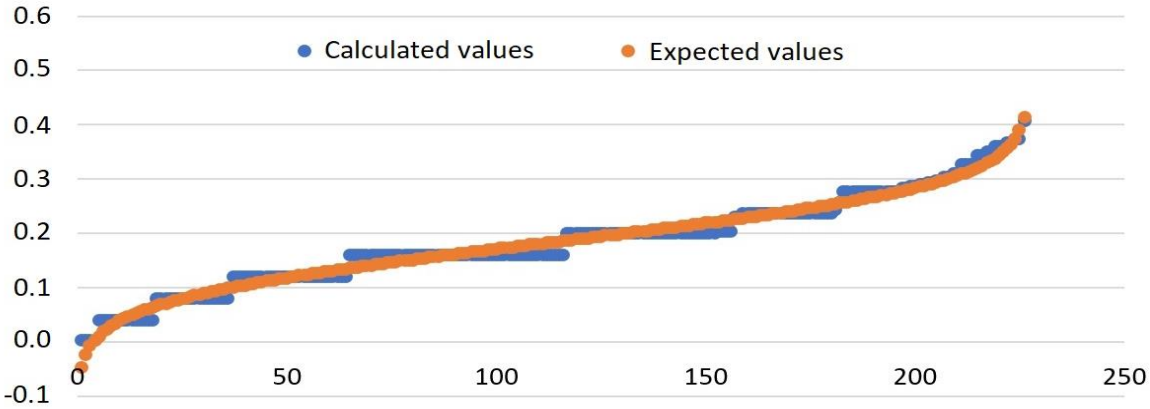

Fig. 1 The distribution of the IDSME dimension Integration of digital technologies

Source: Authors

Figure 1 shows that the calculated values of the dimension *Integration of digital technologies* coincide with the ideal curve of the normal distribution for the corresponding sets of data. Visible differences occur only there where more SMEs have achieved the same, maximum, result. Also, there are several micro-enterprises that achieved score 0, so their cumulative impact led to the expected value of less than zero, which is impossible. When repetitions are absent from consideration, the calculated dimension values are virtually identical to the theoretical values for the normal distribution.

During the research, the first research question (A) was raised: *What is the relationship between the size of SMEs and the integration of digital technologies in SMEs expressed through the dimension "Integration of digital technologies" of the IDSME index?*

To investigate this relationship in the survey, questions were asked about:

- a possession of:
  - an active website,
  - an open order on social networks,
  - business software that SMEs use in their business, and
  - online store,
- using of:
  - the B2B business models in the last three months,
  - the B2G business model in the past year,
  - cloud computing,
  - the decision support tool, and
  - automation of business processes,
- E-commerce turnover share in total turnover, and
- the cross-border share of online sales.

The null hypothesis for the first research question can be set up in the form of:

H_{A0}: *There is no relationship between the size of SMEs and the integration of digital technologies into their business expressed*

through the dimension Integration of digital technologies of the IDSME index.

The alternative hypothesis for the first research question can be set up in the form of:

H_{A1}: *There is a relationship between the size of SMEs and the integration of digital technologies into their business expressed through the dimension Integration of digital technologies of the IDSME index.*

Based on the results of the survey, the null hypothesis was verified by the MS Excel program's data analysis tool Regression. Results of statistical data processing for the relationship between the size of SMEs and their ability to integrate the digital technologies expressed through the dimension "Connection to the Internet" of the IDSME Index are shown in Table 2.

Table 2 Results of statistical data processing for the relationship between the size of SMEs and their ability to integrate the digital technologies expressed through the IDSME dimension "Integration of digital technologies"

Regression Statistics	
Multiple R	**0.1923787**
R Square	0.0370096
Adjusted R Square	0.0327105
Standard Error	0.0832528
Observations	226

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.05967	0.05967	8.608745	**0.003693516**
Residual	224	1.55255	0.00693		
Total	225	1.61222			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	0.170254	0.00683	24.94064	0.000000	0.156802	0.183706
X Variable 1	0.000258	0.00009	2.93407	**0.003694**	0.000085	0.000431

Source: Authors

The obtained result for the Pearson coefficient ρ = 0.192379 and the p-value less than 0.05, they reject the null hypothesis that there is no correlation between the size of SMEs and the integration of digital technologies into their business expressed through the dimension "Integration of digital technologies" of the IDSME index. The correlation is at a level of poor correlation.

The linear regression equation on the basis of the obtained results gets a shape

$$y \approx 0{,}170254 + 2{,}58 * 10^{-4} * x$$

where ***x*** is the number of employees in SMEs, and ***y*** is the value of the dimension Integration of digital technologies.

3.5 Dimension – Internet usage

The Internet Usage dimension focuses on the types of activities that SMEs have on the Internet, primarily on communications and business transactions. Therefore, two sub-dimensions were created:

- *Communication and*
- *Transactions.*

The sub-dimension, *Communication* includes four indicators relating to external and internal communications:

- *video calls (single or video conferencing),*
- *use of e-mail,*
- *participation on social networks, and*
- *possession of intranets.*

The use of video calls and the possession of intranets are encoded with *1* (use, has) and *0* (not

used, no). The use of e-mail is viewed as a percentage share in total written correspondence, and participation in social networks is differentiated according to the frequency of use of social networks ranging from 0 (never used) to 1 (used daily), with values of 0.25 (rare), 0.5 (once a month) and 0.75 (once a week).

The sub-dimension, *Transactions* describes the propensity of SMEs, Internet users, to execute online transactions. It focuses on two indicators:

- *electronic banking, and*
- *shopping via the Internet.*

As a criterion for electronic banking, the percentage of electronic in total banking transactions was taken.

For the indicator Internet shopping, the share of e-purchases was taken in relation to the total purchase. In order to provide more relevant results, the limit value for this indicator was taken as 25% of the total purchase, and all above this value was encoded by the value 1.

The criteria for each of the indicators are shown in Table 1.

Before further analysis and calculating the value of the dimension of *Internet usage*, an analysis was made to see whether this dimension is normally distributed. The results are shown in Figure 2.

Fig. 2 The distribution of the IDSME dimension Internet usage

Source: Author

Figure 2 shows that the calculated values of the dimension *Internet usage* coincide with the ideal curve of the normal distribution for the corresponding sets of data. Certain deviations on the tails of the diagram and the negative value of the expected values for micro-companies can be explained in the same way as explained in relation to Figure 1.

In connection with the use of the Internet, **the second research question (B)** was raised:

What is the relationship between the size of SMEs and the use of the Internet in SMEs expressed through the "Internet Usage" dimension of the IDSME index?

Under "Internet Usage", here are meant:

- using the Internet for video communications in the past year,
- E-mail share in total postal communication of SMEs,
- frequency of using social networks by SMEs,
- possession of intranets,
- electronic banking share in total banking transactions,
- the share of electronic purchases in total purchases.

The null hypothesis for this research question can be set in the form:

H_{B0}: *There is no correlation between the size of SMEs and the use of the Internet within the SME business, expressed through the "Internet Usage" dimension of the IDSME index.*

An alternative hypothesis for this research question can be defined in the form:

H_{B1}: *There is a correlation between the size of SMEs and the integration of digital technologies into their business, expressed through the dimension "Internet Usage" of the IDSME index.*

The null hypothesis was checked with the same tools and in the same way as explained in the case of the first research question. The results of statistical data processing are shown in Table 3.

In this case, the value of Pearson's correlation coefficient is ρ = 0.066627, which is significantly less than 0.3 and very close to zero. The P-value is significantly higher than the limit value of 0.05, so the results obtained for this set of data do not reject the null hypothesis H_{B0} that there is no correlation between the size of SMEs and the use of the Internet in the context of SME operations expressed through the "Internet Usage" dimension of the IDSME index while rejecting the alternative hypothesis of H_{B1} that there is a correlation between the size of SMEs and the integration of digital technologies into their business expressed through the "Internet usage" dimension of the IDSME index. Looking at the limit values of Variable1, Lower 95%, and Upper 95%, one can see that the field includes zero, indicating that these two dimensions are not interdependent.

Table 3 Results of statistical data processing for the relationship between the size of SMEs and the use of the Internet in the framework of SME operations expressed through the IDSME dimension "Internet Usage"

Regression Statistics	
Multiple R	**0.066627**
R Square	0.004439
Adjusted R Square	-0.000005
Standard Error	0.062713
Observations	226

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.003928	0.003928	0.998815	**0.318676**
Residual	224	0.880964	0.003933		
Total	225	0.884892			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	0.121301	0.005142	23.589457	0.000000	0.111168	0.131434
X Variable 1	0.000066	0.000066	0.999407	**0.318676**	-0.000064	0.000197

Source: Authors

Since we have established that there is no correlation between the size of SMEs and the use of the Internet, a new, **the third research question (C)** has appeared:

What is the relationship between the use of the Internet in SMEs and their connection to the Internet in the manner defined by the IDSME model?

Significant on this issue is that it allows one to see how the Internet is used, or how many employees use video communications, e-mail, social networking, e-banking, and online purchases.

In this analysis, *Connectivity to the Internet* is considered an independent variable, and *Internet usage* is a dependent variable. The null hypothesis for a research question C can be set in the form:

H_{C0}: *There is no correlation between the use of the Internet by employees in SMEs and the connection of SMEs to the Internet according to the indices included in the "Internet Usage" and "Internet Connection" dimensions of the IDSME index.*

An alternative hypothesis for the research question C can be defined in the form:

H_{C1}: *There is a correlation between the use of the Internet by employees of SMEs and SMEs' connection to the Internet according to the indices included in dimensions "Using the Internet" and "Internet Connection" IDSM index.*

The null hypothesis was checked with the same tools and in the same way, as it was already explained. The results of statistical data processing are shown in Table 4.

Based on the results shown in Table 4, it can be seen that Pearson's coefficient, in this case, has a value of ρ = 0.27048 and that the p-value is statistically significant and significantly lower than the set limit value of 0.05. So the null hypothesis H_{C0} that there is no correlation between the use of the Internet by employees in SMEs and the connection of SMEs to the Internet according to the indices included in the "Internet Usage" and "Internet Connection" dimensions of the IDSME index can be rejected at the expense of the alternative H_{C1} hypothesis that there is a connection between the use of the Internet by employees in SMEs and SME linkages to the Internet according to the parameters covered by the dimensions "Internet Usage" and "Internet Connection" IDSME index.

Table 4 The results of statistical data processing for the relationship between the use of the Internet and the connection of SMEs to the Internet

Regression Statistics	
Multiple R	**0.27048**
R Square	0.07316
Adjusted R Square	0.06902
Standard Error	0.06051
Observations	226

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.064736	0.064736	17.680762	**3.7777E-05**
Residual	224	0.820155	0.003661		
Total	225	0.884892			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	0.0851	0.0102	8.3826	5.756E-15	0.06510	0.10512
X Variable 1	0.4494	0.1069	4.2048	**3.778E-05**	0.23881	0.66007

Source: Authors

Correlation is at a level of poor correlation.

The linear regression equation on the basis of the obtained results gets a shape

$$y \approx 0{,}0851 + 0{,}4494 * x$$

where ***x*** is the value of the Internet connection dimension, and ***y*** is the value of the Internet usage dimension.

4 CONCLUSIONS

The research has shown that the digitalization process is in an unstoppable rise and that most of the SMEs follow this trend in the hope that they will be able to exploit its potential.

The IDSME index has proven to be a tool that allows SMEs to see their achievements in the field of digitalization, as well as the way forward. The size of SME affects the level of integration of digital technologies into the company's business but does not affect the level of Internet usage in the business. Also, it has been proven that there exists a correlation between the level of connection of SMEs with the Internet and the level of Internet use for the business purposes of SMEs.

This research was focused on the digitalization of SMEs and did not include other employee-related Internet activities. Given the huge number of smart mobile phones used by employees in SMEs, it can be expected that the use of the Internet is higher than that obtained with the IDSME index. It is not possible to set a clear border between the use of the Internet for private and business purposes. The experience that employees acquire when using the Internet for private purposes is also used for business purposes.

The expected introduction of 5G networks will open new opportunities for the business and development of SMEs, and will also influence the change of existing criteria in relation to IDSME index indicators. However, this will not be a limiting factor for the implementation of the IDSME index.

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ANTI-CORRUPTION METHODS

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Abstract

The article presents two groups of methods to counter the corruption of public servants. The first part examines the repressive methods of fighting corruption. Such methods include the death penalty, the increase in prison terms, confiscation of the property of the briber, fines, a ban on the profession for corrupt officials. The second part analyzes the strengths and weaknesses of preventive methods to counter corruption. These include dissemination of knowledge about corruption and measures to counter it, transparency and publicity of public procurement, electronic competitions in public procurement, public reporting of public procurement servants. The following methods are also considered: commercialization of the activities of civil servants, increasing salaries for officials, reducing the number of civil servants, reducing bureaucratic functions, minimizing the variability of decisions of officials, the transition from permissive to notifying public institutions, including the one-window principle. The methods such as electronic paperwork, recruitment of personnel taking into account their psychological and moral qualities, checks of civil servants, operational control over the work of officials, rotation of personnel, the method of "circular bail", anonymous survey of employees are also described. Much attention is paid to the participation of the population in the detection of corrupt officials: opinion polls, "trust telephones", public control over the expenditures of officials, providing guarantees to persons who contribute to the detection of corruption. A special role in the fight against corruption of officials belongs to democratic institutions ensuring equality of all members of society under the law, elected officials, as well as the method of the sociocultural discrediting of bribery.

Keywords: *Corruption. Anti-corruption methods.*

1 INTRODUCTION

The fight against corruption has been under way for thousands of years. This problem was felt by all societies that have entered the phase of state building. It was with the formation of the state and there was corruption. She is a parasite in the state body, appears, lives and dies with the state. Probably, as a Koch's bacillus lives in every human body, so does corruption in all the states of the world. However, just as a healthy body is able to withstand viruses, albeit permanently living in it, there are also states that have managed to reduce corruption to a non-dangerous level for itself. Our country, unfortunately, looks like a patient with metastases, the recovery of which is too slow. The problem of corruption is still extremely relevant for the Belarusian society.

In the fight against bribery, as against any deviation, two main approaches can be taken: repressive and preventive. There is no rigid watershed between them. All repressive measures are also preventive, warning citizens against committing crimes. And yet, there is a fundamental difference between them. The

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repressive measure is aimed directly at the person who has already transgressed the law. This is a way of punishing him for an already committed crime. But the preventive measure is aimed at the citizens who are innocent before the law. It prevents them against committing an offence by creating an environment with the least temptations of illegal acts. We intend to consider these two large groups of methods in this article.

2 REPRESSIVE ANTI-CORRUPTION METHODS

Repressive anti-corruption measures are most popular among the people. They include, first of all, tougher sanctions against corrupt officials up to the death penalty. So let's talk about it first. And let's start with the most radical measure - with the death penalty of corrupt officials.

The death penalty for bribes. Even in ancient times, according to Herodotus, in Persia, King Kambiz from the judge-briber ordered alive to tear off the skin and wrap it around the chair for the next judge, so that he always remembered the fate of his predecessor. Not all our contemporaries consider such measures a manifestation of wild barbarism. And today there are many supporters of the use of the death penalty against bribers. In China, for example, even today, corrupt officials are not only condemned for long prison terms, but often shot, showing the execution on TV in the evening news programs in spite of the ranks and positions. In 2000, for example, even the Vice-President of the National People's Assembly was executed on corruption charges. Of course, the fear of losing a life is a good safeguard against corruption temptations. But is it possible to eliminate corruption as a social phenomenon by the extermination of bribers? Doubt in the effectiveness of even such steep measures of extermination of bribers causes at least the fact that, despite the shootings, bribery in China has not only is reduced to zero, but even, according to the Chinese themselves, is thriving. In any case, in the rating of perception of corruption according to Transparency International for 2019, China was even lower than Belarus (respectively, 87th and 70th place). It seems that the death penalty for bribery is not a panacea for corruption. In our view the thing is that corrupt officials but not corruption are executed. And the difference, as it is easy to understand, is fundamental: if there are favorable conditions for corruption, the heads of bribers will have to be cut endlessly, because it is like the Lernaean Hydra with a thousand heads. The Heracles is cutting of the heads of this hydra, as it is known, led to a doubling of their number. Such efficiency has been observed so far in the most eminent anti-bribery fighters, who have the authority to eliminate corruption among officials, entrusted to the same officials, only from another agency. How can we not remember the sad experience of the fight against the fever of the soon-to-be-killed Russian tsar Peter the Great, all the efforts of whom led, in the end, to the appearance of the unsurpassed briber Alexander Menshikov.

Increase in prison terms. However, our contemporaries in the age of humanism are not so often offered to rip off the skin of bribers and put them on a stake. More often than not, they are referring to an increase in prison terms. But can we increase the terms of imprisonment, if part one of Art. 430 of the Criminal Code of the Republic of Belarus (receiving a bribe) provides up to seven years, part two - up to ten years, and part 3- up to fifteen years in prison. In terms of the severity of sanctions, corruption has already almost been equated with murder, drug and weapons production. It is advisable to toughen the punishment only in relation to those bribers who have a duty to guard the law, first of all, prosecutors and judges. And yet, it seems that the resource of increasing prison terms for bribes has already been exhausted. But there is an opportunity to hurt a corrupt official on the pocket. It's about confiscating the briber's property.

Confiscation of the briber's property. This measure is widely used in many developed countries of the world, including Belarus. Articles 430-431 of the Criminal Code of the Republic of Belarus provide for the possibility of confiscating all or part of the criminal's property. Let's emphasize, not the subject of a bribe, but all the property of the fallen corrupt officials. This measure is good because it devalues the meaning of the corrupter's establishment - the accumulation of material goods. The risk of losing all property can save the most sensible officials from the temptation of corrupt profits. However, it should be recognized that far-sighted corrupt officials find an antidote to this risk by transferring some of the most valuable property in the name of their

relatives and proxies. Therefore, the effectiveness of this measure is also often highly questionable.

Fines. Recently, in a number of countries, particularly in Russia, as a measure against corruption, it is proposed not to imprison bribers, but to fine them. In April 2011, the State Duma passed a bill introduced by Russian President D. Medvedev, according to which the alternative to prison for bribers are fines. Moreover, the amount of fines is multiplied with the amount of bribes. The bigger the bribe is, the more substantial the fine is. Critics of the measure have justifiably accused its supporters of allowing corrupt officials to pay off their prison sentences. In addition, the judges themselves fall into the corruption temptation of assigning criminals qualitatively different types of punishment. And in terms of social justice, there may be inconsistencies: the poor will still get real terms, and the rich will again get a chance to pay off. In any case, this measure deserves to be tested for economic efficiency and social justice.

Prohibition of the profession for corrupt officials. From various social layers often sounds a proposal to permanently exclude from the register of public servants caught with red-handed bribery. The Criminal Code of the Republic of Belarus 430 (receiving a bribe) provides for depriving the offender of the right to hold relevant positions and engage in certain activities. This kind of "prohibition on the profession" is considered by many to be justified repressive measure, which has a preventive effect (Alekseyev, 2008, p. 4). It is able to keep officials from the corruption temptations that accompany the life of a high-ranking official. Doubt can cause only that the severity of the measure, once and forever finishing the career of the official who took a false step. On the other hand, the inevitability of punishment, combined with its harshness, is a strong caution against committing corruption crimes. So, repressive sanctions of the maximum degree were provided by the national law. There is probably nowhere to tighten the legal screws. But even such severe sanctions do not frighten everyone, as the statistics of offenses and data of sociological studies show. This means that the repressive measures have almost completely exhausted themselves. That doesn't mean they need to be minimized. But also they should be supplemented with preventive measures. We will talk about them in more detail in the next part of the article.

3 PREVENTIVE ANTI-CORRUPTION MEASURES

Preventive anti-corruption measures are different from repressive measures in that they are targeted not by criminals but by the conditions that give rise to crime. Accordingly, if repressive measures are used for the most part by law enforcement and regulatory bodies, preventive measures are initiated by public figures and political leaders, and are developed by scientists and social technologists. Preventive measures are being carried out not during special operations of law enforcement agencies, as repressive measures, but within the framework of social policy. Unlike repressive measures, the set of which is severely limited, preventive measures can be inexhaustible. Understanding this, we will try to formulate and summarize some of them.

Expanding and disseminating knowledge on prevention of corruption. This is one of the requirements of the United Nations Convention Against Corruption adopted by the UN General Assembly on 31 October 2003. Training programs for schools and universities should provide future professionals with "specialized and appropriate training in order to increase their awareness of the risks of corruption and their performance". People's knowledge and understanding of what constitutes bribery and what punishments it provides is the foundation of the fight against corruption. Such knowledge serves as an important preventive measure for future public servants and for the entire population, warning them against corrupt interaction. It is for this purpose that a training course entitled "Corruption and its public danger" has been introduced in the programs of all higher education institutions in Belarus since 2009. This course can be called as a training course only conditionally, because its task is not to teach, but to warn against corruption risks, to help future managers to resist the temptations of the authorities. Our experience of teaching this course demonstrates the significant interest of students in the content of the discipline (Bubnov & Gribanovskiy, 2019, pp. 16-20).

Transparency and publicity of public procurement. This method of minimizing

corruption is proposed in Art. 9 of United Nations Convention against Corruption, adopted by the UN General Assembly on 31 October 2003. Public procurement decisions are effective measures to prevent corruption. It is impossible to disagree with this. Only if the complex of all procedures that ensure transparency and publicity of public procurement, we can hope to minimize the corruption risks of this truly "pot of gold" of the greedy officials and enterprising businessmen. In Belarus, any significant purchases are carried out on a competitive basis. The level of transparency and publicity of public procurement greatly increases electronic bidding.

Electronic bidding and competitions for the placement of government orders have become widely introduced recently due to the spread of computer technologies. Private business has long mastered the Internet for trading. But government orders began to be placed in the Internet for direct bidding and competitions only relatively recently. And this applies mainly to the Russian experience. To some extent, such slowness in the development of promising technologies can be explained by the inherent sluggishness of the state system. However, it is necessary to take into account the corrupt interests of a certain part of the bureaucracy, which has always had considerable kickbacks on public procurement and orders. Under any pretext, they try to "roll" electronic trades into a behind-the-scenes format, opening for them a wide range of opportunities for corruption "margins".

Public reporting as one of the fundamental principles of the functioning of state organizations, according to Art. 10, the 2003 UN Convention, is one of the conditions preventing corruption. Beginning with the revolutionary reform of Servius Tullius, which made the contents of state laws in the Roman public, publicity became one of the fundamental foundations of the rule of law. This is also the case with corruption, which flourishes in the face of excessive secrecy and the secrecy of public information. More often only unscrupulous officials are interested in such secrecy. According to modern lawyers (Golik & Karasov, 2005, p. 32), a socially oriented and transparent system of public governing and administration can become a force that can paralyze corruption and effectively control the bureaucracy.

Public participation in the detection of corrupt officials is considered by UN Convention as the most important factor in the success of the problem in identifying corrupt officials. Art. 10 recommends that the public should be provided with all possible channels of access to law enforcement agencies to report, including anonymously, any cases that may constitute any corruption crimes. Indeed, the participation of the population in the active anti-corruption can provide total control over the bribery bureaucracy. So, it might happen if there were no three problems. The first problem is the risk of anonymous slander and personal account information between citizens. And the second, much more significant problem is that, unfortunately, a large part of the population is not interested in uncovering corrupt channels of interaction with compliant officials. There is also a third moral problem. The fact is that in the national mentality it is considered indecent to "signal" to the state authorities about the offenses of fellow citizens. In order for people to want to inform to one government agency about bribes happening in another public body, it is necessary, first, that they should not afraid to do so, secondly, that they should be interested in fighting corruption and, thirdly, that they consider it a noble, decent thing. Unfortunately, so far all three conditions of total people's control over bribers are not in use. It is necessary to work a lot with people to make it an unequivocal ally in the fight against corruption. But if bribery remains a mass social practice, this measure will not result in any obvious results.

Commercialization of state activities. This proposal was made by the well-known economist Gabriel Popov. Being the mayor of Moscow and much later in his activities, he strongly recommended the introduction of "legitimate, transparent, taxable participation of bureaucrats in the share of profits derived from their decisions" (Gutorova & Trifonov, 2010, p. 4). Thus, the author of the idea believed that officials would be more focused on the interests and needs of customers, getting their livelihoods from them. The legality of paying for the services of officials, according to G. Popov, should save them from a number of social guilt and criminal risks. And the state will be able to receive taxes from official payments of visitors to public servants. Critics of this idea called it as legalization of bribery and resuscitation of medieval practice of "feeding" officials. Moreover,

such a reform of the public service will hardly save it from corruption, as it would keep intact its main premise - a monopoly dictatorship of bureaucracy.

Increased salaries for government employees. The idea of financially interested officials to be honest is not new. According to results of the survey, one in four citizens of Belarus supports the proposal to legally raise the salaries of civil servants, so that they do not have their eye on the bribe. This idea is often said by the officials. They can be understood. This is a completely win-win option for them to fight against corruption. In Russia, where corruption has reached unprecedented proportions, it is supposed not only to punish bribers, but also to "buy" them with high salaries. In particular, the project is actively promoted, according to which the salaries of state officials should increase much more and reach several thousand dollars. For example, Boris Nemtsov a few years ago proposed to set the salary of the prime minister at the level of 10 thousand dollars, a minister - 7 thousand, the head of the department - 500-600 dollars. The idea of B. Nemtsov has actually been implemented. The authors of the reform were not afraid of the fact that the adoption of their proposals led to a monthly increase in the cost of bureaucracy by 20 million dollars. In his interview Nemtsov said: "It will cost less than to pay the current starvation wage. The Anti-Corruption Committee estimates that the level of the damage caused to the country by corruption, in the form of duty-free import of goods amounts to 20 billion dollars a year. This figure is comparable to Russia's annual budget. With higher salaries the state will be able not only to hire young professionals who are not corrupted by bribes, but also to reduce the apparatus by 20%" (Samyye interesnyye stat'i, 2005, p. 5). However, the mere increase in the salaries of public servants, as experience has shown, does not produce tangible results. Even with the increased salaries, Russian officials are still taking bribes. It is important not only to increase the salaries of public servants and also it is necessary to give an increase in salary to show government care about the employee and his family. Then it will be taken not for granted, but as an encouragement that still needs to be earned. Today, for example, Belarusian customs officers receive personal allowances for rank, for knowledge of foreign languages, for special conditions of service, for seniority, annual allowances for recovery, etc. So, it is necessary to rise wages to officials, as well as to all other "budget workers," of course. But they should do it wisely.

Reducing the number of officials. One of the most practiced methods of the administrative system to counter corruption is the reduction in the number of officials. And usually one in five civil servants is subject to sequestration. The figure of 20% seems to have a certain magic, because it is most often announced by the decisive leaders of the states, who turned on corrupt officials among their own employees. The Belarusian President has repeatedly practiced a 20 percent reduction in civil servants in the early years of his governing. In 2013, the President of Belarus demanded 25 percent reduction of the state apparatus. D.A. Medvedev, ex-President of the Russian Federation, emotionally commented on how productive such measures are against bureaucratic corruption: "We are reducing it. Then it's six months - look, and again the same number" (Kuz'min, 2010, p. 2). It is obvious that the mere reduction of public servants is labor of Sisyphus. It is necessary to reduce bureaucratic functions. It is time to talk about it.

Reducing bureaucratic functions. Counteracting corruption by reducing the number of officials is like fighting the temperature of a sick person. The boundless growth of the bureaucracy is just a symptom of the dominance of the administrative-command system over civil society. It is necessary to fight not with the symptoms, but with the cause of bureaucracy in the form of corruption, which is the monopoly dominance of the administrative-command system. It is necessary to eliminate not officials, but administrative functions, many of which are useless and harmful. Analysts of the Russian government, for example, have found that almost 1.5 thousand functions of local officials are redundant, i.e. simply, not required, more than 260 of them duplicate each other, and another 700 require clarification of their functional necessity (Kuz'min, 2010, p. 2). It is easy to imagine how many civil servants carry out these useless functions throughout vast Russia. The area of Belarus is much smaller, but this does not mean that the problem of excessive bureaucratic functions is less relevant for us. On the contrary, it

is more difficult for us to maintain extra officials. Elimination of these unnecessary functions will mean a reduction in the corruption capabilities of the entire bureaucratic class. In addition, the elimination of excess staff will save state budget. But will officials want to surrender their privileges without a fight to control everything and everything, without answering? The question, as they say, is rhetorical.

Minimizing the variability of officials' decisions. One of the prerequisites for corruption is the ability of an official to manipulate his functions. The multiplicity of possible decisions of a public servant can be used by him to obtain corrupt income from persons interested in a particular outcome of the case. For example, the "limits" of penalties of a tax inspector or traffic police officer can be used by unscrupulous employees as a tool to pressure the guilty businessman or motorist for the purpose of obtaining a corrupt benefit. The legal unambiguity in making management decisions and sanctions allows to significantly reduce the corrupt capabilities of the greedy public servants.

The transition from permissive to notification of the registration of public initiatives. The essence of this transition is that the official is deprived of the right to authorize or prohibit a socially significant matter. Its function is only to register the initiative of citizens, for which they themselves are now fully responsible. This transition, already partially implemented in the business registration procedure, was an extremely important step of the state towards eliminating the reasons for corruption in the state authorities. The principle of "one window" in dealing with citizens' statements has become a "visit card" of Belarusian administrative reforms aimed at de-bureaucratizing the entire state system of our country. Now all the provisional documents necessary for registration prepare the office to which the citizen applied. Along with the reduction of opportunities for unsubstantiated demands on the part of officials their ability to collect from visitors illegal tributes in the form of a bribe has decreased. Thus, a side-by-side, but very important consequence of the introduction of the "one-window" principle was not only the elimination of queues in front of office offices, but also the reduction of conditions for corruption. But, the polls conducted by Mogilev Institute of Regional Social and Political Studies revealed that the implementation of the "one-window" principle in the work of specific offices still leaves much to be desired. Nevertheless, the direction for improving public services working with the population is correct. It's just about going the course consistently.

Electronic paperwork. A further step towards de-bureaucratization and ridding officials of the temptations of bribery may be the introduction of electronic paperwork into broad administrative practice. The creation of electronic databases, password-available for operational use by the population and responsible officials, will minimize the personal communication of citizens with officials. And this, in turn, will help “to knock out another stone” from the foundation of bribery. The possibility in principle and expediency of electronic paperwork has been proved by the positive experience of domestic banks, which successfully use computer technologies in the management of citizens' accounts.

Recruitment, considering psychological and moral qualities, is one of the most obvious preventive measures to fight against corruption in state bodies, whose employees work closely with the population. Article 7 of the United Nations Convention against Corruption, adopted by the UN General Assembly on 31 October 2003, suggests the use of "appropriate selection and training procedures for public office, which is considered particularly vulnerable to corruption." In some cases, the verification of applicants for positions of responsibility is carried out in an extended and in-depth mode, when the reputation of relatives and ancestors of the applicant for a responsible position is analyzed. Another fundamental drawback of this method is the imperfection of tests for measuring the psychological and moral characteristics of a person. Until now, scientists have not created a test that would not cause doubts and questions in practitioners. This does not devalue the method itself but limits its effect and prevents the absolutization of test results.

Checks of public servants. First try, then trust. This motto can be applied to many government departments, as most of them have internal security services. The effectiveness of these units can be disputed, but hardly anyone will dare to call

for their dissolution. The strength of internal staff monitoring services is their deep integration into the workforce. However, the downside is the same. A serious obstacle to the effective operation of the security services can be just their status and socio-psychological involvement in the team of the department, when the struggle for the cleanliness of the uniform can be taken as a basis for sweeping the litter under the carpet, not from the hut. Some high-ranking officials have gone even further in their efforts to purge government agencies. For example, the head of the Internal Affairs Department of the Russian Ministry of Internal Affairs, Lieutenant General Yuri Draguntsov, suggested checking officials for the tendency to take bribes (RG, 2010, p. 9). He was supported by the chairman of the Federation Council Committee on Constitutional Law A. Alexandrov. Such high support for such a radical proposal should demonstrate the legitimate nature of such verification, which many lawyers consider as an unacceptable provocation. In addition to the obvious legal conflict, which will not be easy to solve procedurally for the authors of this proposal, there is another problem, in our opinion, even more significant than the risk of being a provocateur of crime. Proponents of loyalty test for officials assume that the reason for bribery is the subjective propensity of individuals to bribery. They say, there are people who tend to take bribes, and there are those who will never and, in any circumstances, infringe the law. Incorruptible people, of course, exist in the world. Perhaps they will even be enough to form a government of the whole country. However, we consider relying only on the crystal moral qualities of officials as a manifestation of frivolous idealism. Without denying the importance of moral and psychological testing of applicants for public office, we are still more suggesting relying on the creation of objective preconditions that provide the desired model of behavior of officials, regardless of their moral image.

Operational control over the work of officials. According to our data obtained in the course of sociological surveys, one in three respondents told in an anonymous sociological questionnaire that the transfer of so-called "gifts" to officials takes place in their offices. Such practices are bound to be reduced if audio and video control devices are installed in public or unspoken positions at the place of work of officials. Information that such devices can be installed will be a deterrent to the officials from committing illegal acts that threaten their status and reputation. Therefore, video camera simulators can be installed to make the project cheaper. The widespread practice of using this method in developed countries has proven to be effective. The UK leads in number of video surveillance apparatus per capita. Let us remind the erudite reader that it was in this country that the dystopia of J. Orwell's "1984," describing the setting of Big Brother's total visual observation of citizens. If we talk about the method of video surveillance of employees in their workplaces, it is easy to understand the limitations of its use. Corruption in this case will simply move to any other place inaccessible to the all-seeing eye of the state. If we consistently carry out the principle of total observation of people, wherever they are, then dystopia J. Orwell will become a grim reality.

Rotation of officials. One of the factors contributing to corruption is the presence of close ethnic, kinship, friendly, neighbourly, religious and other ties to responsible workers. The more such connections the official has with the social environment and the closer they are, the more difficult it is for him to resist the temptation to please his family and friends bypassing the law. In order to neutralize the social environment, the method of rotation of management personnel is often used considering their ethnic origin and relations. The newcomers are usually freer from the influence of informal social relations and are more often guided by the statute, regulations and other official norms of relations with the population. The problem with this method is only that people tend to quickly start new friends, friends and neighbors, to find among the social environment tribesmen and co-believers. Therefore, the rotation of responsible personnel must be carried out periodically and systematically, which requires additional organizational efforts and material costs. Possible risks as a result of this method should also be noted. If ethnic or religious characteristics are chosen as the main criteria for rotation, this could provoke conflict.

The mutual responsibility method. Mutual responsibility should be used to destroy corruption. It can be created based on responsible

recommendations of working employees of government agencies to each newly recruited employee. G. A. Vasilevich (2009, p. 14), the Prosecutor General of the Republic of Belarus, made a proposal to guarantee at least two persons when appointing candidates for senior positions. In Russia, we intend to go even further in carrying out this principle. They are going to recruit all law enforcement officers on the recommendations of at least two honored employees. The responsibility of the officials who made the recommendations to the fined employee would lead to their dismissal from service. Similar proposals are discussed in the Russian press. The expediency of using the anti-corruption mutual responsibility method in domestic agencies is obvious. At the same time, however, it is worth considering the possible negative consequences of this method. It can "cement" the mutual responsibility of existing corrupt communities within certain state structures, turning them into impregnable fortresses for external disclosure.

Anonymous questioning of employees of a state structure is a very “edged” tool against corrupt employees. In any collective there will be honest and responsible citizens who do not agree to put up with the bribery of their colleagues. However, due to various circumstances, including pure conventions of a pseudo-moral nature, honest workers may not be able to contribute to the identification of corrupt officials among their colleagues in an otherwise, as only anonymous way. Anonymous questionnaires can become an acceptable channel of information for management about the presence of unscrupulous employees in the staff. However, these “edged” tools should be treated with extreme caution. Motivation of colleagues who report in an anonymous questionnaire about the available facts of corruption can be quite different. It is necessary to consider the probability of slander and personal account information between competing employees. Therefore, the information obtained through an anonymous questionnaire must be double-checked by other methods. The manager, who decided to apply an anonymous questionnaire of employees, should be ready for aggravation of interpersonal relations between them and deterioration of the moral and psychological climate in the team. It is also important to remember that anonymous questionnaire work should be done by a third-party independent organization that is not interested in the results of the survey. She will choose the interview methodology that best ensures his anonymity. For all the difficulties and possible negative consequences of the method of anonymous questionnaire, it is worth using from time to time, because even the very probability of such a survey will be a serious warning for the people in the team.

Opinion polls. In our opinion, this is the most effective method of identifying corrupt officials in the structures of state power. The essence of it consists in periodic sample anonymous surveys of the population about the quality of work of certain departments. This method differs from the anonymous questionnaire of employees the minimum probability of slander on the part of respondents. The mass nature of the questionnaire ensures that the assessments of the work of a public body or even an individual official are as objective as possible. The limitation of the methodical nature here is only one thing: independent organizations and professional research groups should conduct opinion polls.

"Trust phones". This is another method based on the use of the feedback principle. Citizens are given the opportunity to inform the authorized body of all illegal or immoral actions of officials by the "trust telephone". This feedback channel can function both anonymously and personified. In addition to the phone, books of comments and suggestions are also often used. This feedback format is most formalized. The comment books and suggestions are the kind of official document with a special procedure for registering and responding to available records. This is the undoubted advantage of these books, which prevents individuals from ignoring or falsifying their contents. But this is also their obvious drawback. Our fellow citizens are often still afraid to leave personalized remarks about bribery of officials. Any significant official causes fear and awe among most of our compatriots. Few people are at risk of complaining about their own name and address. Therefore, the anonymous feedback format remains preferable.

Control of the official's expenses. The official's income can be found out by his expenses. This logic is based on the method of controlling the

income of officials by voluntarily or forcibly providing them with declarations of property available to them and their immediate family. Indeed, why take bribes, if they cannot be spent on their own needs or on the needs of the family? Providing declarations of property by the officials is one of the most effective means of countering corruption. Article 19 of the Anti-Corruption Act obliges citizens who have entered the civil service, as well as civil servants and their families, to provide declarations on income, property and sources of money to the government agency. Failure to provide a declaration of income and property or intentionally input incomplete, inaccurate information is the reason for refusal to accept public service, appointment of a public servant to another public office or to bring him to disciplinary responsibility, including his dismissal. The challenge of applying this measure is to monitor the credibility of the income and expenditure information provided by the official. Total checks of declarations are too overhead for the budget itself. The thing to do is to rely on random checks. But at the same time, sanctions for an unscrupulous official should be fatal in the status sense.

Modern technology allows you to control budget officials using their card accounts. The general transition of Belarusians to electronic card payments on all types of payments has already made it possible to control the income and expenses of all citizens, including officials. We need to legislate the right of the employer to dismiss from the post of employee, who is unable to explain the discrepancy between his expenses and income. The negative consequence of the mass application of such a measure will be the strengthening of total control over the individual, the reduction of the scope of private life of people, as well as, perhaps, a further increase in the influence of the administrative-command system of a new type.

Guarantees to those who contribute to the detection of corruption. Corruption crimes related to bribery have specifics that prevent their high disclosure. This feature is that in most cases they are the interaction of the two main actors - the briber and the bribe-taker, equally interested in covering up the corrupt act. It is particularly important to destroy common interests of corrupt accomplices, giving them a chance to avoid criminal responsibility. This possibility is provided by the Belarusian law in Article 23 of the Anti-Corruption Act states. This rule is also stated in Art. 431 of Criminal Code of the Republic of Belarus. In some cases, the amount of the bribe may even be returned to its owner. Thanks to the ability of one of the parties to corrupt cooperation to avoid criminal prosecution, many crimes were solved, which justifies the dubious "volunteer" confessions of some hapless bribers and bribe-takers.

Equality before the law. One of the most important preconditions for corruption is the sense of permissiveness and impunity that often arises from high-level bosses. When the law is harsh only in relation to ordinary citizens, and the ruling elite is outside its sphere of its scope, corruption at the top-level officers increases, infecting the whole society to the bottom. Fish, as you know, rots from the head. Therefore, it is necessary to cleanse society of bribery, starting from the very top of the bureaucratic pyramid. Countries with developed democracies here also give a head start to our transitional society, not leaving their high-ranking officials alone. In Israel, for example, even President Weizmann was under investigation for corruption and was forced to resign for that reason. Former German Chancellor - the unifier of the Germans - G. Kohl, despite all his undisputed merits to the nation, also fell under the article about financial fraud, although he was glad not about himself, but about his native party. Such precedents, widely replicated by free media, can rid any member of the political elite, let alone regional leaders or ordinary officials, of the integrity syndrome. The most important condition for ensuring equality before the law of all layers of the population, including political leaders, is a real democracy. Elections by the population of executive and legislative leaders of the state government, as well as other persons important for public life, such as judges and heads of municipal law enforcement agencies, will help to clean away from corrupt administrative apparatus at all levels.

The election of officials. One of the most effective barriers to public service corruption is the elective principle of the allocation of critical posts. Such positions include not only senior officials of the executive and representative branches of government in the centre and in the field, but also

judges, heads of municipal supervisory and law enforcement agencies. However, the introduction of this principle is advisable only on the social basis prepared by the long experience of real democracy. People accustomed to living under the auspices of authoritarianism may very soon fall into the trap of pseudo-democracy when mafia cliques will carry power behind the screen of the electoral process. The transitional form to the election of the top officials can serve as the law's right of the population to declare public distrust of an incompetent or bribery official. The possibility of such a kind of "impeachment" can serve as a warning to civil servants who might be engaged in bribery.

The method of sociocultural discrediting of bribery. During sociological research, we found that the corrupt regime of interaction with officials is more typical for successful businessmen. This may indicate a high status of bribery among entrepreneurs. The activities the successful businesspeople realize becomes a kind of benchmark for business neophytes. Therefore, in the fight against bribery, it is important to discredit the corrupt style of interaction between civil servants and ordinary citizens. To do this, a special program of measures to discredit bribery should be envisaged in order to bring it beyond not only the legal consciousness, which is already taking place from a formal point of view, but also beyond the acceptable moral norm. The media, especially television, should play a special role in this matter. It can be satirical social advertising (rather, anti-advertising), and serious analytical programs. The specific format of each individual measure to discredit bribery should be determined by experts in the relevant industry of ideological and advocacy. It is important that ideological and propaganda pressure on the corrupt consciousness was constant and ubiquitous, carried out mainly not by the "frontal" method, but using subtle psychological tools. And we need to be prepared for the fact that this work is for decades, because, as Karl Marx said, the human skull is the most impregnable fortress. However, considering the testimony of Professor Preobrazhensky from "The Dog's Heart" by Mikhail Bulgakov that “the devastation begins in the heads”, society should be treated from corruption by forming anticorruption consciousness.

4 CONCLUSION

Our task in this text was to give the fullest possible list of all anti-corruption measures, with a brief description and, if possible, an assessment of the effectiveness of each method. This work makes sense, even for organizing the existing methods and creating a data bank on anti-corruption measures.

Conventionally, we have divided all anti-corruption measures into repressive and preventive measures. These two approaches can and probably should complement each other, so both of these approaches need to be used in real social policies to combat corruption. However, the specific weights of these approaches in the specific anti-corruption activities of the current Belarusian government have been significantly shifted towards an administrative and repressive approach. To a certain extent, this has provided positive results. According to Transparency International, Belarus has become "cleaner" in the corruption sense since 2016 almost twice (in 2016 - 119th place, and in 2019 - 70). However, to be in the 70th place for our country in terms of corruption is not honorable, given that the nearest western neighbors occupy much higher places: Poland - 36th place, Lithuania - 38th place. We strongly believe that preventive anti-corruption measures, primarily based on more active involving of people through democratic institutions should be taken on a state-wide scale. Only in this way the Belarusian society will have a chance to become one of the “cleanest” countries in the world, which, by the way, simultaneously tops the ratings of people's well-being.

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TOP SEVEN IoT OPERATING SYSTEMS IN MID-2020

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Abstract

The Internet of Things (IoT) is the close future of the Internet. In the introductory part of the paper, IoT and 5G networks are analyzed, and specifications of operating systems (OS) suitable for IoT are defined, as well as advantages and disadvantages of using Wi-Fi technology within IoT systems. During the preparation of the paper, 56 different IoT operating systems were analyzed according to different criteria, and, in Chapter 2, lists of the seven most popular IoT OS and seven operating systems suitable for IoT devices with small memories were created. The following is a selection of the most suitable operating systems in mid-2020. The ranking was performed based on similar ranking lists from the literature, based on the comments of the users of these operating systems, and the authors' analysis based on twelve additional criteria. Based on the obtained results of the analysis, it was shown that Contiki-NG, Riot OS, TinyOS, Raspberry Pi OS, Ubuntu Core, Zephyr IoT OS, and Windows 10 for IoT showed the best results. Each of the ranked OSs in the continuation of the paper is considered from the aspects of basic characteristics, architecture, basic pros, and cons, as well as the possibility of application, listing significant practical solutions. The third part of the paper presents a checklist that should be followed when choosing an OS for an IoT solution. Chapter 4 provides conclusions that can be drawn based on the performed analyzes and the presented work.

Keywords: *Internet of things, networks 5G, Contiki, RIOT, TinyOS, Raspberry Pi, Ubuntu Core, Ubuntu Enterprise, Zephyr IoT, Windows 10 for IoT*

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1 INTRODUCTION

Since the Internet of Things (IoT) involves many different physical devices connected to the Internet, and tasks related to data collection and/or sharing may occur, it is clear how much the

need for different software will expand. Also, certainly, the application of IoT to analyze a huge amount of related sensor data in the cloud will often require programs that use machine learning algorithms. IoT was initially mostly used for business and production, but now it can be found more and more often in people's homes and offices, with the prospect of mass application in smart cities and traffic and transport of goods. The creation of small super cheap computer chips has made it possible to turn any physical device into a part of the IoT. By connecting physical objects and adding sensors to them, a new level of digital intelligence is obtained. It is predicted that by 2025, there will be 41.6 billion connected IoT devices. (Ranger, 2020) Security is one of the biggest problems of the IoT. Sensors located on the devices collect information e.g. following what is said or done in the environment where the IoT devices are located. Danny Palmer's research (2017) showed that back in 2017, it was possible to easily hack over 100,000 webcams. There is no reason to believe that the situation is now more favorable. Hacking IoT devices in the real world can have unforeseeable consequences if someone successfully hacks the sensors of nuclear power plants or self-propelled vehicles in traffic. Areas in which IoT has the greatest application so far are smart manufacturing, smart cities, connected and smart logistics, smart homes, health systems, public sector…

1.1 IoT and 5G networks

The first step required for the realization of the concept of "Internet of Things" is the introduction of 5G technology. Each new generation of wireless technology has led to faster and more reliable networks. The evolution of 5G networks is shown in Figure 1. In the 1980s, first-generation technology-enabled communication over a mobile phone. The next generation, 2G, enabled more efficient and secure phone calls, and introduced text messaging. 3G has brought a new era of smartphones, and the 4G era has brought new speeds. 5G is a fifth-generation mobile network based on a combination of wireless technologies such as GSM, Wi-Fi, LTE. 5G allows one to connect almost everything and anything, including machines, objects, and devices. At the same time, the 5G network will enable faster data download and transfer, the easier flow of online content, higher quality voice and video calls, and more reliable mobile connections.

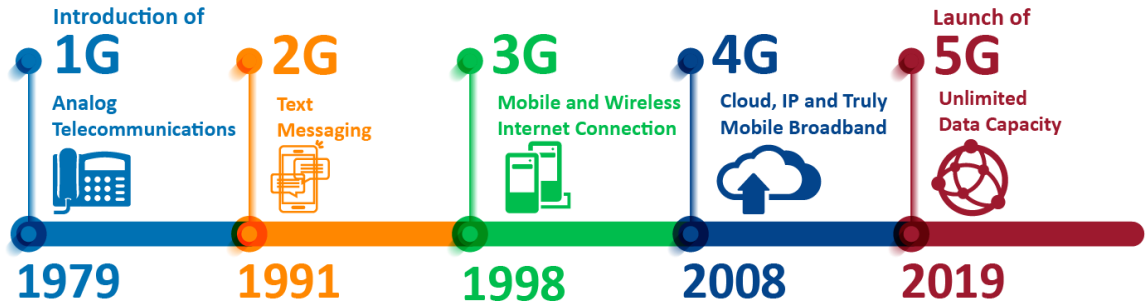

Fig. 1 The evolution of 5G

Source: (OKportal Technology, 2019)

Previous smartphones and other electronic devices used a frequency range from 30KHz (1G) to 8GHz (4G). But with the increase in the number of mobile phones and other devices that share this range, the speed of data transfer has decreased over time. The introduction of millimeter waves (1 to 10 mm) in the 5G network can achieve frequencies between 3 and 300 GHz. (Johansen, 2016) Frequency bands for 5G networks are grouped into two bands FR1 (<6GHz) and FR2 (24.25 - 52.6 GHz). (Craven, 2020). Until now, this technology has been used only by radar systems and satellites.

The main advantages of 5G technology are (Tutorialspoint, 2020) (Pecnik, 2020):

- High resolution and a high-bandwidth two-way connection
- Ability to gather all networks on one platform
- Effective and efficient
- Short response time
- Ability to transfer data at the Gigabit level in more than 60,000 connections.
- Easy management of previous generations of networks.
- Possibility of various services including private networks.

- Possibility of uniform, uninterrupted, and continuous connection around the world.
- Since millimeter waves have high frequencies and small wavelengths, the antennas used for them are smaller, so there is a possibility to build small base stations.
- 5G network can work based on "Massive MIMO" technology.

However, this technology also has its drawbacks (Tutorialspoint, 2020) (Pecnik, 2020):

- The waves are very short, and to "catch" the signal, it is necessary to be close to the cell, that is, the node that emits the signal.
- This technology is not able to pass through the walls of buildings, and it can be disturbed by rain.
- MIMO equipment contains two or four antennas. Installing many antennas is very convenient because in that way we can send and receive data through all of them at the same time. But to achieve Massive MIMO, the number of antennas must exceed the number of users.
- The expected speed seems difficult to achieve due to the level of technological support in most of the world.
- Old devices will likely need to be replaced with new ones, which is expensive.
- Huge investments in infrastructure development are needed.
- 5G technology is still in its infancy and its sustainability is still being explored.
- Privacy and security issues have yet to be addressed.

One of the main disadvantages of the 5G network is coverage. One node that emits a 5G network signal covers a significantly smaller area than a tower that emits a 4G network, which means that the infrastructure of a 5G network requires significantly more nodes that will emit a signal compared to the existing network. Another problem is that only a few phone and tablet models have built-in 5G modems that allow them to use the network. Older phone models that do not have a built-in 5G modem will not be able to use it. The 5G network puts a lot of strain on the processors, which causes the phone to heat up.

All the above significantly affects the creation of operating systems that can be or will be applied in IoT networks.

1.2 IoT Operating Systems' Specifications

Due to the characteristics of IoT devices, the operating systems (OS) provided for their operation differ from other existing operating systems. IoT operating systems are designed to perform tasks within constraints that are specific to IoT devices, such as e.g. limited memory, size, and power and processing capacity. IoT OS must support different hardware architectures and devices. While tablets, smartphones offer gigabytes or terabytes of memory, IoT devices have several kilobytes of memory available. That is why these OSs are essentially oriented towards data transfer via the Internet.

IoT OSs manage systems in smart cars, traffic lights, and streetlights, smart TVs, ATMs, elevators, smart meters, etc., so they should provide security and privacy for the entire IoT network. There should be established mechanisms for authentication, data integrity … Verifications that may be required for IoT OS are DO-178B for aircraft systems, IEC 61508 for industrial control systems, ISO 62304 for medical devices, or SIL3/SIL4 IEC for transport and nuclear systems. Most IoT OSs are open source as TinyOS, RIOT, Contiki, Mantis OS, LiteOS, Apache Mynewt, Zephyr OS, Ubuntu Core, Raspberry Pi OS, and others. When it comes to closed IoT OS some of the most popular are: Android Things, Windows 10 IoT, Micro Digital SMX RTOS, TI RTOS, Freescale MQX… (Mishra, 2019)

The parameters to pay attention to when choosing a suitable IoT OS are:

- **Small memory footprint** – the smaller the memory footprint of the OS the more favorable the OS.
- **Ability to work in real-time** – If the OS enables real-time operation, it is more favorable for the purposes that require it.
- **Energy-efficient operation** – If the OS does not require high energy consumption for its operation, it is advantageous because it saves battery maintenance and makes maintenance cheaper.
- **Portability** – the so-called hardware-agnostic work. It is advantageous if the OS can be transferred to different hardware platforms

and interfaces in BSP format in a standard way, such as. using POSIX calls.
- **Modularity** – The OS must have a kernel-core. All other functionalities can be added later if the application requires it.
- **Network connectivity and protocol support** – For IoT, the continuous connection of the device to the network is crucial, so the OS needs to support various connectivity protocols, such as Ethernet, Wi-Fi, BLE (Bluetooth Low Energy), IEEE 802.15.4 and many others.
- **Flexibility** – The OS must be scalable for any type of device. This means that developers and integrators need to know only one OS, which will be used for both nodes and gateways.
- **Reliability** – This is especially important because the devices are often in remote locations and have to work without error for years. Reliability means that the OS needs to meet all verifications for specific applications.
- **Security** – The OS has add-ons that meet security expectations, ensuring that the device is booted securely, using SSL support, components, and encryption drivers.
- **Eco-system and application development capability** are essential features of the OS, so OSs that come with development tools facilitate the development and implementation of IoT applications.

Gateways are particularly important components of IoT. They represent a bridge between real devices and the virtual IT environment. Therefore, requests for support at the gateway level are set before the OS (IoT Operating Systems, 2016):

- **Protocol support** – In addition to HTTP protocols, the OS should also support small data transfer protocols such as CoAP, MQTT, or UDP.
- **Data collection, local processing, and storage** – The OS should support real-time decision-making processes and reduce the amount of data going to the cloud (e.g. in the case of building management systems or video surveillance).
- **Security** – The OS should provide protection at the hardware and network level, provide crypto security, SSL / TLS certificate management, user authentication, VPN connectivity, firewalls, and a list of secure applications.
- **Reliable communication with IoT platforms in the cloud** and
- **Terminal Management** – The OS should enable remote upgrades and two-way communication between devices and the cloud.

The choice of an operating system is an extremely important step in creating an IoT-based system because it can ensure system performance, but it can also degrade system characteristics.

1.3 Wi-Fi and OS selection from a company perspective

Before choosing the OS, it is necessary to define the concept of the IoT network within the company. Wi-Fi provides many benefits that include the absence of cables and everything that goes with it, easy installation, a lot of cheap Wi-Fi sensors, and enough professionals who can support the system and the company's existing Wi-Fi infrastructure, but with the necessary peripheral power devices with electricity, also brings problems for network configuration. Many different devices can have different requirements for the network and OS. With successful IoT solutions that work well, problems can arise in the process, hardware, or firmware and it is good if the applied solutions are reliable because it is possible to focus on a narrower area and solve the problem more efficiently. If, in addition to these three different areas of problem research, the OS also appears as a possible cause of a problem, the number of variants in solving the problem increases many times over. Unfortunately, the company's Wi-Fi network becomes unreliable and inconsistent when an IoT solution is included. The reasons are:

- Each network is configured according to its previous needs and is not adapted to IoT.
- Network administrators and local IT teams cover certain tasks, but when hundreds and thousands of new devices are connected, and when new experts are not added to local people, problems are inevitable. The IoT may contribute to the improvement of the company's business, but it will burden the people, so they will not accept the change with enthusiasm.

- Lack of end-to-end control. Any, even small change in the local Wi-Fi environment can jeopardize the entire IoT solution.

These reasons say that using Wi-Fi as a backbone for an IoT solution is too risky and expensive. Whenever possible, it is far more convenient to set up the company's own network, such as a private LoRa network. This can provide greater reliability and consistency, maintain end-to-end control, and solve potential problems more efficiently. (Leverege, 2020).

There is no one solution and one operating system that will be suitable for all situations. Therefore, attention should be paid to the choice of OS. The needs of IoT system applications should be identified and based on them, technical requirements for the OS should be set.

2 SELECTION OF THE TOP SEVEN IoT OS

In preparing this paper, 147 operating systems that can be used in IoT were considered. Also, the literature dealing with their evaluation and ranking was considered. Based on a review of the literature, it was determined that this area is developing rapidly so that the same authors at different times give preference to a different OS. Some high-ranking operating systems in 2019 dropped out of the rankings in 2020, while some new ones appeared and were highly positioned. (Okoi, 2019) vs. (Okoi, 2020) Normally, it should be borne in mind that different rankings are made for different purposes within the IoT. The author's experience shows that an increasing number of investors demand software based on open-source software and that the impact of open-source operating systems is growing steadily.

Table 1 Analyzed operating systems

No.	IoT operating system
1	Alpine Linux
2	Amazon FreeRTOS
3	Android Things
4	Apache Mynewt
5	Arch Linux ARM
6	ARM Mbed OS
7	Balena Yocto Linux
8	Batocera.linux
9	Bedrock Linux
10	BMC64
11	Brillo
12	Chromium OS
13	Contiki
14	Device OS
15	Devuan GNU
16	DietPi
17	Domoticz
18	Embedded Linux
19	FreeBSD

No.	IoT operating system
20	Fuchsia
21	Gentoo
22	Huawei LightOS
23	Kali Linux
24	Kano
25	Lakka
26	LibreELEC
27	Linutop
28	Micrium uC/OS
29	Minibian
30	Mongoose OS
31	Nano RK IoT
32	Nucleus RTOS
33	NuttX Real-Time
34	OpenELEC
35	OpenMediaVault
36	OpenSUSE
37	OS-IoT
38	OSMC

No.	IoT operating system
39	Particle Device OS
40	Raspbian
41	RaspBSD
42	RetroPie
43	Riot OS
44	RISC OS
45	Rokos
46	SARPi
47	Siemens MindSphere
48	Snappy
49	TinyOS
50	TizenRT
51	Ubuntu Core
52	Ubuntu Mate
53	VxWorks 653
54	Wind River VxWorks
55	Windows 10 for IoT
56	Zephyr

Based on this research and papers (Mehedi, 2020), (Hawlader, 2020), (Okoi, 2019), (Okoi, 2020), (Dutta, 2020), (Kumar, 2018), (g2, 2020), (Mishra, 2019), (Pecnik, 2020) 56 operating systems were singled out. The ranks achieved by IoT operating systems in different ranking lists in this paper are weighted in accordance with Table 2 so that the first place on a ranking list brought 30 points, and the eleventh and lower places brought 2 points.

Table 2 Operating system ranking weighting

Rang	1	2	3	4	5	6	7	8	9	10	11
Weight	30	25	20	16	14	12	10	8	6	4	2

The rank of the operating system in each ranking list was multiplied by the appropriate weight, and then the obtained values were added up. The obtained results were then sorted from the largest sum to the smallest sum.

If the OS was chosen based on the popularity of operating systems, the results shown in Table 3 would be obtained. Linux operating systems dominate in number and popularity, and far behind are BSD type and Solaris operating systems, as well as some third-party operating systems (KolibriOS and KISS).

If the OSs were ranked by size from smallest to largest, the results would be as in Table 4.

Table 3 Ranking of the seven most popular operating systems suitable for IoT

Rank	Title	Based on	Architecture	Image size (MB)	Journaled File System
1	MX Linux	Debian, antiX	i686, x86_64	1500-1700	ext3, ext4, JFS, ReiserFS, XFS
2	Manjaro Linux	Arch	aarch64, x86_64	2600-3000	Btrfs, ext3, ext4, JFS, ReiserFS, XFS
3	Mint Linux	Debian, Ubuntu	i686, x86_64	1800-2000	Btrfs, ext3, ext4, JFS, ReiserFS, XFS
4	Ubuntu	Debian	armhf, i686, powerpc, ppc64el, s390x, x86_64	800-2400	Btrfs, ext3, ext4, JFS, ReiserFS, XFS
5	Debian	Independent	aarch64, armel, armhf, i386, i686, mips, mipsel, ppc64el, s390x, x86_64	300-3700	Btrfs, ext3, ext4, JFS, ReiserFS, XFS
6	Solus	Independent	x86_64	1600-1900	
7	Fedora	Independent	aarch64, armhfp, x86_64	500-1900	Btrfs, ext3, ext4, XFS

Source: (DistroWatch.com, 2020)

Table 4 Seven top-ranked operating systems suitable for IoT devices with small memories

Rank	Title	Based on	Architecture	Image size (MB)	Journaled File System
1	Bedrock Linux	Independent	aarch64, armv7, mips64, ppc64, s390x, x86_64	1 - 2	
2	MLL - Minimal Linux	Independent	i386, x86_64	10 - 18	ext3, ext4
3	Tiny Core Linux	Independent	I486, x86_64	14 - 206	
4	4MLinux	Independent	x86_64	14 - 952	
5	IPFire	Independent	armv5tel, i586, x86_64	200 - 300	
6	Fugulta	OpenBSD	aarch64, i386, x86_64	200 - 300	
7	Star	Debian	x86_64	200 - 600	Btrfs, ext3, ext4

Source: (DistroWatch.com, 2020)

Why it is difficult to choose the best OS for IoT?

When choosing the optimal operating system for a project, the designer faces several challenges.

1. The first criterion is whether the investor makes a request regarding the type of operating system, i.e. whether the software must be open source. If it is not demanded, the designer has more options at his disposal, which may or may not be an advantage.
2. The next criterion is whether the investor is willing to pay for an operating system license or requests a free operating system. Even if the investor wants a free operating system, a satisfactory solution can usually be found.
3. Many different operating systems is available, and it is unlikely that the designer knows them all well. That is why it is often the case that a designer must seek the advice of his colleagues or search for literature. An aggravating circumstance is that in the initial phase of design, the designer does not have fully defined technical requirements and does not know what he needs. In the literature, all

operating systems are relatively well described, in detail, but very often data are not given in the form that could be used for comparison. User comments are not of great help here either. The reasons are that different users have different expectations, so they can be both satisfied and dissatisfied, but also falsely satisfied and falsely dissatisfied, depending on their experiences. By analyzing 92 groups of responses with a total of 12,312 responses, we observed that the most popular operating systems with the most reviews usually have lower average scores than less popular programs. Less popular programs have fewer reviews, so the impact of each review on the result is significant. Therefore, in the analysis, we, as a rule, avoided grades with less than 10 reviewers. Another reason for lower ratings of popular operating systems is the degree to which user expectations are met. Many users very often means many different expectations, and it is possible that a great operating system is not great in all its features. This role can be played by seemingly insignificant features, from the method of installation to the multilingualism of the system and the quality of translation into certain languages. In addition, it is possible that reviewers have their favorites.

4. Software updates are a very significant factor. Operating systems are usually updated several times a year, and it is rare that an OS has not been updated for more than a year. Each update introduces a new disorder in the analysis, because very often errors noticed in the time between two versions of the software are corrected (which does not mean that no new errors are made). In this way, part of the reviews from the previous period becomes unusable.
5. For a particular application in IoT devices, one of the key factors may be the customer category. As the factors, they are the processor and memory capacities that the device has, the way of storing the operating system (RAM, SSD, Live medium, SD card,…), as well as the way of transferring data and receiving commands from the system (wire, Bluetooth, Wi-Fi ...). It is not the same whether it is an intelligent thermometer, an intelligent controller, an intelligent data acquisition unit, or a control unit, desktop computer, server, or Raspberry Pi-type computer. It is clear that the appropriate operating system should be chosen for each device while ensuring interoperability.
6. When choosing the OS, one should also keep in mind the market for which the installation is being prepared, because the habits of the users are not the same everywhere. In addition to user habits, the choice of OS is also influenced by the architecture of the desired system. Not all OSes are adapted to all possible architectures. Investors often have a request for certain systems to be modernized, which means that they also have older equipment. So the latest solution does not have to be a feasible solution. Normally, old equipment can be replaced with new ones, but this is not always economically viable.
7. The seventh, but one of the most important parameters that need to be analyzed is the protection of the system with the possible provision of privacy and, sometimes, anonymity. In this analysis, we will not consider the physical protection of the system, because it is implied, but we will keep in mind VPN, crypto protection, firewalls, and other types of software protection. Security is probably the biggest challenge for the IoT. Sensors collect a lot of sensitive data, and previous systems do not guarantee their protection. There are too many devices that don't even think about security. Even in mass-used software, security vulnerabilities are detected on a daily basis, and with many IoT devices, it is not even possible to update the software and enter security patches. Currently, routers and webcams are the most vulnerable, and smart children's watches connected to the Internet allow hackers to monitor the user's location, eavesdrop on conversations, and even communicate with the user. (Ranger, 2020). These problems are undoubtedly significant at the level of individual users, but the problems are increasing and more complex with the growth of the number of users. Connecting industrial plants to IoT networks increases the risk of hackers discovering and attacking devices. The readiness of hackers for such attacks is visible, but the readiness of companies to protect their devices and data is less visible.

No major involvement of companies in the field of IoT security planning has been observed. The prevailing impression is that many want to take advantage of the IoT, leaving security to be solved for later.

A special subgroup of protection problems is privacy. There is a real danger of a complete loss of privacy in the IoT sea. The one who has access to the data from the smart house also has data about each member of the household, from what he eats, what he drinks, when he sleeps, when he wakes up, who comes to visit him, all the way to who passes by the house. Virtually all users become participants in the reality show. It is not certain that the service sellers will give the collected data to someone, but it is likely that some of them will. By collecting seemingly harmless data such as electricity consumption, room temperature and humidity, and CO and CO2 concentration during the day, it is possible to determine what someone has for dinner. (Ranger, 2020).

Old, used devices also pose a great security risk. Many of them keep data in memory, so users must have a developed strategy for destroying used devices. Just because a user thinks the device is broken and he cannot retrieve data does not mean no one else can retrieve the data.

In addition to the analysis of IoT OS ranking based on the literature, twelve additional criteria shown in Table 5 were used in the analysis of the selection of the best IoT OS.

Table 5 Criteria for IoT OS assessment

No.	Criterion
1	Hardware agnostic operation
2	Energy efficient operation
3	Real-time capabilities
4	Minimum RAM
5	Minimum ROM
6	OS Footprint
7	Network connectivity and Protocol Support
8	Security
9	Programming model
10	Price and Market target
11	Way of installation
12	Maintenance

For each of the criteria, the observed OS was ranked, and then the ranks for all criteria were added up. In cases where two (or more) systems achieved the same result, everyone with the same result was assigned the most favorable rank, and the next lower-ranked OS was given a rank according to its actual position on the ranking list.

Based on the obtained results, seven "best" IoT OS were selected and ranked in Table 6.

Table 6 Ranking list of the seven best ranked IoT operating systems

Rank	Title	Score
1	Contiki	351
2	Riot OS	292
3	TinyOS	251
4	Raspbian	236
5	Ubuntu Core	202
5	Zephyr	199
7	Windows 10 for IoT	199

2.1 Contiki-NG

Contiki-NG is an operating system that is primarily oriented to small IoT devices with limited memory and power. It is the first operating system to enable IP communication using the uIP TCP/IP protocol stack. Thanks to that, with its minimalist design and wide possibilities of application, it gained great popularity.

Contiki-NG contains an RFC compatible IPv6 low-power communication package, which enables Internet connection. The system runs on various platforms based on energy efficient architectures such as ARM Cortek-M3/M4 and Texas Instruments MSP430. The code print is 100 kB in size, and memory usage can be reduced to 10 kB (Duquennoy, 2019). The source code is available as open source with a 3-clause BSD license (Tsiftes, 2017).

Although there are many similar operating systems like TinyOS, what sets Contiki apart from the competition is the complexity and flexibility it offers developers. It provides functionality for managing programs, processes, resources, memory, and communication, and to run Contiki OS only a few kilobytes are needed. A minimum 2kB of RAM and 30 kilobytes of ROM are required (RIOT, 2020). A complete system that includes a GUI (graphical user interface) requires about 30 kilobytes of RAM. The application enables

efficient use of hardware with simultaneous standardized low-power wireless communication for different hardware platforms.

Contiki-NG comes bundled with a range of applications such as: small web browsers, calculator, web server, email client and FTP.

Contiki OS supports IPv4 and IPv6 implementations based on TCP, UDP and HTTP protocols. All protocols supported by Contiki OS are: 6LoWPAN, RPL, CoAP, uIP (for IPv4), uIPv6 (for IPv6).

The basic language of this operating system is C language.

Before implementing a real-time IoT product, a simulator called Cooja tests each IoT product. Cooja Network Simulator facilitates the process of software development and troubleshooting.

The complete code is available on GitHub for use or further development. This project is under constant development by many developers around the world, and the software is also used in companies such as Google and Cisco.

Advantages

- It fully supports IPv6 and IPv4 standards, along with 6lowpan, RPL, and CoAP.
- Contiki-NG runs on a range of low-power wireless devices, many of which can be purchased online
- Contiki-NG is open source software - it can be used for both commercial and non-commercial purposes.
- It has a large community of developers who can help solve possible technical problems.

Disadvantages

- Contiki-NG is an event-based OS, meaning it does not use a scheduling algorithm.
- Contiki-NG partially supports real-time application development.

Application

Contiki is used in many key systems such as: street lighting, construction site monitoring, industrial surveillance, alarm systems, remote monitoring in the house.

IoT applications require a good knowledge of hardware, embedded system software, network protocols, low-power wireless communication, Internet server software and smartphone applications development. (Pearce, 2012) For Contiki, a Thingsquare platform has been created that allows applications to be created in an easy and fast way. (Thingsquare, n.d.). Some of the examples created using this platform are:

- **A hand wash sensor** built from off-the-shelf hardware to help the 20 seconds hand wash. The sensor detects that someone is standing in front of the sink. Then starts to blink:
  - A red blink for 20 seconds to indicate that we should keep washing
  - A quick green blink to indicate that we are done

  The idea is that this will help us keep the 20 second habit up. (Dunkels, 2020)
- **Retail shelf monitoring**

  Empty shelves in retail outlets repel customers. Up to 24% of Amazon's online sales refer to the sale of goods that customers could not find in stores in their area because the goods were sold out and not renewed. This solution consists of two parts: a wireless laser sensor and a smartphone app that is implemented on the phones of employees in charge of procurement. (Dunkels, 2019) The problem of stock monitoring can also be solved by applying RFID technology, reading RFID tags in the so-called smart shelves as shown in the paper 'SDD ITG Smart shelf RFID solution for the stocktaking of goods on remote shelves' (2010).
- **Street lighting**
- The cost of street lighting can reach 40% of the total energy consumption costs of a city. The greatest benefits from the application of this IoT solution are reflected in lower electricity consumption by using automated or manual dimming, and in automatic failure detection. The solution shown in (Dunkels, 2019) consists of two parts:
  - A wireless microcontroller on each lamp, and
  - A wireless mesh network that connects all the lamps in one huge network. The network has one or more access points that connect the wireless mesh to the back-end controller

  The system uses the Thingsquare IoT platform with sub-GHz networking. (Dunkels, 2019)

- **Office plants-as-a-service**
  Most employed people spend a lot of time indoors, about 90%. To make them feel better, the interior of the room is often enriched with various flowers and trees that require care. In order not to have to take care of plants, companies can rent plants from companies that deal with it. A plants-as-a-service IoT system allows the renter to monitor soil moisture for each individual plant and to define the plant maintenance regime based on a database and schedule. This can significantly extend the life of leased plants and increase the profit of the renter.
  The system consists of. (Dunkels, 2019):
  - A mobile app, for the plant care specialists and personnel
  - Wireless soil sensors, that keep track of the status of each plant
  - A backend database and scheduling system.

The possibilities of creating IoT applications are practically unlimited, from small and sometimes at first glance unnecessary, to technologically complex and economically crucial.

2.2 RIOT OS

RIOT supports IoT in the same way that Linux supports the Internet. RIOT is a free open source operating system that is widely supported by companies and academia, but also by individual hobbyists around the world. RIOT supports most low-power IoT devices and microcontrollers of various architectures (32-bit, 16-bit, 8-bit). It aims to implement all relevant open standards that support the Internet of Things in a secure, permanent and privacy-friendly manner. (RIOT, 2020)

RIOT OS requires ~1.5 kB of RAM and ~5 kB of ROM. RIOT supports C and C ++, Multi-Threading, MCU w/o MMU, modularity and real-time applications.

RIOT supports the 6LoWPAN (RFC6282 and RFC6775 compatible) IPv6 low-power communication package, which allows it to connect to the Internet. The system works on various platforms based on energy efficient architectures such as Airfy Beacon, Arduino, Microchip, Nordic, STM32X, Texas Instruments Zolertia and others. The kernel source code is available as open source with the GNU Lesser General Public License version 2.1 (LGPLv2.1). Some external libraries are subject to other licenses that are part of these packages.

RIOT OS comes bundled with a variety of drivers for a variety of devices, from radio transceivers, acceleration sensors, gyroscopes, to servomotors.

The basic languages of this operating system are C and C ++.

Prior to the implementation of IoT products, testing with tools such as Embunit was enabled.

The complete code is available on GitHub for use or further development.

Advantages

- It fully supports the IPv6 standard, along with 6lowpan, RPL, UDP, CoAP, and CBOR.
- Offers static and dynamic memory allocation.
- It is robust and works on a range of low-power wireless devices.
- RIOT is open source software - it can be used for both commercial and non-commercial purposes.
- It allows scheduling activities over a long period of time.
- It is supported by a large community of developers who can help solve specific problems.

Disadvantages

- RIOT sometimes requires increased memory consumption but is still within the available limits of IoT devices
- A little more work around the service because it is reimplementing "from scratch". (Baccelli, 2018)

Application

RIOT-OS provides a number of possibilities for use. Some of the better-known applications are:

- **CleverWeather with RIOT-OS** in which RIOT-OS applications collect data from sensors and deliver it to an Azure Iot hub using MQTT-SN and MQTT protocol. Details of this system are shown in (Catalano, 2020), and only its basic components will be shown here:
  - *RIOT-OS app* – creates values and publish them to a MQTT-SN channel.

  - *Mosquito RSMB* – ready-to-use broker
  - *PytonGateway* – allows RSMB to communicate with the IoT hub
  - *Azure IoT Hub* – it is used as a MQTT broker. Depending of user and the application, Azure can be free or payable.
  - *Nodejs* – can run an application for visualization the data in local browser.
- **Locha Mesh** solution is based on RIOT, and the idea is to enable the transmission of messages, data, Bitcoin transactions, and other services, decentralized, secure, using radio waves, bypassing the Internet, and even in the event of a power outage. Used radio transceivers have their own batteries. In addition to everyday use, their use is also possible in case of natural disasters. (Dudey, 2020)
- **AWS based IoT Virtual Environmental Station** was created with the goal of building a virtual environmental station based on Amazon Web Services (AWS). Two RIOT-OS native boards generate random environmental data and send them to AWS through MQTT-SN (Mosquitto) and an MQTT transparent bridge. (Zizzo, 2020)

2.3 TinyOS

TinyOS is open source, free software, with BSD (Berkeley Software Distribution) - licensed code. (Boral, 2019) It is designed for low-power wireless devices, such as those used in sensor networks, ubiquitous computing, personal networks, smart buildings, and smart meters. (Hicham, Jeghal, Sabrim, & Tairi, 2017)

It uses the nesC programming language, which is an extension of the C programming language and is intended for TinyOS and applications to control and manage wireless sensor networks. The differences between C and nesC are in the connection model (function). TinyOS has a monolithic architecture based on a combination of components. NesC supports TinyOS components (interface, modules, configurations, drivers). Each piece of code consists of simple functions housed in components and complex functions that integrate all components.

Sensor devices in such networks (particles, motes) are characterized by limited memory and low power. Low power sensors, due to their limited size, require efficient use of resources. TinyOS uses an event-based design, which allows the CPU to "rest" when there are no unresolved tasks. An example of such an event is the activation of an alarm when the temperature of the thermostat begins to change abruptly in relation to the set temperature. As soon as this task is completed, the sensor can go into sleep mode.

As of October 2019, TinyOS had over 35,000 downloads per year. (Kuppusamy, 2019) Its main application is in devices that use wireless sensor networks. TinyOS is also suitable for controlling the environment - it is useful for monitoring air pollution, forest fires, and preventing natural disasters. Its use in smart vehicles is also becoming more common — since smart vehicles are autonomous, one can view them as a network of sensors where all of these sensors communicate over low-power wireless networks known as LPWANs. This way of working fits TinyOS perfectly. TinyOS is also widely used in smart cities. In addition to the basic advantages that this operating system provides such as small code (400B), small requirements for RAM, another advantage is the built-in TOSSIM simulator. It allows one to develop, debug, and test the entire application on a PC and to transfer the unchanged code directly to the sensor nodes.

Advantages

- TinyOS was developed and is supported by the American University of Berkeley, which offers to download and monitor it under a BSD license.
- Based on event-based operation, TinyOS offers the user precise sensor control and allows him to better adapt to random wireless communication between physical interfaces.
- Compatibility with at least 9 hardware platforms and ease of adding or modifying platforms.
- TinyOS tracks hierarchical material abstraction in three layers.
- The preventive nature of an operating system determines whether it will allow an ongoing task to be interrupted. TinyOS does not manage this prevention but prefers hardware interrupts.
- TinyOS is designed to optimally manage power consumption: it puts the node on standby when there are no tasks to perform. This deactivates the radio device and

switches it to the "Low power listening" mode. (Hicham, Jeghal, Sabrim, & Tairi, 2017)
- It takes a little memory to run TinyOS. There is no need to buy larger memory devices to run it. TinyOS also creates small code, which reduces the power consumption for storing data in RAM.
- The code is optimized to run on any specific device. Due to the smaller size of the code, the devices run fast, and the OS does not load them.
- Modularity - TinyOS contains many different modules. Each of them performs its function. Modules include tasks, commands, events, microcontrollers, hardware, and software. Each of these modules communicates with everyone else so that the wireless devices can function properly.
- Low voltage - Due to the small memory and small space it takes up, TinyOS uses a weaker battery, so it can run on smaller devices with low voltage.
- Reuse - TinyOS can be reused on similar devices. This means that a change in the code is not necessary if the devices are of the same nature.

Disadvantages

- TinyOS does not support real-time applications. It provides a priority-based process planning algorithm (FIFO[1] and EDF[2]), but when the planned process is started, it is executed to completion. This may result in missing the deadline for activating the high-priority process that is next in line for implementation after the low-priority process. Tasks are not preempted by other tasks, but can be preempted on some other way.
- TinyOS in its current state is not an operating system that is in line with modern trends. It does not offer, for example, multitasking, multi-user options or a file system. It does not offer user mode and kernel mode. In fact, TinyOS is a set of routines available to the developer to simplify development.

Application

The main applications of this OS include different types of devices that use wireless sensor networks. Tiny OS is widely used for sensor nodes and is considered the most powerful, innovative, energy-efficient, and widely used OS.

- **Environmental Monitoring** - Since each TinyOS can be built into a small sensor, it is very useful for monitoring air pollution, forest fires, and preventing natural disasters.
- **Smart vehicles** can be viewed as a network of sensors. With this, the sensors communicate via low-power wireless networks known as LPVAN, which is very convenient for TinyOS.
- **Smart cities** install smart sensors characterized by high processing power and multi-layered IP capabilities. Sensors are placed everywhere. TinyOS is a sustainable solution for low-power sensors located everywhere in smart cities.

2.4 Raspberry Pi OS

Raspberry Pi OS is a free operating system, based on the latest version of 'Debian 10' (Buster), with Linux kernel version 4.19 and 8.3 GCC compiler. It is recommended and optimized for Raspberry Pi hardware. Debian is a free operating system that includes a set of programs that allow computers to work with thousands of other packages. Debian has a good reputation in the Linux community because it is remarkably high quality and stable. At the core of Debian is the Kernel. These features are copied to the Raspberry Pi OS.

However, the Raspberry Pi OS (formerly Raspbian) offers more than the OS itself. It comes with over 35,000 programs, with pre-assembled software for easy installation on the Raspberry Pi. Almost all the information that can be found about Debian will probably refer to the same version of Raspbian. Because Raspbian is closely related to Debian, a large amount of documentation is available for the Raspberry Pi OS.

As of May 2020, three versions of Raspberry Pi OS (32-bit) with 4.19 kernel are available:
- Lite – 432 MB
- With desktop – 1128 MB
- With desktop and recommended software – 2523 MB

In addition to the usual changes such as code error fixes, many options have been added from

[1] First-In, First-Out

[2] Earliest deadline first scheduling

which we would single out (Raspberry Pi OS (32-bit) Lite - Release notes, 2020):

- The Bookshelf application has been added
- The Raspberry Pi Diagnostics application has been added
- The Magnifier application has been added in the Recommended Software
- Internal audio outputs are enabled as separate ALSA devices
- The preinstallation for MagPi has been removed and replaced by the Beginner's Guide
- Chromium has created a default application for PDF files
- Focus behavior has changed so that the focus shifts to the desktop if the windows are not opened - improves the reliability of the Orca screen reader
- The disk ID is now regenerated on first boot
- i2cprobe: more flexible I2C / SPI alias mapping.

Buster is harder to hack, and most of the other differences from previous versions of Raspberry Pi OS (Raspbian) are mostly small. Python, Scratch, Sonic Pi, Java, and many other programs are also pre-installed in previous versions of Raspberry Pi OS. The latest versions of Raspberry also include a setup wizard.

There are two options when installing:

- the first is via an SD card, which has more than 2GB of memory (maximum 32 GB for Pi3, or 64 GB for Pi4, but with formatting in the exFAT file system) (Manske, 2019), heaving in mind that either Raspberry Pi Imager or NOOBS can be used. In both cases, after installing the OS on the SD card, inserting the SD card into the device will automatically activate the system.
- the other way is if Raspbian is already installed on the Raspberry Pi and it only needs to be upgraded. If one wants to update Raspbian and thus install all the latest application updates in the terminal, he needs to type the following commands:

  $ sudo apt-get update
  $ sudo apt-get upgrade
  $ sudo apt-get dist-upgrade

Advantages

- The main advantage of Raspbian Pi OS is that it is designed for a specific device and allows the best use of device performance. The device itself has aroused great interest and many additional devices are being made for it, which further increases its popularity.
- Another advantage is that it is based on a reliable Linux Debian operating system and that it is upgraded in parallel. This provided him with powerful support.

Disadvantages

- The main advantage is also the main disadvantage. Because it is intended for a specific device, its application on the Raspberry Pi platform is limited.
- Another disadvantage is the amount of memory it needs to operate, and in this connection the amount of electricity to power the device, but this is only a consequence of the basic disadvantage.

Application

Raspberry Pi OS contains software environments intended to expand the knowledge and skills of young people in the field of computer science interestingly. In addition to knowledge of computer science, it is also suitable for acquiring basic knowledge in the field of electronics.

The Scratch environment is one of the pre-installed environments under the Raspberry Pi operating system. This environment is suitable for children older than 8 years. Wolfram Language and Mathematica are integral parts of the Raspberry Pi operating system as part of a joint project and are free for non-commercial use. The first version of the Mathematica program was created in 1988 and has always been considered a very demanding programming environment. The version under the Raspberry Pi operating system executes most requests within a reasonable time, although it is 10 to 20 times slower than the average computer. The basis is a new pilot version of the core (Wolfram Engine) that handles all calculations.

If it is necessary to be able to use the media center on the TV set, via an HDMI cable a Raspberry Pi computer which has an operating system specially designed for these needs can be connected to the newer TV set. If one wants to add the ability to search the Internet or use certain programs, he can in the same way simply connect

a fully installed Raspberry Pi via an HDMI cable to the TV.

2.5 Ubuntu Core

Ubuntu Core is Ubuntu for IoT and embedding. It is optimized for security and reliable updates. It is easy to install, and resistant to unauthorized work and corruption. Its read-only root filesystem is built from the same packages used to build a wider set of Ubuntu distributions and differs only in the way packages are delivered and, essentially, in the way they are updated. All of this is an interrupt-driven, secure, confined, independent, cross-platform Linux packaging system. Snap packages ensure that there is always a clear separation between the base system and all other applications to be installed, as well as isolation between each application, their data, and even application version data. (Ubuntu, 2020)

Updates are transactional, meaning they are either 100% successful or not installed. If the changes are not installed, they do not leave any malfunction in the record. Only the details of the minutes remain. This means that the system remains fully operational and in a constantly well-defined condition during system implementation and updating. The system can also be recovered or restored if necessary, even if the system does not start. An unsuccessful update never leaves the system in an unpredictable state. (Ubuntu, 2020)

Ubuntu Core is designed to meet the requirements of IoT devices. It runs on many different hardware, including the Raspberry Pi, Intel NUC, Qalcomm Snapdragon 410c, and even the Kernel-based Virtual Machine (KVM).

Minimum requirements for Ubuntu Core operation include 500MHz single-core CPU, 256MB RAM, 512MB storage. If used on a Raspberry Pi 4, then it uses 4 cores and 1, 2 or 4 GB of RAM. On Qualcomm DragonBoard it uses 4 cores, 1 GB RAM and 8 GB eMMC flash storage. Intel NUC with Intel Core i3, i5, i7 64-bit enables >8 cores and >32 GB RAM, without built-in storage.

Security is provided by public and private key encryption, and two-step validation raises security to a higher level. For the system to remain secure, it needs to be constantly updated either automatically or after receiving a message about the availability of a new version.

Advantages

- Simple and consistent installation and application.
- A read-only filesystem allows applications to be activated independently of each other, and access to system resources is provided by specific transactional update permissions, so the system can handle any unforeseen situations, hardware, or network.
- The snap-based concept provides security, ease of construction and painless distribution, and public/private key validation ensures that exactly what needs to be run is running. (Ubuntu, 2020)

Disadvantages

- One of the main disadvantages of Ubuntu is the limited choice of applications although the OS is free, and many applications are also free to download.
- One of the main criticisms of Ubuntu is related to "seeming commercialization". With each update, Ubuntu moves away from the open-source identity, because the company is increasingly working independently and neglecting the open-source community. (Ivankov, 2019)

Application

Thanks to the long existence of Ubuntu, the possibilities of application are great. Due to its reliability, Ubuntu Core is suitable for industrial applications, to provide functional safety for critical embedded systems, for example in the automotive sector and robotics. Ubuntu Core is considered the safest choice for IoT because there are several layers that take care of system security, so it is suitable as a gateway (e.g. Dell Edge Gateway) and for business-critical equipment. It can provide full disk encryption. There are examples of using Ubuntu with Tunnel drones. Its application is growing in the areas of digital signage and smart displays. (Canonical, 2020)

2.6 Zephyr IoT OS

Zephyr is a "real-time" operating system used with connected, limited resources and embedded devices. The simple integration of different IoT architectures makes it popular among IoT professionals. The Zephyr project is supported by

the Linux Foundation, as one of their projects. The goal of this project is to build a secure and flexible "real-time" operating system (RTOS) for IoT. Intel, Linaro, Synopsys, Google, NXP, Acer, and Sony are also involved in this project.

Zephyr is highly configured and modular, with statically allocated memory and resources. Zephyr supports IoT in several hardware architectures, such as Intel x86, ARM Cortex-M, NIOS II, ARC, with more than 200 boards. It offers complete flexibility and freedom of choice, open-source code, neutral management and small footprint and scalability from small Cortex-M devices to multi-core 64-bit CPUs. (Zephyr, 2020)

Support for Zephyr now includes Bluetooth, Ethernet, Wi-Fi, IPv4/IPv6, 6LoWPAN, and NFC. Zephyr has excellent documentation and a system development kit.

C is the dominant language.

This OS requires at least 8kb of RAM and at least 512kb of ROM memory. Documentation can be found on Zephyr's website in the documentation section.

The source code of the project is licensed under the Apache v2.0 license, but there are also imported and reused components that are subject to other licenses. The source code can be divided into modules. Modules can be divided into three layers based on how close the module is to the hardware. In each layer, modules from the same and each lower level can be used (Pecnik, 2020):

- Kernel Layer - Contains modules for managing low-level processes related to hardware and task scheduling.
- OS Services layer - Provides access to all common operating system functions. The modules in this layer are viewed as application design blocks.
- Application Services layer - Users can create applications to implement certain functionalities in accordance with their own project requirements.

Zephyr IoT OS is a secure system, which offers support for memory protection. It implements configurable stack-overflow protection adapted to the specific system architecture, monitors "kernel object and device driver permission tracking, and thread isolation with thread-level memory protection on x86, ARC, and ARM architectures, user-space, and memory domains". (Z.P., 2020)

For platforms without MMU/MPU and devices with limited memory, Zephyr supports combining application-specific code with a custom kernel. Thus, the combined code is loaded and executed on the same address space of the device.

Zephyr uses a multi-purpose tool called “west”. It is written in Python 3 and is distributed via PyPI. Zephyr can be used without the west, but then the work is more uncomfortable. One of the more important purposes of the west tool is to manage multiple Git repositories. When installing Zephyr, a directory called the manifest repository is important, and it contains the west.yml file. This file, together with the west configuration files, controls the installation behavior.

Advantages

- Flexibility - Zephyr IoT OS can be tailored to a specific task so that it contains only those components that are needed to support the task's requirements. In this way, much more efficient use of memory and resources is achieved and everything that is not necessary for the application is removed.
- Zephyr IoT OS has integration with test automation tools.
- Some of the features that Zephyr supports are memory allocation, communication, and synchronization, power management, memory protection, POSIX…
- BLE (Bluetooth Low Energy) is one of the main functions supported in Zephyr.

Disadvantages

- Users suggest creating better default varieties of reporting.
- There were some bugs found after major releases (but these were always resolved very quickly).

Application

Some of the most popular products already using Zephyr IoT OS are:

1. HereO uses Zephyr IoT OS to control multiple modem devices. The goal of this project was to develop a software package that would enable the launch of multiple communication devices, using the same UART port. One of the main products is a watch for children. The

watch consists of an EPD screen that is touch-sensitive, and Bluetooth support. It is designed and intended for children aged 3 and over. Parents can track where their children are using the hereO smartphone app. There is also the possibility of setting up safe zones such as school or home, where the application provides notification when a child arrives or leaves a particular location. (Ochs, 2014) This system contains 3 UART[3] devices.

2. CommSolid – CSN130 the market's first integration-ready NarrowBand-IoT Intellectual Property (IP) solution, designed for 3GPP NarrowBand-IoT standard. It is built into the chip and thus allows sensors and actuators to be directly connected to the Internet. This is how smart applications for logistics, health, smart cities, and surveillance were created. Extremely low power consumption makes it very suitable for devices with batteries. CommSolid evaluated and studied different real-time OSes. The main characteristics that were crucial for the selection of the OS are performance and stability. Simple mechanisms are also needed to perform software and user application tasks. All these features are possessed by Zephyr, which offers ultra-low power consumption and long battery life.
3. Grush-Grush is the creator of the advanced Bluetooth toothbrush. This toothbrush differs in that children can have interactive games on their phones while brushing their teeth. All of these games can be found on Google Play and the App Store. (Connelly, 2018) The app also includes a "Parental Control Panel" that allows parents to monitor how their children brush their teeth. The brush wirelessly transmits data with the help of BlueTooth to Grush Games - an interactive mobile game that guides children through the entire process of brushing their teeth. It also uses the Cloud, which preserves the entire history of brushing teeth. Zephyr made it easy for Grush to develop the advanced algorithms on which this brush is based. They needed an OS that could collect data from sensors, process complex algorithms, and communicate with a smartphone. The Zephyr has all the necessary features.

2.7 Windows 10 for IoT

Windows 10 IoT belongs to the Windows 10 family and is intended for the Internet of Things. It enables organizations to create their IoT and fit into the cloud strategy effortlessly. It appears in two editions, Core and Enterprise. The Core version can run individual applications, and the Enterprise version is a complete version of Windows 10 with specialized features for creating a range of applications on peripherals. Accordingly, the differences are shown in Table 7.

Table 7 Differences between Windows 10 IoT Core and Windows 10 IoT Enterprise

	Windows 10 IoT Core	**Windows 10 IoT Enterprise**
User experience	One UWP app in the foreground at a time with supporting background apps and services.	Traditional Windows Shell with Advanced Lockdown Features
App architecture supported	UWP UI only	Full Windows UI support
Cortana	Cortana SDK	Yes
Domain join	AAD only	AAD and Traditional Domain
CPU Architecture support	x86, x64, and ARM	x86 and x64
Licensing	Online Licensing Agreement and Embedded OEM Agreements, Royalty-free	Direct and Indirect Embedded OEM Agreements
Usage scenarios	Digital Signage, Smart Building, IoT Gateway, HMI, Smart Home, Wearables	Industry Tablets, Retail Point of Service, Kiosk, Digital Signage, ATM, Medical Devices, Manufacturing Devices, Thin Client

Source: (Warwick & et al, 2018)

[3] UART stands for Universal Asynchronous Receiver-Transmitter

In addition to these differences, when booting, the Core version is booted to the default application, which allows the user to use open-sourced code for this application and their own applications.

The minimum hardware requirements for Windows 10 IoT OS are shown in Table 8.

Table 8 Minimum hardware requirements summary for Windows 10 IoT

	Components	IoT Core	IoT Enterprise and LTSB[4]	
1	Processor	400 MHz or faster x86, x64 processor or ARM SoC	1 GHz or faster processor or SoC	
2	RAM	256 MB available to the OS for devices without display support 512 MB available to the OS for devices with display support, depending on resolution	1 GB for 32-bit OS 2 GB for 64-bit OS	
3	Storage	2 GB	32-bit	16 GB or greater
4	Security	Optional	64-bit	20 GB or greater
5	Display	Optional	Yes	
6	Wireless	Optional	Yes	
7	Networking	Optional	Yes	

Source: (Microsoft, 2017)

Advantages

- Windows 10 is constantly updated, which is good for ordinary users, but not good for industrial customers because it can affect the functioning of the system. Therefore, while updating Windows 10 IoT industrial customers can choose which updates will be installed. Only security and safety sections are automatically updated.
- Each version of Windows 10 Enterprise IoT LTSC will be available at least 10 years from launch.

Disadvantages

- If users need to use Edge, Cortana, or the Windows Store, they need to look elsewhere, as none of these features are included with IoT Enterprise.
- While updating Windows 10 IoT industrial customers need to choose which updates will be installed.
- The price of Windows 10 IoT is not clear and it very depends on the feature set for an IoT device.

Application

Given the importance of the Windows family of operating systems and the compatibility of systems of this family, there are many different Windows 10 IoT applications. Some are listed below:

- **Dover Fueling Solutions** is described in detail in (Dover, 2020). The idea is to download data on the customer, fuel sold and purchases made by the customer at the gas station from each individual gas station, to send them to the cloud, process them there, and return the results to the place of use. The results contain many statistics important for the gas station owner. This is not a spectacular new solution, because a similar solution for trucking companies has been known for a long time (Cekerevac Z. , Matic, Djuric, & Celebic, 2006), but another technology has been applied here and the network of petrol stations is covered.
- **Idex Fire & Safety** system, the IoT gateway solution, it is intended to keep fire trucks ready for use. The Smart Truck Technology platform based on Windows 10 IoT Core and Azure connects different fire truck systems and components and provides real-time data to the personnel in charge of their maintenance. The activities are performed within the centralized solution for monitoring, processing, and distribution of vehicle data, AXIS. (Idex, 2019)
- **SmartHubs**, elegant multifunctional kiosks with a multitude of IoT devices that are

[4] Long-Term Servicing Branch

available to citizens and enable the execution of many applications and services. They can accommodate radio transceivers for 5G networks, motion sensors, security cameras, IoT gateways, audio-video devices, EV charging devices, etc. Each SmartHub can connect to super high-speed Internet. (Citybeacon, 2019)

- The **Hourfleet** system based on mobile devices using Windows 10 IoT Core installed on each vehicle allows users to control the vehicle if they have a valid code and smartphone. In that way, the application of car-sharing is enabled. The solution consists of a mobile device built into each vehicle that allows one to open the door and start the engine, as well as monitor the use of the vehicle. The back end of the system is hosted in Azure. An ultra-compact, system-on-a-module (SOM) ARM board manufactured by SolidRun, a small PC, which uses an NXP i.MX chip is used to reduce battery power consumption and simplify system updates. (Hourfleet, 2020)

3 CHECKLIST FOR OS SELECTION

Based on the considered needs of the application, a checklist should be created for the technical requirements for the selection of the operating system for a specific equipment configuration and specific purpose. This is explained in more detail in (IoT Operating Systems, 2016), and only the most important issues will be highlighted here:

1. Does the application need real-time or deterministic performance?
2. What the available resources (memory, processing capability, etc.)?
   a. Memory size: If the OS does not fit in the internal memory of the processing unit (MCU or MPU), expensive external memory is required.
   b. Memory management unit (MMU): Many of the small MCUs used in sensor nodes do not support MMUs to manage caching, memory allocation, and protection. The chosen RTOS should be able to provide efficient memory management to minimize extra coding requirements.
   c. Processing capability: The processor should have enough margins to comfortably support the OS as well as run-time applications.
3. What are the security requirements? Security is a top consideration and should be accounted for in the hardware, OS, and network layers.
4. How is the device powered? OSes that support power management features can efficiently manage applications and improve battery life.
5. What is the hardware chosen? The chosen OS should be able to support the various platforms.
6. What are the communication and networking requirements?
7. Is enterprise system interoperability needed? It is necessary to consider process and systems used for the integration of field devices with enterprise systems.

Complete and accurate answers to these questions can allow the designer to avoid the usual pitfalls and later costly system upgrades.

4 CONCLUSIONS

The IoT device market is constantly growing, and it is expected that this trend will continue, and thus more and more things will be connected to the Internet. This includes things that are used in our homes like smart devices, things in our communities like smart parking spaces, and things in offices and factories like smart printers and robotic equipment. As the number and complexity of smart things grow, so does the technology that supports them. Greater throughput, more efficient use of resources and greater coverage are needed for IoT growth to continue in the coming years. In recent years, we have seen that the IoT industry is making increasing progress and that large companies such as Microsoft, Amazon, Google, T-Mobile, AT&T, GE, and many other top brands are part of the IoT industry.

For the growing demands coming from the IoT, it will be suitable the 5G system together with intelligent connectivity, a concept that envisions a combination of 5G network, IoT, and AI. By applying 5G technology and IoT, society will be more efficient, and smart cities will live up to their name.

The next trend is the massive adoption of IoT with billions of devices. To achieve it, two conditions must be met:

- On the technical side, the IoT standard must offer both scalability and versatility, offering enough capacity and network efficiency to connect millions of devices. At the same time, it must offer advanced features such as longer battery life and a wider coverage area to increase the number of new uses of this concept.
- On the application side, many new use cases need to be developed and tested. It will take several years for the full adoption of the 5G network, according to the GSMA, by 2025, half of the mobile connections will be 5G, and the other half will use older technology.

The proposed IoT OS represents a narrow selection of possible IoT OS. Each of them has the specifics that give it an advantage at a certain time and in a certain area. Very frequent updates and additions allow them to be constantly improved, so those who survive will likely look more and more like each other.

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SELF-ASSESSMENT IN THE ELECTRICITY SUB-SECTOR

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JEL Category: **L94, Q49**

Abstract

The critical infrastructure (hereinafter referred to as CI) is a complex unit made up of a plurality of elements, which are mutually connected. CI covers processes, systems, equipment, technology, to ensure the functioning of the state in and civil society. In society, you need to make every CI element working. The failure of the CI element can lead to disruption of the functioning of the relevant sector, for example, transport, energy, industry, which can lead to disruption of basic service delivery. A serious outage would have a negative impact on society. The most important sub-sector of CI is the electricity sub-sector. The current life of citizens and the functioning of the company is dependent on the supply of electric energy. Since the year 2013, the electric energy is considered a unique critical sector in the framework document PPD-21. Increasing the security of the elements incorporated into this subsector can be achieved by increasing the level of resilience. Increasing the level of resilience of elements can be achieved through self-assessment by operators. Self-assessment can analyze the current situation and give answers to the questions addressed.

Keywords: *infrastructure, private sector, public sector, resilience, electrical energy, critical infrastructure.*

1 INTRODUCTION

Critical infrastructure security issues and the protection of CI elements themselves are closely linked to resilience issues. (Dvorak, Leitner, & Rehak, 2019) Resilience is more closely related to maintaining the element's essential functions in the event of an adverse event. Resilience development began in 1973 in the work of Holling and continues to this day. In the case of the protection of elements incorporated into the electricity sub-sector, it is necessary to concentrate on the self-assessment of durable axes. Self-assessment of resilience is directed primarily to know the current state of the object and the achieved level of resilience. The self-assessment should analyze the current level of adaptability, robustness, and renewability at the beginning of the process. By the self-assessment of resilience, the operator can reveal problems that are required to be solved and can involve external entities. In the case of finding larger deficiencies, external entities can be called to address the situation.

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2 RESILIENCE OF CRITICAL INFRASTRUCTURE

The contemporary world is facing many threats arising from the various processes taking place in nature and society. The natural and anthropogenic threats facing society so far have had widespread consequences that negatively impacted the functioning and life of the affected country. Alternatively, we meet and the cases in which the consequences have also hit neighboring countries. Therefore, it is necessary to focus on building robust systems. Resilient systems will

make it possible to reduce the likelihood of an adverse event and, where appropriate, allow the system to respond effectively if the adverse event occurs.

The concept of resilience, respectively. Resilience is often used in various scientific disciplines, such as psychology (Patterson & Kelleher, 2005), the economy (Hallegatte, 2014), in medicine (Lecklin & et al, 1996), environmental science (Stip, Mao, Bonzanigo, Browder, & Tracy, 2019) and in the field of security (Rehak, Senovsky, Hromada, & Lovecek, 2019).

The term resilience was first defined in 1973 by C. S. Holling. In the context of the examination of the resilience and stability of ecological systems. Holling understands resilience as a characteristic of a system that results in the persistence or likelihood of extinction of the environmental system. In his work, he mentioned the relation to resilience; resilience determines the stability of interrelationships in the system and is a measure of the ability of these systems to absorb changes in the state of variables, control variables, and parameters and to remain in that state. (Holling 1973)

In general, resilience means the ability to adapt to "normal", foreseeable, or unexpected adverse events. (Zubieta, 2013)

As regards approaches to resilience, each author has taken a specific stance on the explanation of this concept. In his study on food security, Maxwell (1996) understood resilience concerning "resilient households", which are affected by adverse events but can recover quickly.

Barnett (2001) in his scientific publication on adaptation to climate change in Pacific island countries defines resilience as a problem of uncertainty. He stressed resilience as a key ability of the country to cope with uncertainty and surprising events while maintaining the overall balance of the system. Barnett argues that resilience is about learning from the mistakes that have occurred and returning to equilibrium in a better form that will be ready for future adverse events. Resilience is, according to Barnett, an integral part of the development of adaptation capacity. Resilience is most often manifested in response to impacts that are basically negative, but a company that is flexible and able to recover quickly can take advantage of all the positive opportunities that might arise for the future. (Barnett 2001)

Manish Bapna (2009), with a team of authors, addressed in their publications the priorities of rural poverty in a changing climate. Their publication focused on the problem of the rural population related to the changing climate, which has a negative impact on the functioning of ecosystems. They focused on increasing the resilience of the population, focusing on their property and income so that they could adapt and face the challenges of climate change. Resilience is the ability to manage stress or recover from disorders. Resilience in the context of rural dependent communities consists of ecological, social, and economic resilience. (Bapna, McGray, Mock, & Withey, 2009)

Allen, Macalady, Chenchouni, D. Bachelet, and others (2010) claim that resilience has two main variants. One variant is so-called "engineering resilience". It is the ability of the system to return to equilibrium after failure. It focuses primarily on efficiency, consistency, and foresight. It is a concept where engineers try to develop optimal safety designs in the event of a system failure. The second variant is called "environmental resilience". This is the amount of disturbance that can be absorbed before the system; it predefines its structure by changing the variables and processes that control behavior. It focuses on conditions outside the steady state where instability can change, transform, the system to another mode of behavior. Both options deal with aspects of system equilibrium stability and offer alternative measures for the system to maintain its functions even in the event of a failure. (Allen, Macalady, Chenchouni, D. Bachelet, & et al, 2010)

2.1 Assessment resilience of critical infrastructure

When examining the issue of resilience and the way of evaluation, it is necessary to analyze several information sources that can provide new ideas and ideas. Approaches to resilience evaluation are different. Part of the evaluation is usually a combination of quantitative and qualitative methods that allow quantifying the level of resilience of the evaluated object. In practice, the issue of resilience evaluation is addressed as follows.

The issue of CI resilience has attracted many authors who have started to address it in various contexts. Luiijf and Klaver (2019) in relation to resilience focus on resilience access to information relating to CI. In their scientific publications, they discuss a new social risk related to the use of information and communication technologies and operational technologies. It is this technological advancement that represents a new risk related to cybersecurity for critical infrastructures, essential services, and society. The authors argue that the current national approaches to protection mainly focus on the telecommunications sector and critical sectors and, as such. energetic on, health care, transportation in, etc. To properly deal with cyber threats, it is necessary to apply the appropriate procedure to address these risks, and that before there is a serious incident. A new approach is needed to increase the resilience of society in general. (Critical infrastructure, 2018)

Virendra Proag (2014) devoted itself to assessing and measuring CI resilience in her Assessing and Measuring Resilience. In her publication, she displayed a list of infrastructure systems that affect everyday life, drawing attention to resilience issues. A quick overview of resilience can be obtained by examining cases where infrastructure has been roads, hospitals, disrupted by adverse events, e.g. flooding. The robustness of the system depends in part on its features or those built into the system. To define, quantify and overall design to improve resilience, Proag (2014) introduced features such as absorption, adaptation, and recovery. In the paper, the author also mentions steps for the evaluation of the resilience of socio-economic systems, e.g. defining the system - understanding the system components and how resilience affects the system, resilience assessment - identifying the recovery path and performing recovery using models, etc. It also presents indicators within individual infrastructures e.g. emergency services - number of lives saved, telecommunications - number of interrupted phone calls, and others. The publication includes a quantitative and qualitative evaluation of resilience. When quantitative assessment addresses the effectiveness of resilience (Resilience efficiency) and in qualitative evaluation is conducted risk analyses reveal the sources of risk.

The assessment of the resilience of the CI food and agriculture sector was dealt with by Meuwissen et al. (2019) with a research team consisting of authors from different European countries who created the framework for assessing the resilience of agricultural systems. The article “A framework to assess the resilience of farming systems” dealt with the growing economic, environmental, and social threats facing the agricultural system in Europe. The authors have created a framework for assessing resilience, focusing on three systemic capacities that are critical to understanding the resilience of agricultural systems: robustness, adaptability, and transformability. For the frame, see Fig. 1, it consists of 5 steps, wherein steps 1 to 5 deal with specific resilience, while steps from 5-1 focus on general resilience.

The basis for the elaboration of step-by-step methodological steps was the just defined framework. The individual steps made it possible to compare analyzes between several cases examined. The methodology consists of a mixed-method approach that includes quantitative methods (statistics, econometrics, and modeling) qualitative methods (interviews, workshops providing stakeholders with more detailed information). (Meuwissen, et al. 2019)

In the publication Complex Approach to Assessing Resilience of Critical Infrastructure Elements, Rehak, in collaboration with several authors, focused on a comprehensive approach to assessing the resilience of CI elements. Resilience was perceived as a quality that makes it possible to reduce the vulnerability of a KI element, absorb the effects of adverse events, increase the ability of the element to respond and recover, allowing it to adapt to negative events similar to those that occurred in the past. The paper presents the CIERA methodology, which is designed to evaluate the resilience of CI elements in the Czech Republic. CIERA methodology can be applied in various technical branches. (Rehak, Onderkova, & Brabcova, 2019)

These approaches were mainly focused on static resilience evaluation. When dealing with resilience, it is necessary to mention not only the static resilience evaluation but also the dynamic aspect of the resilience evaluation.

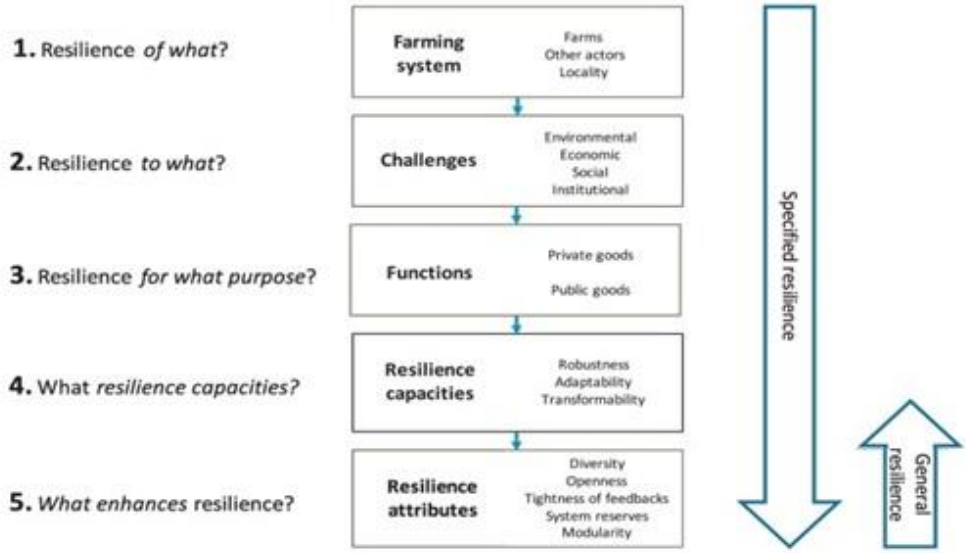

Fig. 1 Approach to assessing the resilience of agricultural systems (Meuwissen, 2019)

Zinetullina et al. (2019) in the article Dynamic resilience assessment for process units operating in Arctic environments. The study aims to develop a method of a quantitative assessment of the resilience of processing units operating under arctic extreme conditions. They use Dynamic Bayesian Network (DBN) to model probability relationships between causes and consequences. The proposed method for assessing dynamic resilience:

- identify absorption, adaptation, and recovery parameters,
- creating a butterfly diagram,
- mapping of butterfly diagram by DBN,
- estimate the likelihood of system reliability states using the DBN model,
- develop a dynamic resilience curve,
- revise the design of the processing system to increase resilience,
- assess the robustness of the system and compare it with the previous durability curve.

The proposed approach will contribute to the detection of critical operating parameters under extreme conditions for production units. It also helps to identify potential areas where improvements are needed to increase process safety. (Zinetullina et al. 2019)

The project Dynamic Assessment of Resilience of Corresponding Critical Infrastructure Subsystems was established in the Czech Republic. The project was supported by the Security Research of the Ministry of the Interior of the Czech Republic. The group of authors Martin Hromada, David Rehak, Pavel Fuchs, Tomas Apeltauer, Petr Hruza, Michal Bil, Vit Stritecky, Zdeněk Dvorak and others participated in the work. The project focused on the dynamic evaluation of the correlation of European major sectors (i.e. energy, transport, information, and communication technologies) and their elements. The project should include a description of the synergic effect of the failure of these systems and their impact on impact assessment and the establishment of a dynamic assessment of CI resilience. The practical part of the project was aimed at creating a system for identifying key elements of land transport infrastructure, critical infrastructure in the energy and ICT sectors in the context of their correlation, and in relation to the crisis preparedness of territorial units (Resilience 2015-2019). This project involved the processing of several publications. One of them is the Determinants of Dynamic Resilience Modeling in Critical (Rehak, Onderkova, & Brabcova, 2019). The authors claim in the publications that immunity is an important factor in protecting IC elements from the adverse effects of adverse events. The higher the level of resilience, the longer the element can withstand adverse events. The resilience depends on the duration of the adverse event acting on the element. The longer an adverse event affects the object, the lower the level of immunity. Dynamic resilience allows you to capture changes in resilience when it is exposed to negative factors. The publication deals with the issue of modeling the dynamic resilience of the CI element. The authors pay attention to the

factors influencing the resilience of CI elements and the nature of adverse events. Factors define the basis for dynamic resilience modeling. (Rehak, Onderkova, Brabcova 2019)

2.2 Proposal process of self-assessment of resilience

The resilience research carried out by the author represents a way to increase the resilience of critical infrastructure elements. Each element demonstrator should focus on self-assessment when determining the level of resilience. Through the internal information on the operation of the element, it should be able to carry out a self-assessment of resilience, which would lead to the detection of errors and the consequent adoption of adequate measures. Self-assessment would save operators the many costs needed to perform analyses to identify deficiencies in processes and safeguard the element. The self-assessment could be carried out based on a set structure. The following issues would be addressed in the structure:

- The resilience of what?
- Resilience to what?
- Purpose of resilience testing?
- Method of resilience evaluation?
- How to increase resilience?

The content of the answers to the questions asked would include a description of the selected sector to which the element belongs, a description of the threats, a description of the areas, a description of the resilience components and, consequently, resilience measures. The entire structure can be seen in Fig. 2.

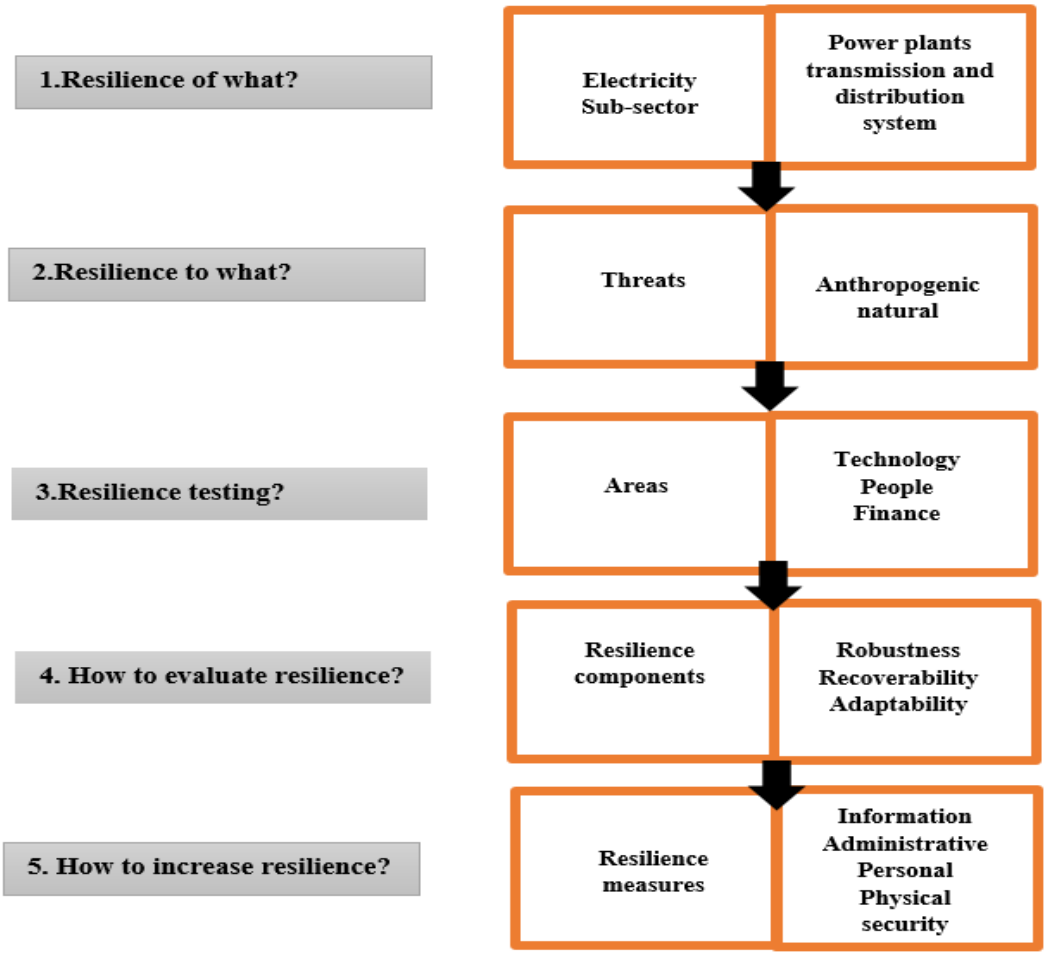

Fig. 2 Resilience self-assessment structure

RESILIENCE OF WHAT?

Characteristics of the relevant area to which the element to be assessed including a detailed description of the critical infrastructure element concerned. Describe the internal and external processes that take place on the board. Based on the evaluation, this section may focus on a general description of the e.g. subsector.

RESILIENCE TO WHAT?

The current fast development of society brings many adverse factors that may endanger the operation of the CI. This part should be oriented on the identification of threats of natural and anthropogenic character. Identification can be done, for example, through a checklist that will be evaluated by several evaluators. Subsequently, the results from the checklist can be shown in a graph, see Fig. 3.

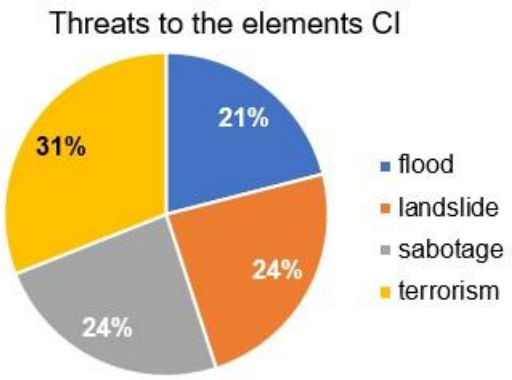

Fig. 3 graphical response display

RESILIENCE TESTING?

Step 3 is intended to determine the purpose of the immunity study. The purpose of the resilience study is to reconsider the security of the individual components in the specified areas that are in each element. Based on the CIERA methodology, the following areas have been identified:

- technology,
- people,
- finance,
- activation of measures.

All these areas have an impact on the level of resilience. To efficiently quantify the resilience, it is necessary to know the technologies and technological processes that take place in the assessed power plant. It is also necessary to know the way of training and education of workers in the building, providing financing in case of breakdown, how the measures are carried out, because all activities taking place in the electricity building may have deficiencies, which are a source of the unwanted event or a factor reducing resilience. Individual areas will be reviewed as part of the established static resilience assessment procedure.

HOW TO EVALUATE RESILIENCE?

CIERA methodology from the Czech Republic is an excellent starting point for the self-assessment of resilience. The methodology is designed for the complex determination of a static level of resilience. The self-assessment of resilience would result from its three components, which are shown in Fig. 4.

Fig. 4 Basic resilience components

Self-assessment would consist of evaluating the individual indicators in the relevant components. Subsequently, indicators would be assigned values from 0-3 based on the representation of the indicators for the component. The areas would be

evaluated based on the established scale, see Fig. 5 and Fig. 6.

Electrical distribution			
Ro	Re	A	Resilience
3	3	1	7
3	0	0	3
2	2	1	5
2	2	2	6
2	0	1	3
2	1	0	3

Fig. 5 Resilience self-assessment

THE LEGEND	
RESILIENCE LEVEL	
7-9	higher level
4-6	medium level
1-3	low level

Fig. 6 Resilience levels

HOW TO INCREASE RESILIENCE?

Through self-assessment of resilience, it is possible to identify weaknesses in individual areas and take appropriate measures to increase the resilience of individual components. Measures that would aim to increase resilience will be applied in the 4 areas shown in Fig. 7

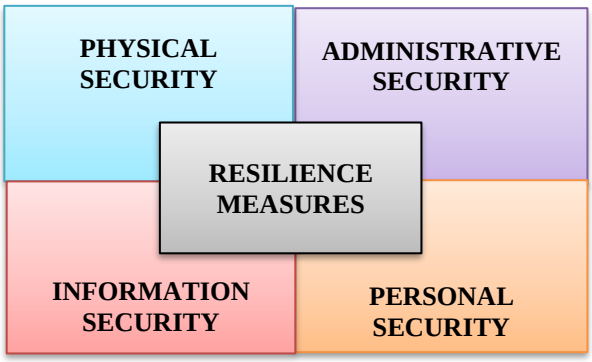

Fig. 7 Displaying security areas

The sets of measures are always prepared in real-time for a specifically selected object, based on the results of the self-assessment. In the area of administrative security, measures are usually directed at organizational processes. Information security needs to be improved through technical and organizational measures directed at its employees. Personnel security requires measures especially in the area of selection and education of people. Physical security measures need to be directed towards effective, time-based solutions.

3 CONCLUSIONS

Research on the resilience of energy systems and infrastructure is currently focused on an in-depth analysis of the various variables of robustness, adaptability, and renewability. The research reveals new areas of technical security and organizational security of energy systems and buildings. Today, electricity is considered a subsystem whose functionality affects dozens of other subsystems. The uninterrupted power supply is crucial for the life and functioning of modern society. In the case of short-term outages or long-term blackouts, the life of the whole company will gradually become more complicated. Production, transport, service provision, and state functions will stop. It is, therefore, necessary to look for new methods and procedures to increase the resilience of the electricity industry.

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THE BANK'S IMAGE: FORMATION AND WAYS OF IMPROVEMENT

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JEL Category: **G21, G41**

Abstract

The bank's image is the totality of perceptions, opinions, and visions of different contact groups about a bank. Its study allows determining the level of bank trustworthiness, on which depends its ability to attract financial resources and, therefore, to perform its activity. Due to this fact, image is a highly important asset for a bank. The assessment of bank image differs from one group of interest to another. It determines the division of the aggregate bank image into elements, namely: business image, social image, an image in the financial sector, image made by clients, by the government, by the international public, etc. Therefore, the formation and management of the bank image is a complex of activities, which include: communication of the corporate identity using different marketing techniques, correct management of the bank, especially related to risks and prudential norms, qualitative banking products, and high level of customer service. The recommended method for improving the image of a bank contains the following steps: evaluation of the current image; reviewing the philosophy on which the bank's activity is based and, if necessary, its re-formulation; checking the consistency between the bank's mission, objectives and long-term strategy; improving the elements of external and internal images, and developing the undiscernible banking image by establishing deeply subconscious links between the bank's image and the emotions and values of the general public.

Keywords: *bank's image, reputation, corporate identity, advertising, management of bank's image, banking sector.*

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1 INTRODUCTION

Actuality. The financial sector is characterized by a high level of competition. To ensure its competitive advantages and continuity in its activity, the bank should prove that it is a reliable and trustworthy institution. In this regard, the bank's image management should be a domain of

keen interest for every bank, because it directly impacts the accessibility of the bank to financial resources and, therefore, its market share. But to perform appropriately this management, there should be a clear understanding of what bank image is, what elements it consists of, and how it is created.

The goal of this research is to reveal the importance of the image for a banking institution and to propose measures, which can be undertaken to improve the bank's image. The objectives, established for the achievement of the set goal include:

- defining the concept of bank image and its main elements;
- determining the way the bank image is formed;
- a suggestion of solutions in the improvement of the bank's image.

The research methodology is based on the deductive method, comprising the documentary and graphic methods. Under the documentary, the method is performed in the study of bibliography sources, linked to the research problem, such as specialty literature, research papers, publications, etc. Some of the findings were further presented in graphical form.

2 CONCEPT AND ELEMENTS OF THE BANK'S IMAGE

The financial market is characterized by a high level of volatility (Nitu, 2000), due to the existence of a large number of factors, which determine its activity and development. In such a continually changing environment, the banks are aware that in their aim to obtain profit, their exposure to risk is permanent. The consideration of all risks related to the banking activity should be performed in a prudential manner, taking into account not only the regulations imposed by the central bank, desired profit level, or eventual losses, but also the possible effects on both external and internal image of the bank (Nitu, 2000).

But what is a bank image? Generally, the corporate image is the totality of perceptions, opinions, and visions of different contact groups about a company. It represents an instrument, created for achieving the company's strategic goals (Burtseva & Mironova, 2008). A well-created image will influence the public/ client to act in a certain way towards the image holder (Gorchakova, 2005). Thus, image is an essential element for any corporation, which enters the market and is concerned about the way its products are perceived by the public. Image is paramount for the companies in the financial and banking sector, in which the relationships are based mainly on trust (Rogacheva, 2007).

Bank image assesses qualitatively the opinion of the general public about the bank's activity, taking into consideration also the activity of its shareholders, their affiliated persons, dependent, and daughter-companies (Smirnova, 2009). Additionally, the image can be perceived as an objective result of the bank's activity on the market, generated by the coincidence between the bank's interest and the interest of the public and clientele (Reshetikova, 2009).

The image of a bank can be seen from three perspectives (Reshetikova, 2009):

1. the intentionally created representation, the scope of which is to impact emotionally and psychologically the recipients of information with the aim of advertising.
2. the fixed opinion of the customers, partners, and the general public about the prestige of the bank, quality of its products or services, reputation of its management.
3. a complex system of visual identification, which facilitates the establishment of a favorable organizational style and amplifies the advertising impact on clients, increases the partners' trust and contributes to the improvement of the market position of the bank.

The bank's image includes the following features (Smirnova, 2009):

- there exist two parties: the inductor, source of information (bank), and the recipient receiving the respective information (e. g. public).
- is presented as being the information about the bank, fixed in a symbol or message.
- image, like information, is communicated during the "dialogue" between the bank and its "audience".
- image is not always the representation of the real characteristics and possibilities of the bank but can be perceived as such.

- it can influence and manipulate the behavior of the recipients of the information towards its inductor, the bank.
- is characterized by individuality, due to its formation in specific, conditions under the influence of different factors (Solcan, 2003).

The public appreciates how successful is the activity of a bank. From the perspective of different groups of interest, the image of the same bank differs, due to the distinction in parameters that affect the bank's perception (Rogaleva, 2007). This fact determines the elements of the bank image, presented in figure 1. For customers, for example, are important the quality and diversity of bank products and services and the corporate identity of the bank. Partners would value more the volume of bank operations and the style of doing business. The society will look at the sponsorship activities, performed by the bank, its support, and help in solving social problems. The level of customer service influences the image of the bank subsidiaries. The internal image would be surely affected by the corporate climate, working conditions, and social benefits of the workers. For the government of particular importance is the implication of the bank in the regional social programs and the good faith of the bank's activity. The volume of operations, trustworthiness, and financial stability is of high importance for the financial sector. And the international community takes into consideration the professionalism of personnel and the respect of ethical standards in doing business.

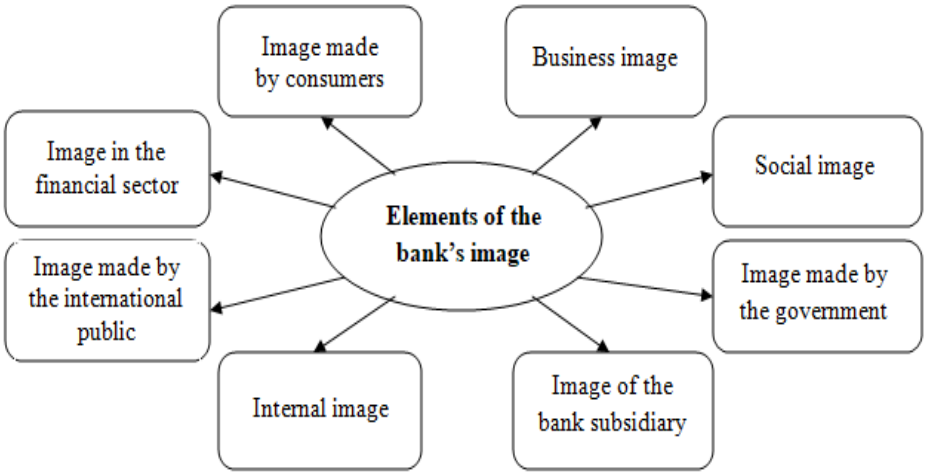

Figure 1 Elements of the bank's
Source: Adapted by authors based on Burtseva & Mironova (2008)

A positive bank image is a strategic resource, which helps the bank to adapt to the market conditions, being in such a way a tool for its survival and development (Reshetikova, 2009). Also, it ignites the desire of potential clients to deal with the bank. Because the trustworthiness is the ground of financial relations between a bank and a client, the latter would choose the bank with a better image. The positive image kept over time is of great importance for a bank, because it offers numerous advantages (Rid, 2008):

1. capturing the attention of potential clients, partners, investors, and workers. It offers the opportunity to be the first option for those who are seeking a commercial or partnership relation.
2. reduction of the expenses for advertising, because a good image promotes the bank's products and services by itself.
3. increase in bank's revenues. The positive image proves that there exists trust from the clients towards the bank, which, respectively, contributes to the increase in the value of bank operations, and therefore finds its reflection in the revenues of the bank (Akulich, 2013).
4. consolidation of the bank's position on the financial and capital markets. Through the correct development of the bank image and appropriate management of the bank activity, is gained the appreciation in the stock price of the bank's shares and improves the reputation of the bank in the financial sector.

5. serves as a motivational tool for the personnel. As mentioned previously, the potential workers also draw their attention to the image of the bank in which they intend to work. Therefore, a positive image attracts by itself new human resources and, also, allows keeping the existing qualified workers.
6. serves as a strategic asset in times of uncertainty for the bank. When the bank faces a problem, related to the launch of new products or faults in the day-to-day activity, which can impact negatively the performance indicators of the bank, the values imparted by the bank image among its personnel and the clients' appreciation of the activity before the crisis, can serve as a point of return for the bank to the past level of main financial indicators, helping, in such a way, to overcome the uncertainty.
7. represents a strong competitive advantage. A good image helps to attract more clients, respectively, more financial resources and increase the market share as compared to the existing competitors. It also protects the bank when the market is entered by new participants.

Table 1. Types of bank's image

Type of image	Characteristic
Tangible	represents the first impression of the bank
Intangible	is linked with the response reaction of the consumers of the banking products to the changes in customer service and the changes in the attitude of the personnel towards the bank
Internal	ensures the working climate, reflects the attitude of the personnel towards the policy promoted by the management and the bank itself
External	depends on the internal image and the attitude of the general public towards the bank

Source: Authors based on (Akulich, 2013)

The bank image also reveals the comparison between the promised functionality of the bank products, expressed in the advertising and product description, and actual functionality, along with the emotional feelings of the client during his collaboration with the bank (Akulich, 2013). Meeting consumer expectations is paramount in building customer loyalty. The last depends on the subjective evaluation of the bank by the consumers. While this evaluation has a psychological aspect, for a better understanding of what the bank image is, it can be divided into 4 subcategories, which are presented in table 1.

Internal bank image is based on the psychological aspects of the personnel's attitude towards the bank. A positive internal image serves as a means of self-regulation and self-motivation (Gorchakova, 2005). It fosters the staff confidence in the security at work, which serves as a driver for the personnel to work with greater effort and to look for the continuous professional development and improvement of their qualification (Akulich, 2013). All these contribute to the formation of a positive impression about the bank as a professional, reliable market participant, and employer. Additionally, the bank personnel ensures the accurate informational channel between the bank and the existent and potential clients. The last can "feel" the internal image of the bank, and it can affect the desire of the clients to enter the bank, and therefore, its performance and competitiveness. In such a way, the internal image plays a paramount role in establishing the positive external image of the bank.

The external image includes the presentation of the bank as a responsible business partner, which offers quality products and services, the activity of which is based on the social and corporate techniques, such as (Reshetikova, 2009): environment protection; social security of employees; development and creation of the new workplaces; pension, educational, medical, cultural, housing and other types of programs, which have social and economic importance for the society, country and national economy as a whole; and management of human resources. The visual features, which fix the information about the interior and exterior of the bank subsidiaries and agencies, as long as the exterior appearance of the bank personnel also contribute to the building of the external image of the bank.

3 FORMATION OF THE BANK IMAGE

The bank image is the totality of socio-economic and organizational relationships, oriented towards the creation of the bank's representation, its "face" (Reshetikova, 2009). The first step in establishing a positive and successful bank image is the well-developed corporate identity. It includes firstly the totality of the color and graphic elements along with slogans, which aim to distinct the bank from its competitors. All these symbols should ensure the visual and meaningful unification between the bank's products and services and the informational flows provided by the interior and exterior appearance of the bank (Akulich, 2013). The corporate identity should reflect the mission, structure, business activity, and assertions of the bank. Only as a result of the management of the corporate identity and the use of corporate communications appears the image (Smirnova, 2009).

An important element of corporate identity is also corporate governance. "Corporate governance is a set of relationships between a company's management, its board, its shareholders and other stakeholders which provides the structure through which the objectives of the company are set, and the means of attaining those objectives and monitoring performance. It helps define the way authority and responsibility are allocated and how corporate decisions are made" (BCBS, 2015). Therefore, the corporate governance unifies the personnel, fortifies the personnel's morale (Akulich, 2013), contributes to a better working climate, and, indirectly, leads to better customer service.

When the bank is just established and attempts to start its activity, high efforts are oriented towards a good advertising campaign, which communicates about the bank's corporate identity. The correctly chosen marketing techniques will allow the bank to reach its target audience and acquire the first clients. In such a way is created the initial bank image, which represents the aggregation of the individuals, businesses, and governmental organizations' opinions about the bank before they approach the last. The values, business standards, features, and usefulness of the products and services promoted through the popularization means of mass-media – they all create in the minds of the potential clients some expectations regarding the activity of the respective bank. But initial image changes over time after the establishment of the first relations with clients, partners, investors, and other stakeholders. The way how the current image is formed is presented in the following scheme.

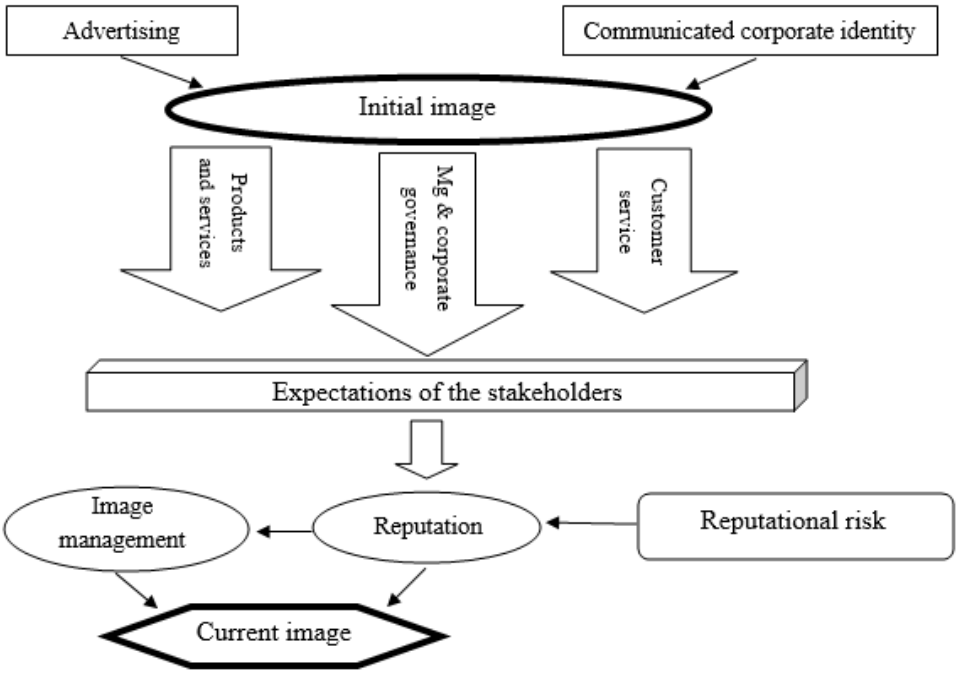

Figure 2 Formation of the bank's image (adapted by authors)

The moment when the bank starts to attract deposits, grant credits, and offer its services to the clients – it is a crucial point in the creation of the bank's reputation. The later represents a collective assessment of a bank's attractiveness to a specific group of stakeholders as compared to its competitors and/or the established standards (Trotta & Dell'atti, 2016). On reputation depends the bank's trustworthiness, and, thus, the number of financial resources it can further attract. The reputation is considered to be positive when the expectations of the stakeholders are met and fulfilled by the bank. For example, the clients will have positive feedback about the bank when the products and services, offered by the bank, fully satisfy their necessities and the customer service provided by the bank's personnel is impeccable. Additionally, a good reputation appears in the situation when the bank's image and the personal system of values of the individuals coincide (Smirnova, 2009). The strong corporate governance and the ethical business activity performed by the bank will be of great importance for shareholders, regulators, and business partners. The well-performed financial intermediation function and the social advantage of the bank's products will lead to a positive assessment of the bank by the government. Therefore, the past experiences in collaboration with the bank generate impressions in the stakeholders' minds regarding the respective entity and their aggregate amount represents the bank reputation (Smirnova, 2009). This reputation affects the actual perception of the bank, consequently its current image.

The positive reputation usually generates mouth-to-mouth advertising for the bank, through the recommendations made by the existent and former stakeholders to their acquaintances. In such a way, the good reputation affects positively the bank image, and, vice-versa, the negative one is capable to destroy it, unless the timely and appropriate image management decisions are taken. This is why, in the scheme, reputation influences both the image itself and its management.

Marketing channels and techniques, customer service, corporate culture, etc., which are used in image management, and the reputation - all are influencing the bank image (Rogacheva, 2004). But the image management tools can be directly influenced by the bank, unlikely its reputation, which is the subjective judgment of each stakeholder. The bank can only do its best to ensure its stability, durability, profitability, and trustworthiness, which impacts positively the bank's reputation.

The efforts of the bank to ensure the best possible management, which will allow to respect the bank's strategy, comply with all regulations and follow the best practices in the banking industry, should orient also towards the consideration of the reputational risk. When the bank registers the occurrence of the reputational risk resulted from inappropriate risks or human resources management, deficiencies in the bank's corporate governance, inefficient marketing techniques, misuse of the bank by its clients for criminal activities, dishonest shareholders, failure to adapt on time to the new tendencies in the banking industry, etc., it immediately affects the bank reputation. The bank loses its clients, partners, investors. The negative publicity appears which in the end affects negatively the bank's image.

Because the bank products possess usually a long-life cycle, the bank's image can be considered to be one with big implications. This is why the appreciation and especially feedback from the stakeholders are of great importance for monitoring the bank's image and tanking appropriate and timely decisions for its improvement (Solcan, 2003). Therefore, the management of the bank image is a complex of activities, oriented to each factor named above.

4 IMPROVEMENT OF THE BANK'S IMAGE

Improvement of the bank image is especially important when the bank faces problems related to its reputation or market share. It allows the bank to retake its activity in a new ampleness. The bank image is the result of the day-to-day activity of the bank and is not created exclusively by the marketing department. Reducing the bank image only to visual characteristics is a superficial approach and it does not bring success. Acknowledgment of this fact is the first step in the improvement of the bank image.

The process should start with the gathering of the information related to the current position of the bank within the banking sector and the assessment of the current bank image through interviewing and establishment of the focus groups. The main directions and factors to be studied during the interviewing process are presented in table 2.

Table 2 Concept of corporate image study

Type of image		Key directions of study	Basic Factors
Internal Image	Assessed by employees	- Workplace satisfaction. - Awareness about the general development strategy and mission. - Evaluation by the employees of the clients' awareness of the entity. - Identification of the associations related to the entity - Level of company prestige.	Personnel's loyalty; the possibility of career growth; a system of moral and material remuneration; social and psychological climate.
	Assessed by managers	- Assessment of the employees' workplace satisfaction. - Specification of the general development strategy and mission. - Evaluation by the managers of the clients' awareness of the entity. - Identification of the associations related to the entity - Level of company prestige.	Managers' loyalty towards the employees; possibilities of the employees' professional growth; social and psychological climate.
External Image	Assessed by clients	- Evaluation of the company's prestige and trustworthiness. - Informational transparency. - Perception of the mission and development strategy. - Identification of the associations regarding the company. - Corporate identity of the company.	Degree of loyalty; quality and features of products, services, and customer service; prices, bonuses, and discount systems.
	Assessed by partners	- Evaluation of the company's prestige and trustworthiness. - Informational transparency. - Perception of the mission and development strategy. - Identification of the associations regarding the company. - Corporate identity of the company.	Evaluation of the quality of collaboration; the level of satisfaction resulted from the partnership.

Source: (Bushuyeva & Frolova, 2015).

During the banking, sector study are undertaken the following actions (Bushuyeva, & Frolova, 2015): determination of the degree of competitiveness; identification of the main competitors and assessment of the advantages and disadvantages of the bank as compared to them; determination of the range of offered banking products; detection of the attitudes towards each participant in the banking sector; determination of the "portrait" of the target clients' segment of the bank; determination of the satisfaction level of the existent clients, their expectations and degree of loyalty towards the bank and positioning of the bank in the market and

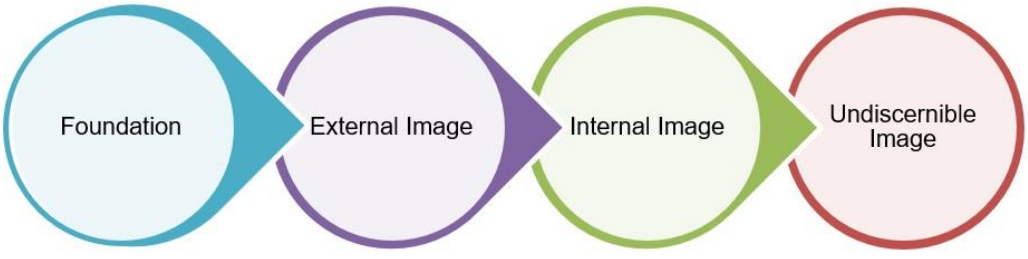

Figure 3 The strategic plan of the image improvement (adapted by authors, based on Garstea, S.,2002)

the perception of the target segment. The performance of such a complex study allows determining the strong and weak points in the actual bank image among its stakeholders. The detected deficiencies should be further eliminated through changes in image management strategy. Further, the management of the bank's image should run through four stages, specified in figure 3. The effects of the correct process of foundation can result in high morality, sound corporate culture, and governance within the bank. All these will ensure the efficient segregation of responsibilities among the bank's employees and the effective day-to-day activity of the bank (Garstea, 2002). At this stage is also justified the importance of the bank from a social point of view and is created of the premises for the next step – external image management.

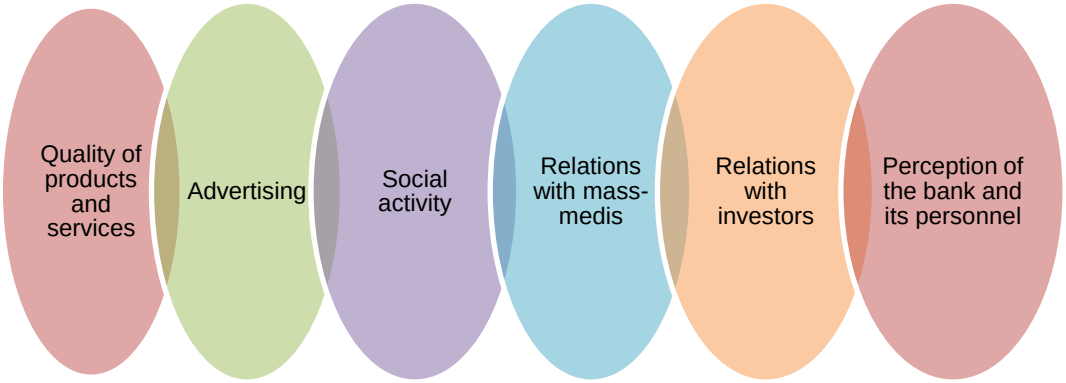

Fig. 4 Elements of external image management (adapted by authors, based on Garstea, 2002)

The quality of banking products and services depends on customer satisfaction and loyalty. Thus, the products and services should be designed to meet the clients' expectations and should contribute to the formation of the bank's reputation, which together with advertising increase the prestige and popularity of the bank. Advertising on its turn should have an emotional impact on the target clients' segment of the bank in such a way affecting unconsciously the audience's behavior (Garstea, 2002). Important to be mentioned is the fact that advertising impacts faster the bank's image in a positive way when the bank is involved in and supports different social projects (Rogacheva, 2004). The activities of social responsibility bring not only necessary resources for a good cause, but also help to establish emotional relationships between the bank and society (Garstea, 2002). The positive image is gained also by the targeted marketing communications through mass media. For big banks, for example, is essential the work with mass media (Burtseva & Mironova, 2008), because it increases the prestige of the bank, highlights its strong points and serves as an intermediary between the bank and potential clients, who seek for the products and services, the bank is offering (Rogacheva, 2004).

Bank image is one of the factors which influence the bank's capacity to attract investors. To be perceived as a stable and reliable business to invest money in, the bank management should ensure the fruitful collaboration with the existent shareholders, based on transparency and performance.

When the bank wants to create its image, it should decide firstly, what impression it wants to be made about the bank (Rogacheva, 2004). In this regard, the bank management should focus on the visual attributes, such as name, logo, slogan, employees' dress code, the interior and exterior design of the bank's subdivisions, their territorial footprint, etc. Each component should be well designed, spreading the bank's philosophy and corporate identity.

The interior image of the bank is linked to the programs aimed to boost the workplace satisfaction of employees, their trust towards the bank as a sound and reliable employer, and their motivation to work professionally and efficiently, fulfilling their responsibilities and respecting the internal procedures. In this regard, the greatest impact has the following programs (Garstea,

2002): human resources policy, training, and professional development program and remuneration program.

The workplace satisfaction of the employee results in a high level of customer service. Very often, the positive opinion about the bank can be created by a good approach to the client by a cash-desk operator. Any worker, which is dealing directly with the client plays the role of "ambassador" of the bank, and on his actions and behavior depends the customer satisfaction, potential loyalty, and readiness to recommend further this bank to other people. His approach to the client affects directly and essentially the whole activity of the bank. Therefore, the personnel is the first and the most important factor in creating a positive image of the bank (Rogacheva, 2004).

Undiscernible image is the last stage to go through. The managers should understand that the bank image is a totality of socio-economic and organizational relationships, oriented towards the creation bank's "face", which is aligned with the demand of consumers and the general public values (Reshetikova, 2009). Image is a multifunctional, multilayered, and multi-component communicational phenomenon (Gorchakova, 2005). In such a way, the image's impact is realized on both conscious and unconscious layers. The unconscious layer includes inner intentions, motives, interests; social, moral, and spiritual rules; individuality, emotional experience, and memories. The image's signals can be, therefore, strong and weak, obvious and implicit, visible and invisible, influencing the mind or affecting the feelings. The second one is defining the communication of the image. Thus, the psychological indirect signals have the greatest impact on the unconsciousness of the people, contributing to the improvement of the bank's image. The conductors of the unconscious signals are emotions and feelings, and the bases of emotions are perceptions and associative representations.

An essential feature of the bank's image is the ability to manage and determine the behavior and decisions of the recipients. In this regard, the image can be the instrument of manipulation, necessary to affect every recipient, to achieve the desired goal, or to stimulate the desired behavior. Thus, the image is created by both intentional and unintentional actions of the bank. And the unintentional play greater importance, as they are not planned and reveal the real state of things. Also, it should be considered the fact that the information linked to image building can be perceived consciously and unconsciously, purely based on feelings. And many people trust more their feelings than their analytics or mind, and the bank specialists in image building should use appropriately this fact.

As an important factor in building a positive bank image are also good performances and achievement of the set targets and goals, aligned with the bank strategy and corporate culture. The successful and correct day-to-day activity of the bank for a long time will result in a good image of the bank. It is recommended also to create permanently active crisis groups, which will analyze the potential scenarios of the development of a negative bank image and will elaborate on the appropriate methodologies to overcome such situations.

5 CONCLUSIONS

Bank image assesses qualitatively the opinion of the general public about the bank's activity. It is also the mean of communication with social mass consciousness, a way to transfer the information from the bank to the public, to achieve the goals of the former. A positive image results in many considerable advantages for a bank, such as capturing the attention of potential clients, partners, investors and workers, reduction of the expenses for advertising, and an increase in the bank's revenues and its competitive power.

The assessment of bank image differs from one group of interest to another. It determines the division of the aggregate bank image into the following elements: business image, social image, the image in the financial sector, image made by clients, by the government, by the international public, internal image, and the image of the bank subsidiary. Therefore, the formation and management of the bank image is a complex of activities, which include: communication of the corporate identity using different marketing techniques, correct management of the bank, especially related to risks and prudential norms, qualitative banking products, high level of customer service and implication in social programs.

Improvement of the bank image contains the following steps: evaluation of the current image, especially of its weak points; reviewing the principles, values , and norms on which the bank's activity is based and, if necessary, re-formulating the bank's philosophy; checking the consistency between the bank's mission, objectives and long-term strategy; improving the external image elements, such as corporate identity, product quality, advertising, social activity, investor relations and media; improving the internal image by improving the general human resources policy, in particular, the training and professional development programs and the remuneration system; and developing the insensitive banking image by establishing deeply subconscious links between the bank's image and the emotions and values of the general public. The bank should also do its best to ensure its stability, durability, profitability, and trustworthiness, which impacts positively the bank image.

The image stirs up the public's trust in the bank's possibilities and responsibilities. An important point to be mentioned here is that the bank should be aware to create its image based on its real possibilities, without impossible promises. Otherwise, this dissonance will result in a negative image for the bank, due to asymmetry between the bank's supply and customers' demand and, also, not fulfillment of the promises and expectations, communicated previously through the bank's image.

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EUROPEAN TERRITORIAL COOPERATION AS A FACTOR OF TOURISM DEVELOPMENT

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Abstract

The article presents the outcome of qualitative and quantitative research methods applied by the authors to evaluate benefits and obstacles of the cross-border INTERREG program between Hungary and the Slovak Republic from 2014 to 2020, as one of the tools of European territorial cooperation for tourism development concerning bordering regions of Slovakia. This article aims to provide a recipient with a verified research method and results of the analysis to encourage more efficient employment of the European territorial cooperation to alleviate differences in bordering regions between the Slovak Republic and Hungary, furthermore with other non-member states of EU such as Serbia or Ukraine. Besides the most essential institutional and legal outputs of the topic in question, analysis, and evaluation of the current condition reflecting the tourism development in the Slovak Republic are provided. The quantitative analysis offers results of systems analysis regarding the direct, indirect, and induced contribution of tourism GDP creation and employment. World Tourism Organization Yearbooks were taken into account as the secondary sources to analyze the development of tourism in Slovakia in comparison with other European countries. Official statistics published by the Statistical Office of the Slovak Republic and the INTERREG cross-border cooperation program portal of Hungary and the Slovak Republic for 2014-2020 were the basis for analyzing and comparing the benefits of cross-border cooperation programs between Slovak republic and Hungary for the development of tourism including all three periods. Quantitative indicators such as awareness of the local public authorities and legal persons involved, benefits, and obstacles within tourism programs were analyzed by primal sources

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in the process of the statistical survey and verified by the Delphi method in the conclusion. The results of partial analyses and surveys served as the basis for drafts of measures to improve the current state of employment of cross-border cooperation programs for the development of tourism across the bordering area of Slovakia and Hungary.

Keywords: *cross-cultural research/measurement issues, data analysis, data source: primary data source: secondary, economic growth, institutional environment**,** tourism development, European territorial cooperation, INTERREG Slovakia-Hungary*

1 INTRODUCTION

Tourism is set to be one of the most dynamic economic sectors within the national and European regions. The argument supporting tourism as one of the top economical sectors in Slovakia reflects foreign exchange gain amount of 1.8 billion EUR during the last fruitful years. There are more than 20.000 economic operators active in the tourism industry, comprising approximately accommodation facilities with 122.000 beds. According to the Ministry of transport and construction of Slovak republic. (abbrev. MoTC SR). (Tourism, 2020.)

The tourism industry as a set of activities focusing on satisfying the needs of citizens regarding traveling is a cross-cutting sector of national with direct or indirect influence on processes in the industry, business, and services, finance, transport, regional development, culture, sports activities and protection of the environment. The tourism sector stimulates employment rates by the creation of vacant job positions. It is fair to say that tourism provides a unified aim covering various sectors to create establishments for active and passive national and international tourism.

Local and international investment are crucial economical tools of tourism in provision to Slovak republic since its accession to the European Union. (abbrev. EU).

Member states of the EU were permitted to draw on resources regarding tourism development in 2013 through European regional development fund.

Operational programs of the European territorial cooperation are the main resources of the European Union in tourism development in bordering regions of member states. The EU allocated more than € 500 mil. EUR for the period 2014-2020, solely for programs cross-border cooperation operated under name INTERREG. More than 183 mil EUR has been designated by EU to program of cross-border cooperation INTERREG V-A Slovakia - Hungary and more than 80 mils EUR to cross-border cooperation program Hungary – Slovakia – Romania – Ukraine.

Contribution to the sustainable growth of GDP as well as other possibilities of EU financial support for the development of tourism in border regions was the main objective of a survey conducted by VŠEMVS in cooperation with the association „Združením miest a obcí Slovenskej Republiky“, with local government authorities, citizens and city mayors of particular bordering regions with Hungary.

Concluded results demonstrate the strengths and weak spots of the current state and provide various suggestions for improvement. Authors of the article use a verified method to inspire subsequent research on this issue in SR and other countries keen on accession to the EU, such as Serbia and Ukraine.

However, this paper deals with the contribution of tourism on GDP growth and employment rate only briefly authors focus mainly on analysis and evaluation of the current state of EU financial support regarding tourism development in bordering regions of Slovakia and Hungary.

2 LITERATURE REVIEW

Overall review focus on terminology and terms related to tourism and its effect on GDP and employment rate. The main aspect of the review is to specify the possibilities of EU financial support provided to member states for tourism development in border regions.

The overview applies data obtained from available domestic and foreign resources of scientific and professional literature, documents of relevant public administration institutions of the Slovak Republic, and international organizations, as well

as international and national legal standards of the Slovak Republic.

In the publication *Tourism. Politics and Economics* (Gucik, Tourism. Politics and economy, 2011)Gucik describes tourism policy and tourism economics. *Management of the tourist destination* (Gucik & al., 2012) introduces innovative knowledge to the issue for experts in the field who are concerned by the development of tourism at destinations in the Slovak Republic. The economic and social effects of tourism on government revenue for the state budget are characterized by Novacka (2011). Publication *Tourism and the European Union* provides a comprehensive view of the conditions and relations that are being formed, developed, and present within the European Union in the context of tourism. Palatkova (2011) presents a comprehensive view of international tourism in the book *International Tourism*.

Ministry of transport and construction of Slovak republic as the Central State Administration Body defines tourism as „the set of leisure activities with scope to satisfy needs connected to traveling and motion of citizens outside of their permanent residence“ (MoTC SR, 2020).

Several Hungarian experts have been dealing with the strategic issues of northern Hungary and regional research aimed at developing the tourism of the country. The relation between tourism and regional competitiveness through the example “*Matrai Rural*” is addressed by Bujdoso, Lorant, Herneczky, and Tóth (2007)

Cross-border cooperation is generally considered a specific area of bilateral and multilateral international relations of neighboring countries. However, currently, there is a lack of professional publications on cross-border cooperation.

Cross-border cooperation of two particular countries focuses on the development of cities and regions to detect and evaluate natural and regional characteristics of border areas, development of the transport infrastructure, eco-tourism, agrotourism, attractivity of sightseeings, health care system concerning public accessibility, increase the number of education subjects providing lessons in the language of the minority, support partner schools, support cooperation among local and regional municipalities with a significant number of Slovak or Hungarian minority citizens (Agreement,2002).

Programm INTERREG has been an initiative of Union supported with a budget of 1 billion and in 1990 concerning solely cross-bordering cooperation.

Slovak republic, shortly after accession to the EU, was allowed to profit from the third cross-border cooperation program of Union Interreg III Slovak republic – Hungary – Ukraine 2004-2006 during the shortened programming period of three years.

From 2007 to 2013, the Slovak Republic could draw on financial support for cross-border cooperation under the revised European Territorial Cooperation Program. The Interreg IV Slovak Republic - Hungary program for 2007-2013 was approved for cooperation with the Republic of Hungary.

In the period 2014-2020, European territorial cooperation, alongside the Growth and Jobs objective, is one of the two objectives of EU Cohesion Policy. Over the years, INTERREG V has become a key instrument of the European Union to foster cooperation between partners from different countries. (Kovac, 2016); (Sidak, Cibak, & Hajnisova, 2020)

The aim is to find mutual solutions for issues, whether in the fields of health, tourism, research and education, transport, or sustainable energy. INTERREG programs are financed from the European Regional Development Fund to support the harmonious development of the European Union territory at various levels.

The question of European and world-wide tourism is a matter of focus World Tourism organization (UN WTO), OCEDD, EU, and Visegrad group. World Travel and Tourism Council (WTTC) is a particular body to conduct research and evaluation process on travel and tourism impact globally.

UN WTO (2020) gathers statistical data on tourism in member states under Tourism Satellite Account (TSA) to support unified system with aiming to foster knowledge in a particular sector, monitor progress, evaluate the impact of promotion on tourism results. The Yearbook of Tourism Statistics is published annually with the latest edition of the Yearbook published in 2020 for the

years 2014 to 2018 and containing data from 197 countries. (UN WTO, 2017).

Tourism and cross-border development issues are reflected in the work by Stoffelen and Vanneste, (2017). Stoffelen, Ioannides, and Vanneste (2017) dealt with the obstacles to cross-border tourism management on the example of the Czech-German border region. Opportunities for cross-border entrepreneurship development in a cluster model exemplified by the Polish-Czech border region were the topic of Polish authors Kurowska, Pysz, (2016). The authors contributed to the research of presentation issues and the case study Implementation of sustainable tourism in the German Alps (Paunovic & Jovanovic, 2017).

3 AIMS

Based on the current state of knowledge of the problem in question, the main aim of the research was analysis and evaluation of the results of objective (financial and non-financial) indicators of the impact of INTERREG programs within the European Territorial Cooperation on tourism development.

Data collected in statistical survey help to assess subjectively, perceived assessment indicators of the impact of the current state of use on cross-border cooperation within tourism development in the bordering region of the Banská Bystrica region and the adjoining Hungarian region, identification and evaluation of benefits and obstacles to tourism development in this region. The following partial tasks have been set assessment to accomplish this aim:

- Elaborate an overview of examined issues based on data from local and foreign resources.
- Analyze a contribution of Slovak tourism on economic growth during the last two programming periods 2007-2018 with a prospect in 2027.
- Analyze and compare funding of cross-border cooperation projects in tourism within the Cross-border Cooperation Program of the Slovak Republic and Hungary in the programming periods 2004 - 2006, 2007 - 2013 and 2014 – 2020
  - Integrate a statistical survey to determine the state of public satisfaction and awareness on the possibilities and acknowledged benefits and obstacles of using the SR-HR Cross-Border Cooperation Programs for 2014-2020 in the area of tourism in the border area of Slovakia and Hungary
  - Integrate a statistical survey to determine the state of satisfaction and awareness among mayors of cities in the Nohohrad region the possibilities to apply outputs of the Cross-Border Cooperation Programme between SR and Hungary on the development of tourism and detect benefits and obstacles.
  - Using the Delphi expert method to verify the research results with an emphasis on the current barriers to the use of the Slovakia - Hungary cross - border cooperation program for the development of tourism.

4 RESEARCH METHODOLOGY

The research target problem was to determine the share of cross-border cooperation programs in tourism development using analyzes of objective and subjective indicators. The research was based on statistical data of the World Council of Tourism and Tourism WTTC, the Statistical Office of the SR, the Ministry of Agriculture and Rural Development of the SR and the Ministry of Transport and Construction of the SR and statistical survey of particular indicators of cross-border cooperation for tourism development conducted among employees of municipalities, mayors, inhabitants of the border area of Slovakia and Hungary, entrepreneurs and experts in cross-border cooperation.

One main and seven specific hypotheses were presented to verify the research target problem.

Main hypothesis (MH): Cross-border cooperation program between Slovakia and Hungary in the period of 2014-2017 is a determinative aspect of development and tourism in neighboring regions of Slovakia and Hungary.

Specific hypotheses were confirmed by citizens, mayors, and experts in tourism and cross-border cooperation.

The main target of qualitative research, i.e. objective indicators of impact was:

- The overall contribution of tourism on Slovak GDP
- Contribution of tourism on the employment rate in Slovakia
- Ranking position of Slovakia in previously mentioned indicators in as compared on a global scale or with particular member states of EU including Hungary, Serbia, and Ukraine

The main target of qualitative research i.e. objective indicators of impact was:

- public awareness on the importance, benefits, and obstacles of cross-border cooperation programs between Hungary and Slovakia on tourism development.
- acknowledgment of city mayors and other municipality authorities on the importance of cross-border cooperation programs between Hungary and Slovakia on tourism development and their perception of benefits and obstacles of such program.
- the consensus among experts regarding project draft and implementation to boost tourism on cross-border cooperation programs between Hungary and Slovakia on tourism development

The primary research data were obtained by mathematical-statistical analysis of publicly available databases of the World Tourism and Tourism Council (WTTC), the Statistical Office of the Slovak Republic, and databases of relevant ministries. Part of the primary data was collected through a questionnaire survey and structured interviews with representatives of towns and municipalities of the Novohrad region and inhabitants of the bordering region of Slovakia with Hungary and experts using the Delphi expertise method.

Secondary research data were gathered from accessible resources such as literature, academic publications, and monographs, scientific journals of WoS a SCOPUS.

The basic group consisted of 500 respondents from the border region. The statistical set of towns and villages of the Novohradský Region consisted of 140 addressed mayors of towns and other municipality authorities. The Delphi method by fifteen experts in tourism and cross-border cooperation was applied to the two-phase verification process of research results.

Primary and secondary resource data have been categorized, analyzed, and evaluated by standard scientific methods:

- Quantitative,
- Qualitative methods,
- Logical methods:
  - abstraction and description,
  - analysis and synthesis
  - Mathematical statistics,
  - Charts and diagrams,
  - Comparative method,
  - deduction and induction.

Mathematical statistics method of result evaluation included criteria of arithmetic mean, median, modus, variability, and dispersion.

Despite careful preparation authors of the research faced certain obstacles and limitations during implementation:

- lack of willingness from municipal authorities to fill an online questionnaire
- lack of skills regarding the use of electronic devices required for the online questionnaire
- respondents misunderstanding of questions and answers given in online questionnaire respondents
- incomplete nature of statistical data from international organizations, the Statistical Office of the Slovak Republic and relevant ministries

5 RESULTS

Given the limited capacity of the article, we present only some of the results as the most relevant to both quantitative and qualitative research on the relation to the set goal.

5.1 Quantitative results

The total contribution of tourism to Slovakia's GDP, including the wider effects of investments, the supply chain, and the impact on income in 2016, was 5.0 billion euro. In 2017, the share of tourism in the country's GDP was 6.3 and in 2018 there was a further increase to 6.4%. Future-oriented, by 2027, the total contribution of tourism to GDP should reach 7.1 billion euros. (6.7% of GDP). An overview of the growth in the share of tourism in Slovakia's GDP for the years 2016 to 2018 with a view to 2027 is given in the graph in Figure 1.

Data from WTTC indicate a ranking position of Slovakia among 170 countries of the world and particular neighboring countries included in evaluation in 2018. This result points out the deficiencies of the Slovak republic compared to neighboring countries excluding Poland and Ukraine.

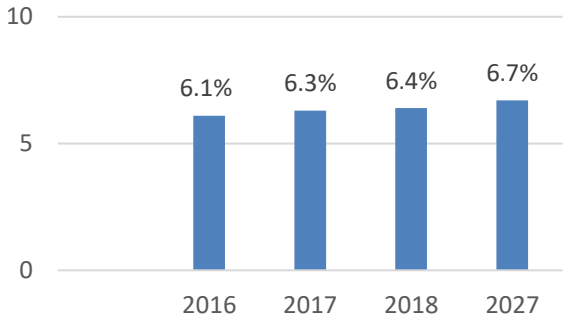

Fig. 1 share of the contribution of tourism to GDP growth in Slovakia in the period 2016 - 2018 in %
Source: Authors' research

Table1 Ranking place of Slovakia in % share of tourism on overall GDP in 2018

Ranking	Country	% share of tourism on GDP
1	Macau	72.2
103	Hungary	8.5
112	Czech Republic	7.8
124	Serbia	6.9
131	Slovakia	6.4
146	Ukraine	5.4
160	Poland	4.5

Source: (WTTC, 2019)

Among all interesting quantitative indicators of the touristic impact on the economy of the country percentage share of tourism in the total employment rate in the Slovak Republic is mentioned.

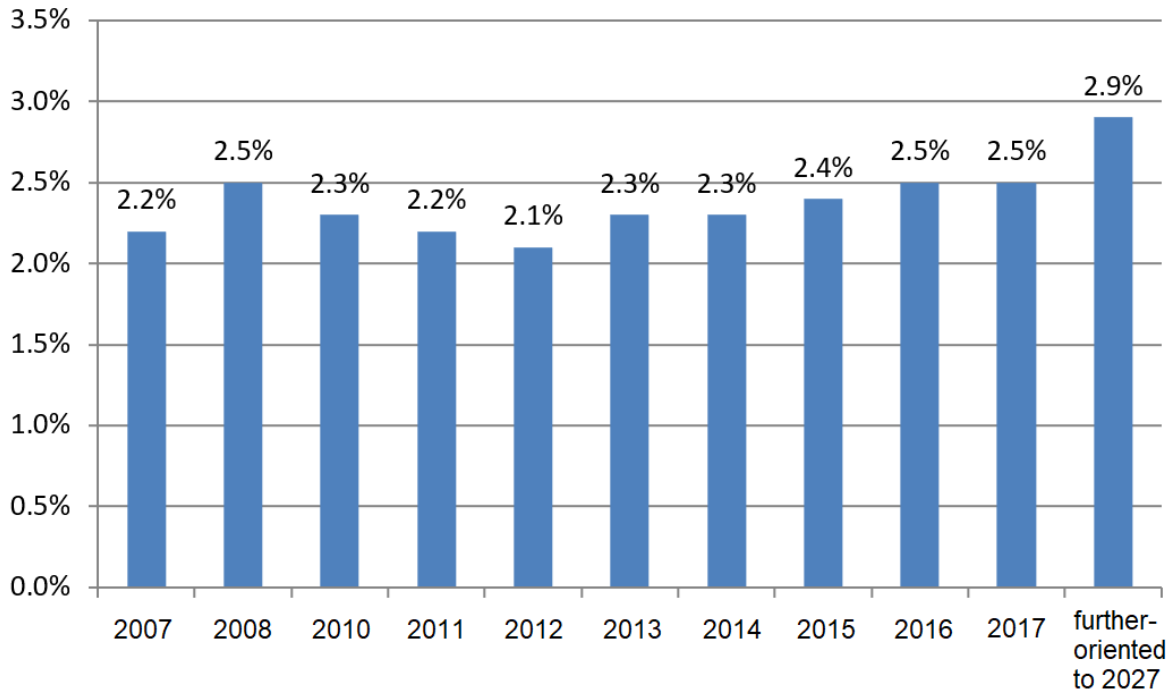

Fig. 2 Share od employment rate in the tourism sector within the overall employment rate of Slovakia in 2007-2017 with further prospects into 2027.

Source: Authors' research

An interesting result of quantitative research is the analysis of the use of allocated EU funds for the development of tourism in the border regions of Slovakia and Hungary within the cross-border cooperation program INTERREG. Table 2 shows the insufficient effort of Slovak Republic to drawn the allocated funds for the development of tourism, as evidenced by the low percentage of these funds. The causes of this situation were examined through statistical surveys and structured interviews with competent public authorities.

The funds' absorption rate of Slovakia within the INTERREG III program after accession to the EU in 2004 received an even worse evaluation. Less

than three years long preparation and implementation period resulted in a limited number of projects and their insufficient quality. None of seven submitted projects was approved as a consequence and Slovak republic did not draw any of 65.4 mil fund.

Table 2. Overview absorption of financial support from EU funds on touristic development within programs INTERREG VI. and INTERREG V. To date 31.03.2020

Criteria	INTERREG IV. SK – HU 2007 - 2013	INTERREG V. SK – HU 2014 - 2020
Allocated funds for the development of tourism	175.6 mil. EUR	65.2 mil. EUR
Number of projects on development of tourism	24	21
Support from ERDF	23.4 mil. EUR	26.1 mil. EUR
Share of fund absorption	14 %	39.9 %

Source: Own elaboration based on (HUSK, 2020) *and* (n.d., 2019)

5.2 Qualitative results

The article illustrates the most relevant results of qualitative research.

The first results are drawn from the statistical survey of public satisfaction in the border area of the Slovak Republic and Hungary regarding the question of general awareness of the cross-border cooperation program. In a sample of 395 respondents, 76% of women and 33% of men, we found out that up to 48.4% knew nothing about the program, or rather nothing. Only 40% of respondents were aware of INTERREG activities. The other 11.7% could not comment on the question.

There was a general negative reply in more than 70% of the answers to question whether the public acknowledges poor accessibility (transport system) as a problem of cross-border cooperation. Details can be found in the graph in Figure 3.

Representatives of 5 cities and 145 municipalities of Novohrad region were inquired to provide the objective state of goals accomplishment of the INTERREG Slovakia - Hungary 2014-2020 (INTERREG V-A, 2020), cross-border cooperation program, to identify economic benefits and obstacles to the preparation and implementation of projects in the selected bordering regions with Hungary. An electronic questionnaire was correctly filled in by 52 respondents. The size structure of the towns and municipalities involved in the survey is shown in the graph in Figure 4.

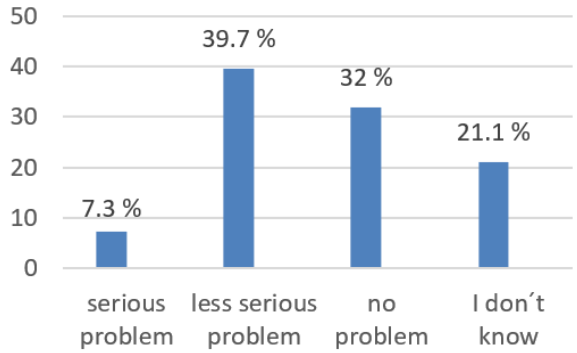

Fig. 3 Graph reflecting infrastructure obstacles of cooperation
Source: Authors' research

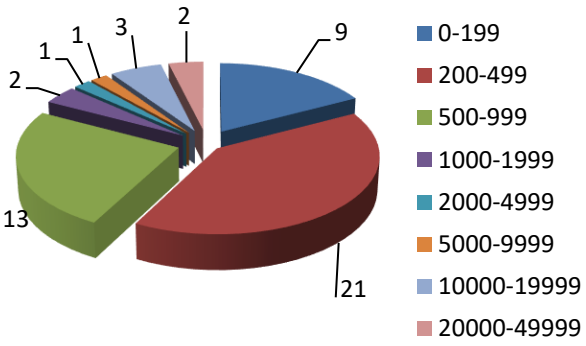

Fig. 4 Graph reflecting the size structure of towns and municipalities involved in the survey
Source: Authors' research

Question on whether and how much they had managed to improve the socio-economic situation after the implementation of cross-border cooperation projects aroused a rather pessimistic approach by respondents. More than 50% of respondents suppose that the implementation of projects has not improved the socio-economic situation in the city/municipality in neither of the programming periods evaluated. In terms of identifying obstacles towards more efficient use of cross-border cooperation programs for tourism

development and thus improvement of the socio-economic situation in the municipality, respondents reported a lack of their funding to co-finance projects (54.5%), the administrative burden of projects (47.7%), lengthy process of project evaluation and implementation (40.0%).

Quantitative research results were verified with the Delphi method. The verification process was carried out in form of an anonymous electronic questionnaire created by an expert in the sector of tourism and cross-border cooperation in two phases with the scope to achieve a consensus and unified conviction among the community of experts. The structure of experts can be found in Figure5.

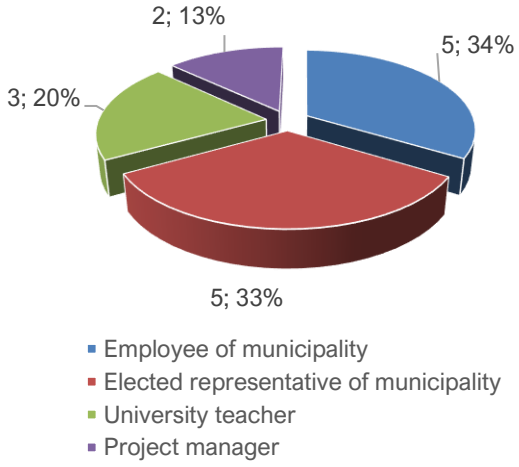

Fig. 5 Professional structure of experts

- Parameters examined in the survey demonstrate significant level agreement in the opinions of experts on thirteen questions out of the total number of nineteen analyzed answers. The arithmetic mean of these responses ranged from 1.8667 to 2.933. The median and modus ranged from 1 to 3. The dispersion of responses ranged from 0.5156 to 1.956 and the standard deviation ranged from 0.422 to 1.2649.

There was a disagreement among the experts on the six questions with increased arithmetic mean

of responses from 2.8667 to 3.333, median and mode ranging from 3 to 4, dispersion from 1.049 to 1.6889, and standard deviation from 1.0242 to 1.2996.

In compliance with standard methodology, the second round of the questionnaire was established to achieve a common agreement within the outstanding questions. The same criteria were applied to verify the credibility of responses. We were prone to use the + 10% rule to the median in case of a large dispersion or standard deviation. However, the results of the analysis of the responses reflected a significant consensus in the answers to the second round questions.

Based on the evidence stated above we might confirm and therefore verify subsequent hypotheses:

1. Cross-border Cooperation Program Hungary - Slovakia 2014-2020 is considered to be the most beneficial cross-border cooperation program between the Slovak Republic and Hungary for the development of tourism based on analysis data obtained from particular programs described in Table 2. So far, the program has supported 21 projects with a total amount of 26.1 mils. EUR.

Thus, given the reflected conclusion main hypothesis has been confirmed

2. The objectives of priorities of the cross-border cooperation programs met the expectation of the prior draft:
   - Economic and social cohesiveness in border regions was achieved,
   - Bordering regions have recorded a higher level of attention,
   - Improvement of tourist management,
   - Significant improvement of travel destination offer and eco-friendly touristic products
   - The higher employment rate in the region
3. Objectives failed to succeed:
   - To encourage the interest of eligible entities for small projects from the Small Projects Fund of the program
   - 10 out of 15 experts report the failed attempt for a common promotion strategy of the border region between Slovakia and Hungary
   - To encourage interest in cross-border cooperation projects among regional tourism organizations of particular districts (no project during both programming periods in question), even though partnership might have been beneficial in the preparation and implementation of projects,

- according to experts the administrative burden of project preparation and implementation is an obstacle that diminishes the interest in cross-border cooperation projects to support the development of tourism. Up to 80% of experts have confirmed information

4. Obstacles emerged as a consequence of cross-bored cooperation programs reflected by experts:
   - Cost of co-funding projects solely from the budget of the municipality,
   - Complicated and lengthy system of reimbursement of eligible expenditure for the implementation of projects,
   - The lengthy and administratively challenging process to verify the eligibility of expenditure.
   - Lacking supervision interest of managing authorities of cross-border cooperation programs for methodological guidance and coordination of project preparation and implementation
   - Methodological support of self-governing districts and regions reported a slightly better result of the evaluation

6 PROPOSALS

Suggestions for further activities developed under results from quantitative and qualitative research, including Delphi method:

1. Consider the already existing system of reimbursement of eligible expenditure with the possibility of converting it to an advance payment alternative following an example of projects from operational programs.
2. Revision of the administrative burden of project forms and proposal for simpler administrative forms.
3. To maintain to offer courses, seminars, and workshops for those interested in cross-border cooperation projects.
4. To provide applicants with a possibility to justify, or rather correct errors when verifying the eligibility of expenditure. The supreme audit office should not issue a decision not to award expenditure without prior written notification and justification of the applicant.
5. Consolidation of time horizons for verifying the accuracy of expenditures on both sides of Slovakia and Hungary.

7 CONCLUSIONS

The course of the research, but especially its results, clearly confirmed the importance and accuracy of the issue. The question of the benefits of cross-border cooperation programs for the development of tourism not only in Slovakia is crucial for the sustainable development of the socio-economic development of border regions. It holds significance for the sector of science and research, for competent state administration bodies and local government authorities, for interest groups of tourism, for business entities in tourism and their employees and last but not least for the population of the region confirming their interest by active participation in the statistical survey.

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COMPARATIVE ANALYSIS OF THE RESILIENCE AND VULNERABILITY OF THE RAILWAY INFRASTRUCTURE

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JEL Category: **R41, R42**

Abstract

At present, society is increasingly dependent on certain technologies, services, systems. The failure of such elements would have an impact on the functioning of the state and the very lives of the population. Such elements may be marked as critical if they meet the criteria set. The elements are assessed based on the sectoral and cross-cutting criteria of the country. The current threat is terrorism, which may jeopardize the functioning of critical infrastructure elements. It is, therefore, necessary to pay attention to their security. Security is closely related to concepts such as resilience and vulnerability. In some studies, these two terms are considered identical. The authors of this article consider these two terms as related. The article aims to analyze the approaches to these two concepts and to conclude what the two concepts are related to each other.

Keywords: *resilience, vulnerability, risks, assessment, railway infrastructure*

1 INTRODUCTION

State transport infrastructure is one of the important conditions for the development of society. Investors and citizens are very sensitive about the availability and quality of transport infrastructure if they are to move to a new space. (Dvorak, Sventkova, Rehak, & Cekerevac, 2017) To secure the functions of the state, part of the transport infrastructure in the Slovak Republic is included in the network of selected roads from the perspective of the state defense. (Dvorak, Leitner, & Rehak 2019) Another part of the transport network is part of the Trans-European Transport Network. Another part of the transport network is part of the critical infrastructure sectors. In general, critical infrastructure is essential to ensure the basic operation of selected areas of the state. (Rehak, Hromada, & Novotny 2016) As part of the critical infrastructure protection research, researchers are looking at resilience and vulnerability. The critical infrastructure boards include those objects that meet at least one cross-sectional and sectoral criterion. (Act 45) These criteria are determined by the State in which the element is located. However, these criteria are largely based on superordinate legislation, such as European directives. (Hoterova, Dvorak, & Blaho 2019; Dvorak, Luskova, Cekerevac 2014) To ensure the functionality of these elements it is necessary to ensure their safety. The resilience or vulnerability assessment shall help the operators of critical infrastructure elements to take action to enhance the element's security. (Hoterova, 2019, Sousek, 2013) The article aims to analyze the

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different approaches to the concepts of resilience and vulnerability. There are discussions as to whether these two terms can be considered identical.

2 ANALYSIS OF APPROACHES TO THE CONCEPTS OF RESILIENCE AND VULNERABILITY

One of the many topics discussed is resilience to vulnerability. Discussions about whether the two concepts are so similar that they can be considered as identical. There are as many authors of the definitions as there are different opinions. These two terms are used in various fields of investigation. This chapter of the article is devoted to the analysis of the approaches of individual authors to both terms. The key point is that the authors use these terms in the technical field, in the assessment of the railway infrastructure.

2.1 The resilience

The term resilience is generally understood as the ability of a system to prepare, resist, and adapt to adverse effects. The measurement and analysis of resilience itself is a multifunctional activity. It depends on the uniqueness of the system under assessment. Hollnagel presents four basic points of resilience analysis:

- know what to do,
- know what to look for,
- know what to expect,
- know what happened. (Hollnagel 2011)

The first point, knowing what to do, is the ability to know the real disturbances and be able to respond to them or adapt to existing conditions. The second point, knowing what to look for, is the ability to identify critical factors of the internal and external environment through monitoring that can detect existing threats. The third point, knowing what to expect, means being able to address potential future threats, anticipating opportunities for change, identifying sources of potential threats. The last point, knowing what happened is a critical point in assessing resilience, is the ability to take lessons in the light of successes or failures. (Hollnagel 2011)

Based on the results of the Nordress - Nordic Center of Excellence on Resilience and Societal Security, it can be argued that resilience and security are made up of four pillars - society, institutions, individuals, and the infrastructure itself, see Figure 1. Each of these pillars should be in good condition and cooperate smoothly with the other elements to maintain durability and security.

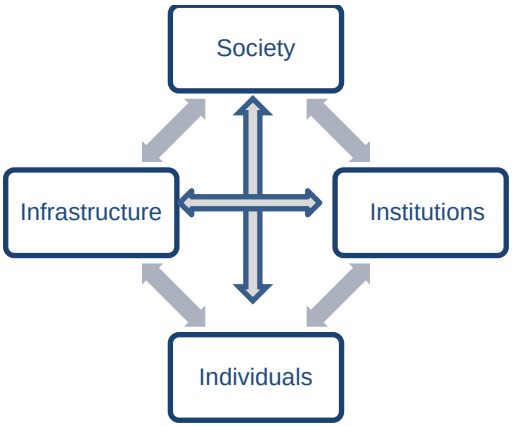

Figure 1 Relationships between the four pillars of resilience

Another approach to resilience analysis proposed by Linkov et al. (2013), The principle of the analysis is to quantify the resilience assessment, which is based on similar system capabilities that can be summarized in the following four steps:

- plan / prepare,
- absorb,
- recover,
- adapt.

To apply this approach, managers need to plan and prepare the system to deal with an adverse event while maintaining the system's most important functions. The system thus prepared can better absorb the adverse effects, to recover from the effects of the adverse event, and to adapt more flexibly to the new conditions. Linkov then analyzed these four steps in four areas of the subconscious to create a matrix of resilience evaluation. The four areas are:

- physical area,
- information area,
- cognitive region,
- organizational / social area (Linkov, 2013).

Resilience can also be perceived from the perspective of how to deal with the negative impact of an undesirable phenomenon. These can be:

- *hard resilience* - when the direct force of structures or institutions under pressure is

acting, such as increasing resilience through specific reinforcement measures to reduce the likelihood of system collapse,

– *soft resilience* - the ability of the system to absorb and recover from the adverse effect of an adverse event, i.e. without significant changes in the functions or organization of the structure, which depend on the flexibility and adaptive capacity of the system. (Moench, 2009)

In the approach published by Rehak, resilience is understood as the internal readiness of critical infrastructure subsystems against negative threats, or the ability to ensure and maintain their basic functions in the event of a negative event of external or internal nature.

The research of the assessment of the resilience of the subsystem in critical infrastructure was devoted to the security research project of the Czech Republic called RESILIENCE2015, within which the CIERA certified methodology was developed. (Rehak et al, 2018).

Understanding and unambiguous definitions are key in assessing and strengthening resilience. Resilience is a cyclical process that involves continuous improvement in the prevention, absorption, recovery, and adaptability of the system, see.

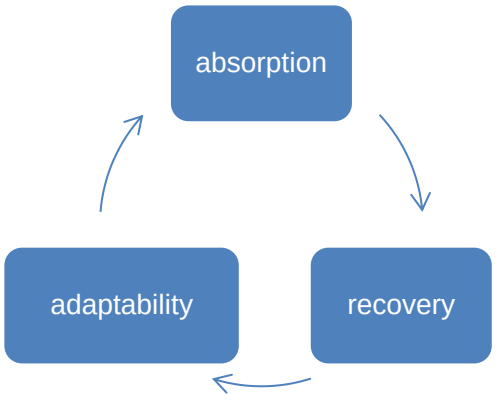

Figure 2 Cyclic resilience process
Source: (CIERA, 2018)

Another important contribution of the RESILIENCE project in the field of critical infrastructure resilience research is the creation and testing of a critical infrastructure resilience assessment algorithm. Its graphical representation is shown in Figure 3.

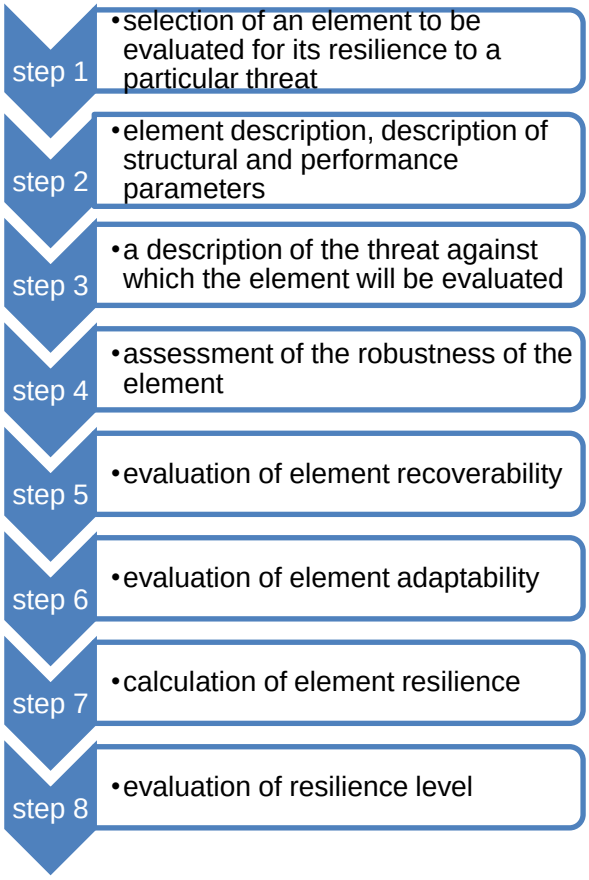

Figure 3 Resilience Rating Algorithm
Source: (CIERA, 2018)

2.2 The vulnerability

Vulnerability generally refers to the extent to which a system or part of a system can react adversely to an adverse event. Furthermore, the vulnerability can be understood as:

– the ability of the system and its components (elements) to accept gambling in the form of losses and damage, (Ondrasik, 2018)
– lack, weakness, or condition of the system that the threat can use to assert an undesirable condition, (Cordona, 2011)
– susceptibility to damage, (Cordona, 2011)
– the degree of the environment's ability to withstand events of a certain nature, considering the level of threat, exposure, preparedness, and preventive measures. (Gallina et al, 2016)

Based on the risk exposure differentiation, vulnerability can be divided into two aspects:

– intrinsic vulnerability - elements that can withstand, manage, and deal with risk,

– external vulnerability - these are elements that will be exposed to and affected by the risk. (Bohle, 2001)

The vulnerability may be understood as the property of any object, technical device, or social entity to lose the ability to perform its natural or specified function due to internal/external threats, which may be different and intensity. Vulnerability represents those parts of the assessed object that do not provide the required level of protection, that is, a weak or easily overcome element in the protection system, or create suitable conditions for attacking the object, increase the probability of attack and consequently the stretch. Vulnerability studies shall include vulnerability analyzes which may include:

– identification of potential vulnerability of CI objects to identified threats,
– identification of existing protective measures, and their effectiveness in reducing or eliminating the negative impact of identified threats,
– assessment of the vulnerability of the analyzed sectors. (Hofreiter 2014)

Based on their research, the authors concluded that the vulnerability of infrastructure objects depends on exposure, sensitivity, and ability to manage the possible negative consequences of impacts. In terms of exposure, we examine the duration of exposure. In terms of sensitivity, we examine how much the object is susceptible to damage caused by the threat. As part of our ability to deal with possible impacts, we look at how much we can withstand the current threat. (Hofreiter, 2004)

3 COMPARISON OF RESILIENCE AND VULNERABILITY

Both concepts deal with the response of systems to adverse events. Resilience understands adverse events as the ability to learn about change and develop the ability to adapt to such changes, while vulnerability seeks to block such changes. (Miller, 2010)

In another aspect of resilience, the opposite term to the term vulnerability is not considered. He considers the term resilience to be one part of the three vulnerability indicators. Other indicators are risk exposure and sensitivity. It follows logically that, although the resilience may be high, if both exposure and sensitivity are high, the system is considered to be vulnerable. (Miller, 2010)

The indicators for assessing the vulnerability of an object, its zones, and premises are:

– the degree of vulnerability, assessed by qualitative methods (expert assessments) as a small, medium, and large, and the like.
– the probability of a successful attack, which can be expressed using probability models on a scale or as a subjective probability.

Opposite indicators to the previous are:

– the degree of resilience of the object protection system (zone, building, space), where the expression of the degree of resilience will be inverse to the degree of vulnerability, i.e. if the level of a vulnerability is small, the degree of resilience will be large;
– likelihood of detention intercepted before reaching access to a protected object or the protected areas and areas of the object. (Hofreiter 2014)

Some authors present the view that while increasing the system's resilience while reducing the vulnerability of the system. That assertion also applies the other way round.

It is especially important to know the value of the protected object. If it is an object of incalculable value (cultural heritage) then the interest of the potential perpetrator will be great. It always depends on the location where the object is located, increasing the vulnerability is supported by quality physical, electronic, and sheath protection. (Kmet, & Dvorak, 2020)

Practical Union seeks to find solutions to global problems related to climate deterioration and persistent poverty. It uses the V2R framework to find solutions. This framework addresses the examination from vulnerability to resilience. It is a framework for analysis and action to reduce vulnerability and strengthen the resilience of individuals, households, and communities. The framework sets out the key factors that contribute to peoples' vulnerability: exposure to hazards and stresses; fragile livelihoods; future uncertainty; and weak governance. It provides detailed explanations of the linkages between these factors, as well as ideas for action to strengthen resilience.

The V2R framework has been written with the needs and interests of the Practical Action program staff in mind. However, the issues and principles in the document are also relevant to a much wider audience including practitioners, researchers, and policymakers working in livelihoods, disaster management, and climate change adaptation. It is intended to guide the reader, rather than dictate a set way of doing things. The material can also be adapted to suit communication with other audiences such as community-based organizations. (Pasteur, 2011)

The intersection of common and different properties of resistance and vulnerability assessments is shown in Figure 4.

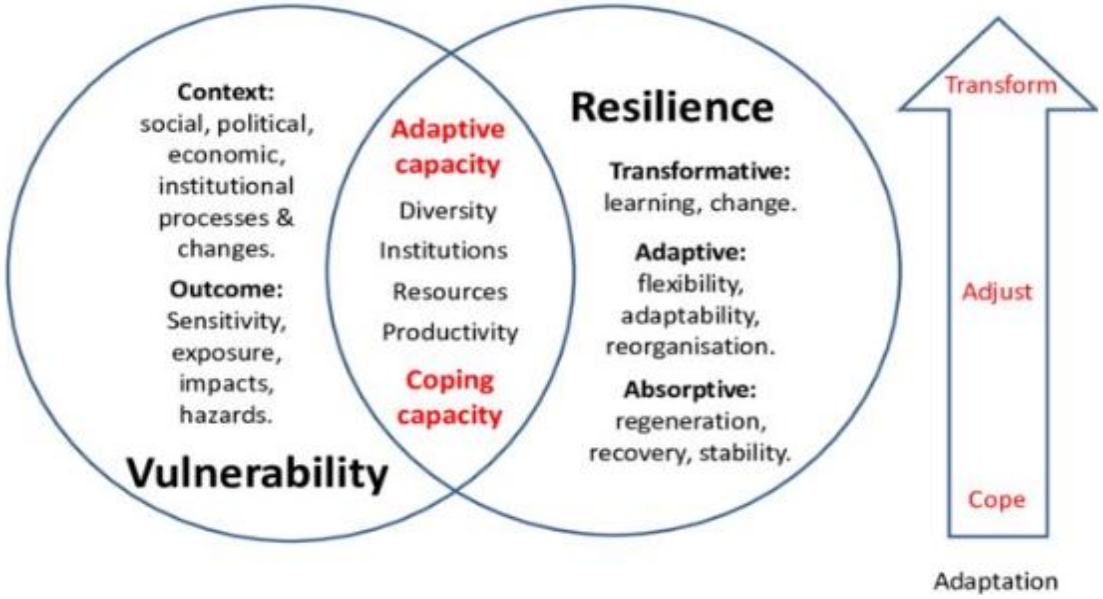

Figure 4 Penetration of resilience and vulnerability

Source: (Dixon, 2014)

4 CONCLUSIONS

Research on systems resilience and vulnerability is one of the important challenges in all areas of social development. Critical infrastructure protection is one of the top security issues in developed countries. Researchers at the University of Žilina have been involved in research on railway infrastructure for a long time. Current research focuses on the impact of the failure of critical infrastructure systems on the social vulnerability of the region and society.

We consider the development and testing of indicators addressing the full breadth of security as key in our research, such as:

- resilience indicators,
- adaptability indicators,
- robustness indicators,
- recovery indicators,
- vulnerability indicators,
- crime indicators,
- accident indicators,
- physical security indicators,
- fire safety indicators,
- environmental safety indicators,
- process/operational safety indicators,
- occupational health and safety indicators,
- information security indicators.

The article aimed to present the actual results of the research carried out at the Faculty of Security Engineering in Žilina. The final summary is that security needs to be examined at all levels, from personal, through corporate, local, regional, national, international to global. It is crucial to know that security research is always a multidisciplinary topic that needs to be addressed in terms of both natural, technical, social, medical, humanities, and environmental sciences.

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PROSPECTS OF MARITIME TRANSPORT IN THE ESTABLISHMENT OF "GREEN" LOGISTICS CHAINS

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Abstract

Maritime transportation is dominantly focused on freight since there is no other effective alternative to the long-distance transportation of large amounts of freight. The EC encourages improvements in the sustainability of maritime transport by reducing emissions from ships, and a European maritime transport policy to be developed in the common maritime area. Based upon statistical analysis, the role of waterborne transport, and maritime in particular in the national economy is indicated, in connection with describing the attempts to introduce green logistics in Bulgaria. Special attention has been paid to the opportunities to develop sea ferryboat transport. Also, to support the rile of combined transport for a green logistics, a Cargo Ferry concept has been mentioned, developed is aiming at the removal of the barriers for transferring freight from the road to the sea, particularly on short than 500 kilometers distances, offering a cost-effective and more environmentally friendly alternative.

Keywords: *waterborne transport, logistics, traffic, technological change, policy, European Union*

1 INTRODUCTION

Europe is surrounded by many islands and four seas: the Mediterranean, the Baltic, the North, and the Black Sea, as well as two oceans: the Atlantic and the Arctic Ocean. This continent is a peninsula with thousands of kilometers of coastline - longer than any other landmass, such as the United States of America or the Russian Federation. This geographical reality means that more than two-thirds of the EU's borders are coastline and the waters under the jurisdiction of its Member States are larger than their terrestrial territory. Through its outermost regions, in addition to the Arctic Ocean, Europe is also present in the Indian Ocean and the Caribbean. Their maritime issues are many and affect the EU as a whole. The EU now can apply sustainable development to the oceans. To do this, the European Union can draw on the forces with which it has already paid off its maritime leadership: knowledge of the oceans, expanded experience, and the ability to take on new challenges and combine these qualities with a strong obligation to protect the resource base.

So far, our policies on maritime transport, maritime ecology, and other important areas have been

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inadequately addressed about green logistics. The purpose of the paper is to draw attention to some aspects of maritime transport and its possibilities for improvement, bearing in mind its importance for the economy of the Republic of Bulgaria.

2 EUROPEAN TRANSPORT POLICY AND MARITIME TRANSPORT

Maritime transportation is dominantly focused on freight since there are no other effective alternatives to the long-distance transportation of large amounts of freight.

Based on the White Paper, European policy objectives for waterborne transport mode are the following:

- Maritime: protection of high EU safety standards, rules, and regulations to reduce accidents and reduce climate and environmental impacts; improve working conditions; digitalization in the maritime services; provide safe and secure conditions of maritime services
- Inland waterways (IWW): strengthen the role of IWW, improvement of IWW markets in Europe for reduction of climate and environmental impact, high qualified staff and quality jobs, and integration of IWW in multimodal transport chains and logistics operation.

The EU maritime strategy, originally defined in 2009, was assessed in a 2016 Commission Staff Working Document (EC, 30.9.2016), covering the period 2009-2015 and providing an outlook for required future activities with main relevant areas such as:

- Maritime Safety and Security.
- Digitalization and Administrative Simplification.
- Environmental Sustainability and Decarbonisation.
- Raising the Profile and Qualifications of Seafarers and Maritime Professions.
- EU Shipping as a stronger global player.

In recent years, numerous measures were adopted in protecting the marine environment (EC, 21.1.2019). In its resolution of 5th May 2010 on strategic goals and recommendations for the EU's maritime transport policy until 2018, Parliament supported the Commission's approach and also required further action against abuses of flags of convenience, new rules on state aid and guidelines for ports, greater consideration of maritime routes within the TEN-Ts (particularly through the motorways of the sea), improvements in the sustainability of maritime transport by reducing emissions from ships, and a European maritime transport policy to be developed in the common maritime area (EC, 30.9.2016).

On 15th December 2011, in the adopted Resolution "Roadmap to a Single European Transport Area" in response to the 2011 Commission White Paper, regarding maritime transport the requirements of Parliament are:

- A proposal on the "Blue Belt" (COM (2013)0510 of 8th July 2013).
- The introduction of a European policy for short and medium sea shipping.
- The allocation of at least 15% of TEN-T funding to projects that improve sustainable and multimodal connections between seaports, inland ports, and multimodal platforms.
- In 2016 a call "Port of the Future" was made as part of the Horizon 2020 program.

The systematic growth of maritime freight traffic has been fueled by:

Competitive advantages as a mode of transport applicable separately and as a part of combined transportation chains. Maritime transport is linked to the growth of energy products' trade carried over long distances. The international trade liberalization, production specialization and industrial globalization brought forward the need for final products' transportation, which is supported mainly by combined modes of transport, based upon containers. On the other hand, containers are closely related to maritime transport, again over long distances, subject to different origins and destinations.

*Technical improvements***.** Besides ships and maritime terminals, with their ability to handle different types of cargoes, more and more companies are developing digital platform strategies responding to the needs of ship crews, enabling the analysis and ongoing control of ship systems, the technological and economic parameters of ship voyages, the maintenance of crew wellbeing and the provision of IT to the ship.

The integration of these platforms with the shipowners' or operators' internal IT systems allows for real-time scheduling of cargo operations, crew schedules, ship supply, routine preventive repairs, and the proper operation of ship's facilities. Unfortunately, many shipowners and shipping operators still think that digital transformation is just a matter of new technological solutions, confusing the terms "digitalization" with "business transformation" and not realizing that they lack a digital vision for the future.

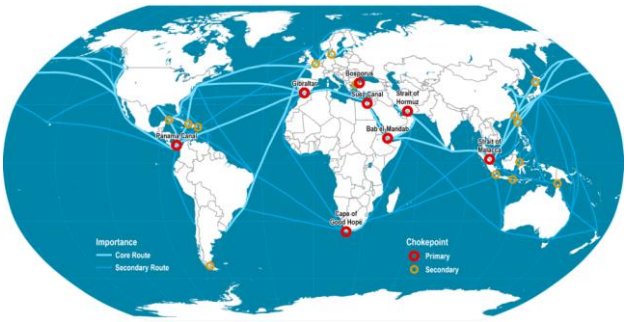

Figure 1. Main Maritime Shipping Routes
Source: (Rodrigue & Notteboom, 2017)

Economies of scale. The flexibility of ship size, as well as ship specialization, allows maritime transportation to be cost-efficient

There are three major problems with the digitalization of the shipping industry - the high value of satellite internet, its lack of speed, and the lack of a single communication standard. Excellent internet connectivity is a vital issue not only for the efficiency and optimization of ocean routes but also for the ship's smart systems. This is especially true of new experiments with "intelligent" semi-autonomous or autonomous ships conducted in the Far East and Europe. The administrative barriers to digitalization are outdated regulations, social pressure to keep crews, computer security issues, and the threat of terrorism that further delay the introduction of technological change. However, these obstacles cannot discourage the many digital startups and platforms that appear on the horizon almost daily, backed by private investors, classification societies, public and private foundations, global technology leaders, and advanced maritime nations.

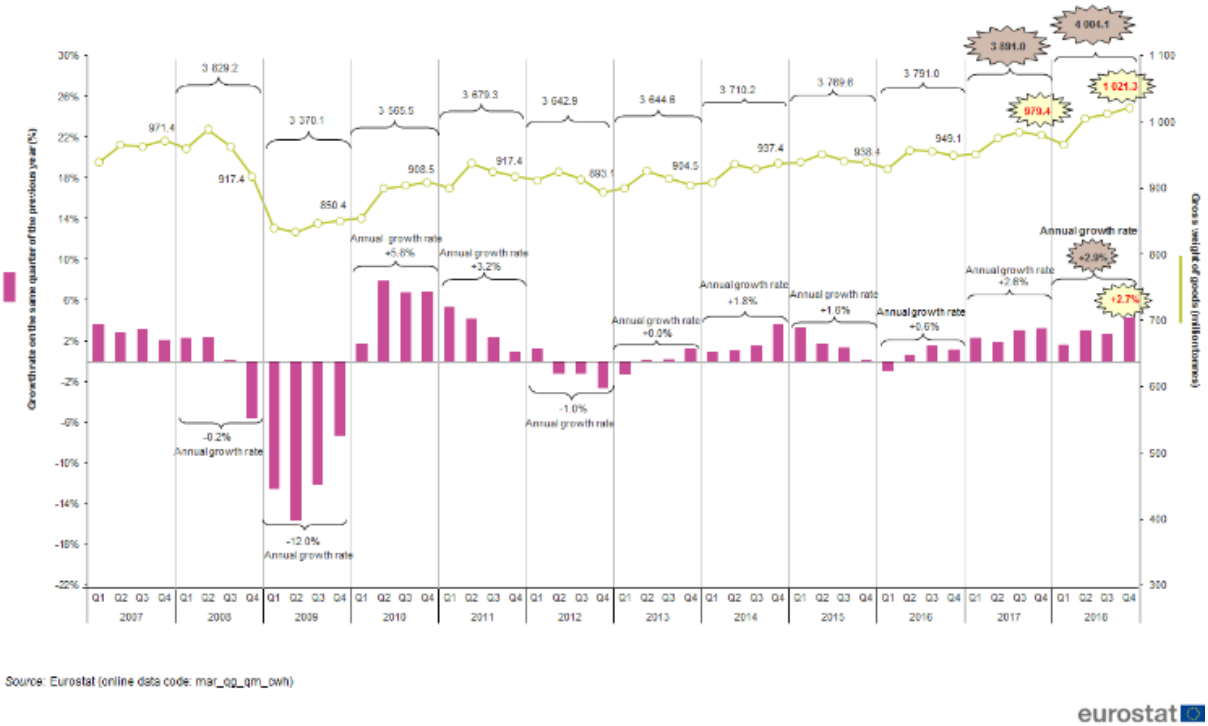

Figure 2. The gross weight of seaborne in main ports of EU-28 (Eurostat, 2020)

3 MARITIME TRANSPORT AND GREEN LOGISTICS

Green Logistics describes all attempts to minimize the negative ecological impact of transportation and other activities connected to the internal and international flow of goods aiming to create a sustainable balance between economic and environmental issues. Green logistics has its origin in the mid-1980s and was a

concept to characterize logistics systems and approaches that use advanced technology and equipment to minimize environmental damage during operations (Thiell, Zuluaga, Montanez, & van Hoof, 2011). The approach towards green logistics requires transferring towards ecologically friendly modes of transport, among which waterborne transport as a major transport solution or in combined versions.

Green logistics has different components, but among them, the most important is green transport. The most important solutions in this area are the following:

- **Route Optimization** – cutting down travel costs, time, or distance, since the best chosen brings the possibility to save fuel and, consequently, to reduce the amount of CO2 emissions.
- **Choosing the eco-friendliest transportation method available** – it is important to choose more ecological options, like rail or maritime transportation.

Green logistics is a principle that modern logistics companies adhere to. Globally, carbon dioxide emissions need to be reduced. Green practices in modern logistics will contribute significantly to this reduction. This is especially important as the share of logistics services is constantly increasing. Green logistics is increasingly being implemented through so-called intermodal transport. It combines modes of transport to achieve more optimal routes and thus saves fuel and, consequently, reduce carbon emissions. Intermodal logistics solutions can be achieved by shuttle trains to ports where cargo containers are loaded in wagons for transportation to the destination

The state of waterborne transport in Bulgaria is estimated based upon statistical data of the National Association of Bulgarian forwarders (NSBS, 2019) as shown in Table 1.

Table 1 Maritime transport activity

	Processed tonnage (tons)			Processed containers TEU		
	Import	Export	Transit	Import	Export	Transit
2015	1 051 361	4 454 208	1 105	53 581	49 344	3 567
2016	820 581	4 932 269	32 380	42 558	36 154	5 824
2017	1 729 480	4 961 974	90 095	50 856	36 012	7 544
2018	2 037 324	3 388 723	103 421	66 375	52 019	6 497

Source: (NSBS, 2019)

The analysis of the data indicated in Table 1 suggests a tendency towards increasing the number of goods processed included in the seaborne traffic of Bulgaria.

Table 2 Distribution of freight between different modes of transport in Bulgaria

Years	Road	Rail	Sea	Air	Total goods (t)
2015 Imports	1 942 125	115 024,5	1 051 361	6 808.7	3 115 319
2015 Exports	1 141 344	1 203 793	4 454 208	4 619.0	6 803 964
2016 Imports	1 111 670	1 015 985	820 580,7	6 459.4	954 695
2016 Exports	938 861	986 659	4 932 269	6 391.3	6 864 180
2017 Imports	1 049 994	899 078	1 729 480	6 809.8	3 685 362
2017 Exports	1 342 953	1 080 037	4 961 974	6 748.4	7 391 712
2018 Imports	1 601 311	840 569	2 037 324	5 618.4	4 484 822
2018 Exports	1 193 788	1 096 098	3 388 723	6 658.6	5 685 268

The analysis of the data indicated in Table 2 suggests a tendency towards increasing the amount of goods processed included in the seaborne traffic of Bulgaria, compared with other

modes of transport. Still, there are inequalities observed in the total volume of freight in the period observed.

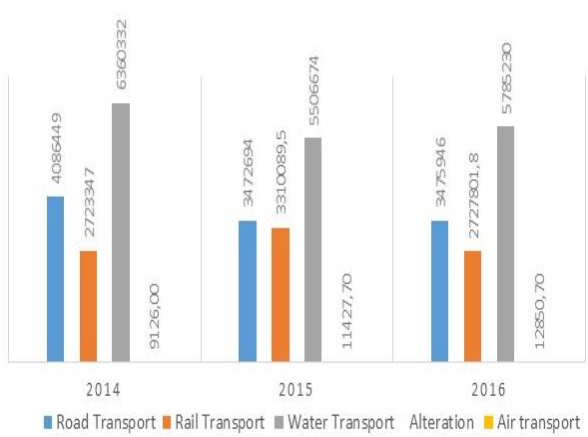

Figure 3. Distribution of freight by transport modes in Bulgaria

In connection with the increased use of maritime transport in the international logistic chains a Cargo Ferry concept has been developed to provide transport users with a better range of transport and logistics services through the development of new vessel concepts, new methods of loading and discharging, new traffic patterns and new IT solutions. The concept is aiming at the removal of the barriers for transferring freight from the road to the sea, particularly on short than 500 km distances, offering a cost-effective and more environmentally friendly alternative (Norbeck, 2016).

Bulgaria has developed traditions in ferryboat transport mainly for freight purposes. The Varna Ferry Complex is a part of the Varna Port Complex, operated by two national carries - Shipping Company "Bulgarian Navy" and Bulgarian State Railways – Cargo, Ltd. It is the only transport facility in the European Union that allows the carriage of Russian wagons without overload, by changing the track from a standard European (1435 mm) to a Russian (1520 mm) track. With this unique advantage, the terminal provides some of the shortest and cheapest routes between Europe and Asia thanks to regular flights to Ilychevsk (Ukraine), Poti/Batumi (Georgia), and the Caucasus (Russia).

The transportation between Varna and Caucasus is already 80% of all traffic through the Ferry Complex. This line has been operating since 2009, shortening the distance between Bulgaria and Russia by 800 kilometers, reducing delivery times by 40%.

Figure 4. Direction on the sea routes between Black Seaports

Door-to-door service is available for all types of freight (railway wagons, trucks, and vans, containers, deck cargo, and passengers) to and from Belarus, Kazakhstan, Uzbekistan, Georgia, Armenia, Azerbaijan, Afghanistan, Turkey, Greece, Macedonia and Serbia by rail, sea, and land; from Europe to the Caucasus region and Central Asia, since the direction Varna - Ilychevsk - Poty/Batumi is a part of the international transport corridor TRASECA (Europe-Caucasus-Asia). Still, notwithstanding the integration of the ferry line Varna – port Caucasus within the logistic chains between Europe and Asia, Bulgaria is far behind the EC in the development of multi-modal transport, and in particular, Varna Ferry Complex operates well below its operational capacity.

The statistics of the Ferry Complex in the port of Varna West shows that the main cargo is Propan-butane (more popularly called autogas), about 1755 railway tankers with 59 898 tonnes of oil delivered from the Russian port of the Caucasus with the two ferry vessels annually. Propane-butane is supplied by Gaztrade, the largest importer of this fuel in our country. In addition to the importer, the company is also a railway carrier and loads the OMV chain, Fuel, and other dealers. Propane-butane accounts for over 92% of goods imported from Russia. Besides, from the Caucasus port arrive also petroleum products, mainly base oils (about 47 railway tanks with 2546 tons of petroleum products annually). Third in import is cereals, mainly ripe beans. Few machines and equipment are imported along the ferry line - 4 wagons (53t), as well as 15 other goods wagons - a total of 867 tonnes. The Varna-Caucasus ferry line is one of the main prerequisites for maintaining and even increasing

the turnover and revenues of the Port of Varna in recent years. Almost immediately after the opening of the line in March 2009, it proved to be the most direct, fast, and inexpensive route for trade between Bulgaria and Russia, but there is a significant foreign trade deficit in the trade between Russia and Bulgaria.

The export items to the Caucasus are mainly construction materials - 28 cars (1832 tons), food products - 15 cars (561 tons), machinery and equipment - 11 cars (559 tons), cosmetics - 10 cars (395 tons) and other goods, such as polymers, magnesite, wood boards, base oils, etc. Part of the export to Russia is due to cargo volumes delivered from Turkey since a direct ferry connection with Russia for freight carried by wagons is missing.

On the other hand, the Varna-Caucasus line is not integrated into a single, continuous door-to-door chain, especially for shipments in the range between 20 tonnes and a block train (800 tonnes), so the service is currently limited in use only the Varna-Caucasus-Asia section and only for traditional rail customers. The services of the Varna-Caucasus ferry could be sold to third parties, especially in the South-North direction, specifically Greece - Russia, and Turkey - Russia. Also, the unexplored market is the freight for the Scandinavian countries through the Varna Caucasus-Saint Petersburg line, especially for Finland. There are prerequisites for this because of the high infrastructure costs in Romania and, in principle, the high prices for road transport only from Bulgaria but also from Greece and Turkey, especially for agricultural machines' transportation (Norbeck, 2016).

4 CONCLUSION

Among the measures, recommended by the Integrated Transport Strategy of Bulgaria until 2030 (Eurostat, 2020) is the development of transport schemes and technologies to respond to the contemporary environmental and climate requirements.

To fully realize the potential of the above principles and opportunities, as far as the ferry boat line is concerned, the following possible steps need to be taken:

- Implementation of a unified tariff policy by Russian Railways and Bulgarian operators.
- Creating an integrated product to the final recipient, based on strategic partnerships between customers, shippers, and carriers.
- Attracting private wagons along the Greece/ Bulgaria-Russia line of the Varna-Caucasus Ferry, using reverse load options.
- Application of technology for specialized transportation (e.g. of refrigerated containers);
- Integrate the Varna-Caucasus ferry into a future container rail line between Western China and Southern Europe. This will reduce the transit time by one week and enter the segment of high-interest parcels and will have competitive advantages over seafarers and Northern European ports.

Bearing in mind the role of combined transport of containers within and outside Europe, the potential of the ferryboat line between the ports of Varna and Caucasus has got potential for future development, bringing forward economic advantages to all the participating partners.

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THE ISSUES OF TERMINOLOGY STANDARDIZATION IN THE FIELD OF MARKETING

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Abstract

The purpose of this paper is to provide insights into the issues of marketing terminology standardization from the translation perspective by contrasting the English and Serbian languages of marketing. Nowadays in the era of globalization processes and all respective communication phenomena, the treatment of the field of marketing is of utmost importance. This particularly refers to the need for prescribing principles, norms, and standards when dealing with translation. The field of marketing has been extremely topical and challenging for a long time. It is the field with the greatest number of internationally recognizable anglicisms among its terms. The Serbian language is no exception with all its specific modes of using anglicisms. The paper encompasses adequate term usage with a special emphasis on the frequent use of anglicisms, their adaptation, and the standardization of terminology. The process of standardization requires the elaboration of definite phases and sequence of steps. The first and probably most essential phase refers to establishing a normative body certified by adequate professional and expert institutions at the national level. The next phase would include determining and defining the terminological principles taking into consideration appropriate contrastive elements at all linguistic levels. A significant precondition that would facilitate efficient standardization is the existence of reliable reference books such as specialized dictionaries, glossaries, manuals, and similar material. The permanent cooperation between language and marketing experts is necessary to ensure a successful outcome of this endeavor. The authors point out the necessity of adopting norms and standardization principles when translating from English into Serbian with special reference to marketing terminology and expressions such as marketing slogans and other specific tools of marketing.

Keywords: *marketing terminology, Anglicism, terminology standardization, language norms, a specialized dictionary*

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1 ENGLISH – THE LANGUAGE OF MARKETING

The English language is the language of marketing due to the following facts: the greatest amount of literature in the field of marketing is written in English; the majority of authors and marketing experts come from Anglo societies such as the USA, the UK, Canada, Australia; English is used for almost all marketing activities worldwide, particularly those pertaining to advertising and promotion regardless of the native language of the particular country; and consequently there is a much greater number of Anglicisms compared to other fields of business economics. The Serbian language is no exception in this respect. Therefore, studying marketing terminology and respective standardization issues primarily assumes dealing with a complex corpus of Anglicisms issues.

The language of marketing and advertising is simple, striking, memorable, effective, amusing and as such suitable to serve this purpose.

The global language of advertising and marketing is English. Advertisers throughout the world use English words, sentences, and even entire texts as an efficient strategy to sell brands and products to consumers. English serves as a "lingua franca" that is understood by people in different countries. The process of globalization and the development of the global market have been accompanied by the development of international marketing and all related activities. These processes preceded Information Technology expansion which brought about a definite domination of the English language as a global or international language.

English is associated with today's dominant cultural values of western civilization; they reflect Anglo-American models of internationalism, modernity, prestige, youth, globalization, cosmopolitism, and other positive stereotypes.

Since English has become the international or global language, it has turned into a "neutral" and "transparent" language, tied to no particular social, political, economic, or religious system, belonging to everyone or no one.

It is necessary to emphasize that the English language is used not only for advertising and marketing of American and British brands but also for promoting all other famous French, German, Scandinavian, Japanese, and other brands.

It is almost impossible to imagine a famous brand coming from any country that is not advertised in English.

Leo Burnett, one of the most famous advertising experts and slogan producers, gives guidelines for the language of advertising: "Make it simple. Make it memorable. Make it inviting to look at. Make it fun to read." (Burnett, 2018)

To serve this purpose, the language of advertising uses plain, clear, concise language elements, simple and catchy vocabulary, short, and effective language structures. The field of advertising and marketing recognized the need for the use of "plain English" long ago. Nowadays Plain English movements of Britain and the USA are advocating the use of uncomplicated clear and simple English in all spheres of life. "Plain English campaigns" continue to grow and they are the outcome of the requirements of modern times. (Crystal, 2010, p. 398)

2 MARKETING TERMINOLOGY

Ideally, a term should be transparent, internationally recognizable, consistent, concise, precise, unambiguous, system compatible, non-synonymous. This paper focuses on the following two features of marketing terms due to their specific validity regarding English - Serbian translation processes: being internationally recognizable and non-polysemous. (Sipka, 1998, p. 28).

Terminological borrowings from English into Serbian in the field of marketing mostly take place as a result of an urgent need to create terms when there are no equivalents in the Serbian language. Anglicisms are therefore used to fill in the gaps. Of course, there are various degrees of justification for the introduction of Anglicisms into Serbian ranging from relatively unjustified to completely justified borrowings. This among other reasons brings about the necessity for terminology standardization activities.

The term *marketing* itself is an outstanding example of a completely justified Anglicism not only in Serbian but also in other languages worldwide. The same is true for a derived term such as *marketing mix*. *Advertising* is an example

of a relatively justified Anglicism as we already have Serbian words *"oglašavanje"* and *"reklamiranje"*.

Borrowing from English and using the word in Serbian with or without adapting it appears to be quite easy, convenient, and above all extremely trendy nowadays. The English terms are used not for their real advantage over Serbian ones in terms of being objectively more powerful and more precise in meaning, but because people are more inclined to perceive the foreign words as something special, mystical, extraordinary, complicated. There is a very well-known tendency to sound more sophisticated, more bookish as a reflection of the so-called intellectual elitism and snobbism. Professional prestige connected to the English language is one of the reasons for the introduction of a great number of Anglicisms in marketing terminology. These two different justifications for using Anglicisms in Serbian are mentioned by Tvrtko Prcic (2005, p. 150), who identifies two tendencies:

1. professional reasons mostly motivated by experts' view that only English terms express the meaning clearly and authentically ignoring Serbian.
2. status reasons, mostly motivated by a strong belief that using Anglicisms helps to make a stronger impression on the audience and to appear more elegant, modern, and novel.

The authors of this paper believe that the experts' tendency and need to maintain international recognition of terminology bring about the following major problems:

1. the first problem refers to the derivational capacity of Anglicisms in the process of adaptation into the Serbian language system (orthographic, phonological, morphological, and semantic level). For example, the term *marketing concept* in translation into Serbian appears either as unchanged or translated as "*marketinški koncept*" (marketing is used as an adjective) or translated as "*koncept marketinga*" (marketing is used as a genitive case).
2. the second problem refers to the adaptation of English terms on the semantic level into the Serbian language causing the introduction of semantic neologisms. The typical examples are *training,* and *recruitment of staff* translated as *"trening zaposlenih"* and *"regrutovanje zaposlenih"*. These words are in Serbian traditionally related to sports terminology - training and military terminology - recruitment. We do already have precise Serbian words for these expressions: *"obuka zaposlenih"* and *"zapošljavanje kadrova"*.
3. the third problem refers to a rapid direct borrowing of English terms containing words with several meanings that are phonologically similar but associated with completely different meanings in the Serbian language. The typical example is *marketing intelligence* translated as "*marketing / marketinška inteligencija"*. The word "*inteligencija"* in Serbian does not have the meaning of *information* as in English.

International recognition of terminology is a rational and economical method of creating professional terms and therefore it is not necessary to insist on linguistic purism at all costs. However, it is necessary to insist on establishing norms, principles, and standards concerning the ways of their adoption and translation. This particularly refers to the issue of the adoption of Anglicisms into Serbian and the degree of justification of their introduction into Serbian terminology.

The adaptation of Anglicisms into the Serbian language takes place at four main levels: orthographic, phonological, morphological, and semantic.

Orthographic adaptation could range from:

1. literal rewriting of the original, i.e. zero adaptation such as "*public relations" (PR)," remarketing".*
2. modified, i.e. simplified rewriting of the original "*stejkholderi", "mejling liste".*
3. arbitrary transcription of the original "benčmarking", "faktoring", "džoint venčer".
4. calque i.e. that is literal word-for-word or root-for-root translation of English words such as "*marketinška agencija"*.

There are many examples of adaptation at the phonological level in marketing terminology: "*brend", "imidž", "advertajzing", "merčendajzer", merdžer,* etc.

Morphological level examples in marketing terminology include among others: "*distribucija", "distributer", "kastomizacija", "damping"*.

When it concerns the semantic level, which is perhaps the most complex, various semantic changes could occur in the process of adaptation of Anglicisms. Those changes could imply narrowing or extending the meaning the word has in English. Of course, when the meaning remains equivalent to English there is zero semantic adaptation of the term.

"Market" is used in the Serbian language with a narrower meaning: "a retail store". "*Dragstor"* is another example of a narrower meaning: "a shop working longer hours". Serbian "*outlet"* means: "shop with reduced prices". The following terms mostly retain the English meaning: *cash and carry, outsourcing, brand, design, digital marketing,* and many others.

3 STANDARDIZATION OF TERMINOLOGY

Marketing terminology with all its specific features inevitably requires certain standardization procedures at both national and international levels. Special concern should be devoted to contrasting English and Serbian marketing terms. The process of standardization requires the elaboration of definite phases and sequence of steps.

The first and probably most essential phase refers to establishing a normative body certified by adequate professional and expert institutions at the national level. This body should take the form of a committee for marketing terminology standardization and should consist of members representing the following specialists: marketing experts, experts from the academic and professional sphere (university scholars, marketing agencies, marketing companies, corporate marketing managers, language institutes, the national association of translators, the international organization for standards -ISO, etc.).

The primary goal of this body should refer to adopting the norms and standardization principles related to marketing terminology translation issues and implementing methodological standards for terminology and language resources. To achieve this goal, the body should probably first draw up a document provisionally entitled "National Strategy for Terminological Standardization in Marketing".

The next phase would include determining and defining the terminological principles taking into consideration appropriate contrastive elements at all linguistic levels. The main purpose of conducting this phase would be to try to establish order and provide the grounding for a systematic approach in dealing with marketing terminology instead of the present "chaotic" situation. The science of language has not invented so far, a better method than contrastive analysis when trying to introduce norms, principles, and order of things with all its advantages and disadvantages. Therefore, the methodology of contrastive analysis should be applied to the treatment of marketing terminology and its standardization from a translation perspective. This phase of standardization procedures also includes a large corpus of Anglicisms as already discussed in this paper.

The specific feature of marketing terminology is that it contains a special segment of language expressions in addition to the terms themselves. This refers to a special corpus of expressions such as slogans, marketing propositions, and similar marketing communication tools. This corpus is an inevitable component of marketing and as such requires to be standardized similarly as the rest of marketing terminology.

A significant precondition that would increase the efficiency of the standardization process is the existence of reliable reference books such as specialized dictionaries, glossaries, manuals, and similar material.

Speaking of dictionaries and similar reference books, the general situation in Serbia is an absolute lack, or even absence of all contemporary dictionaries including specialized ones (Prcic, 2016). Monolingual, bilingual, and multilingual dictionaries of marketing are no exception. Therefore, lexicographic work which would result in the creation of a terminological English Serbian and Serbian English dictionary of marketing would be of the utmost importance in resolving the problems of standardization.

Certain basic principles should be prescribed for future authors of such a dictionary. These principles should refer to the following issues:

a. The major sources for collecting terminological entries should include monolingual specialized English dictionaries of marketing, prepared by well-known recognized publishing houses, the existing English Serbian and Serbian English dictionaries, English and Serbian textbooks written by reputable professors of marketing, various publications in the field of marketing such as manuals, glossaries, journals, digital material, web corpus, and other media sources. Besides translation equivalent, the entries should include cross-references, synonyms, and examples. Most terms require a concise definition. Definitions should be compulsory in each terminological dictionary. This is the most demanding and delicate task in compiling such dictionaries considering the above-mentioned principles for the application of Anglicisms.
b. The team of dictionary authors should consist of linguists, translators, academic and professional marketing experts who are not only proficient in English and but also computer experts.
c. The most practical, efficient approach would be provided by applying digital i.e. electronic, "e-lexicography". The electronic form of such a dictionary has many advantages over other traditional publications. The lexicographic work is much easier, less complicated, and faster. It is less costly to prepare and to use such a dictionary. A special advantage refers to great possibilities for on-going editing, supplementing, changing, revising, and similar activities of crucial importance for the lexicographic endeavor. Of course, an electronic dictionary does not exclude traditional printed options.

Finally, to come out with such a dictionary should not take too much time striving for perfect reference material. What we need is a solid, not overly pretentious, easy to use, edition reliable to begin with, having in mind the wise words of the father of English lexicography Samuel Johnson who said a long time ago: "Dictionaries are like watches, the worst is better than none and the best cannot be expected to go quite true". (Johnson, 1784)

4 CONCLUDING REMARKS

The characteristics of the language of marketing could be summarized as follows:

1. The English language is the language of marketing; It is the global internationally recognizable English language of marketing and advertising and as such is simple, striking, memorable, effective and above all plain, belonging to everyone and no one, reflecting today's dominant cultural values of western civilization: Anglo-American models of internationalism, modernity, prestige, youth, globalization, cosmopolitism and other positive stereotypes;
2. Consequently, the language of marketing and marketing terminology uses the greatest number of Anglicisms compared to other fields of business economics and the Serbian language is no exception.
   - Therefore, studying marketing terminology and respective standardization issues primarily assumes dealing with a complex corpus of Anglicisms issues.
   - There are various degrees of justification for the introduction of Anglicisms into Serbian ranging from relatively unjustified to completely justified borrowings.
   - This among other reasons brings about the necessity for terminology standardization activities.
3. The treatment of the marketing terminology standardization from a translation perspective (English Serbian and vice versa) requires a series of steps to be taken:
   - Establishing a normative body certified by adequate professional and expert institutions at the national level consisting of language and marketing specialists and experts from the academic and professional sphere.
   - This body should first draw up a document provisionally entitled "National Strategy for Terminological Standardization in Marketing".
   - Among the fundamental steps, special attention should be devoted to determining and defining the terminological principles and language norms applying the methodology of contrastive analysis at all linguistic levels.

- The final step refers to creating a reference book in the form of a specialized terminological bilingual English Serbian dictionary of marketing. Because of the complexity and ever-changing lexicographic language corpus concerned, the authors suggest an electronic version of such a dictionary.

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TRANSPORT IN THE SUSTAINABLE DEVELOPMENT GOALS FRAMEWORK

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Abstract

Transport plays an important role in achieving the sustainable development goals set by the UN member states for the period up to 2030. This article discusses the concept of sustainable economic development and its basic principles, which made it possible to substantiate and determine the content of sustainable transport development. It has been established that transport has a direct impact on ten sustainable development goals (SDGs): zero hunger; good health and well-being; affordable and clean energy; decent work and economic growth; industry, innovation and infrastructure; sustainable cities and communities; responsible consumption and production; climate action; life below water; partnerships for the goals. The achievement of these SDGs is affected by transport factors such as Vehicle Regulations, Road Traffic and Safety, Transport Infrastructure, Dangerous Goods and Border Crossing Facilitation. Since transport is a complex organizational, economic and technical mechanism, it is impossible to assess the current state and progress of sustainability based on a single indicator. It is advisable to establish a set of indicators to determine the current situation and trends in sustainable transport. Moreover, the indicators must meet the requirements of their measurability on the basis of available statistics. It is proposed to assess the state and development of sustainable transport based on economic, social, human and environmental capital, the value of which depends on transport and individual accessibility, reliability, and safe environmental impact. Each of these factors was evaluated by a system of indicators, the measurement of which is possible based on official statistics. A study was also conducted to assess the level of achievement of the established indicators of sustainable development of transport in Belarus.

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Keywords: *sustainable development goals, transport, capital, accessibility, security, reliability, environment.*

1 INTRODUCTION

For a long time, sustainable development was considered as permanent economic growth in countries with developed economies. A similar approach to sustainable development at the present stage still takes place in some developed and especially in developing countries. On the one hand, the fallacy of this approach is that economic growth, as a rule, does not guarantee social justice, and on the other hand, is not based on the rational use of natural resources to ensure future generations and is not aimed at protecting the environment from pollution.

The main principles of sustainable development, laid down in the report of the World Commission on Environment and Development "Our Common Future" in 1987, as well as at the UN Conference on Environment and Development in Rio de Janeiro in 1992, are as follows:

- taking decisions must always consider the justice and the rights of future generations.
- a long-term view should be based on the precautionary principle of the threat of serious or irreversible damage.
- he fair distribution between generations and within generations to ensure the well-being of present and future generations of the world's population.
- the lack of a full scientific justification for the project should not be used as a reason for postponing cost-effective measures to prevent degradation.

Sustainable development involves complex relationships between the economy, society, and the environment. These relationships should ensure economic growth, social equality and public health, and environmental sustainability.

However, at present, the economy, the social sector, and the environment face growing problems. Unfair distribution of income within and between countries is growing, unreasonable volumes of production and consumption lead to a sharp deterioration of the environment and the depletion of natural resources. At the same time, the economic development of any country is based on efficient transport, which ensures both domestic and international distribution of goods flows. The level of development of the country's transport sector is one of the main indicators of its economic well-being. For example, transport employs more than five percent of the able-bodied population of the planet and creates 3-5 percent of value-added in world GDP (Transport for Sustainable Development. The case of Inland Transport, 2015).

2 SUSTAINABLE DEVELOPMENT OF TRANSPORT

The United Nations Department of Economic and Social Affairs (UNDESA) predicts that the world's population will reach more than 9.5 billion people by 2050 (Transport for Sustainable Development. The case of Inland Transport, 2015). Population growth, coupled with continued globalization and trade liberalization, will accelerate the demand for transportation, both people and goods. It is expected that the volume of freight and passenger traffic by 2050 will increase by 80% and 51% compared with 2005, respectively. (Miloslavskaya & Myskina, 2013). The constant increase in the volume of transport of people and goods necessitates careful monitoring of the development of this sector for sustainable development since efficient and effective transport systems play an important role in combating poverty, providing access to markets, increasing employment, access to education and basic services.

By 2050, the number of cars on the roads will double and reach 2 billion, which will increase the number of accidents and the load on the environment dramatically. Today, more than 1.25 million people die and up to 50 million are injured on the world's roads every year. Moreover, low- and middle-income countries account for 90% of deaths, although they own only half of the world's vehicles (Transport overview, 2019).

Transport is expected to be a major driver of growing global energy demand. Currently, transport accounts for about 64% of global oil consumption, 27% of total energy consumption and 23% of global energy-related CO2 emissions, which negatively affects the environment (Transport overview, 2019).

The above indicates the intensive development of transport in the coming decades. Therefore, today, the development of this industry must be given the character of sustainable one within the framework of the 2030 Agenda for Sustainable

Development, adopted by the UN member states in 2015. This agenda outlines 17 goals in the field of sustainable development and 169 related tasks that are designed to help humanity once again embark on the virtuous path of sustainable development (Sustainable Development Agenda, 2015). The analysis of goals and objectives made it possible to establish their direct connection with the functioning of transport, which confirms its special significance in the development of society.

The transport factors such as Vehicle Regulations, Road Traffic and Safety, Transport Infrastructure, Dangerous Goods and Border Crossing Facilitation (Figure 1) affect the achievement of the mentioned targets.

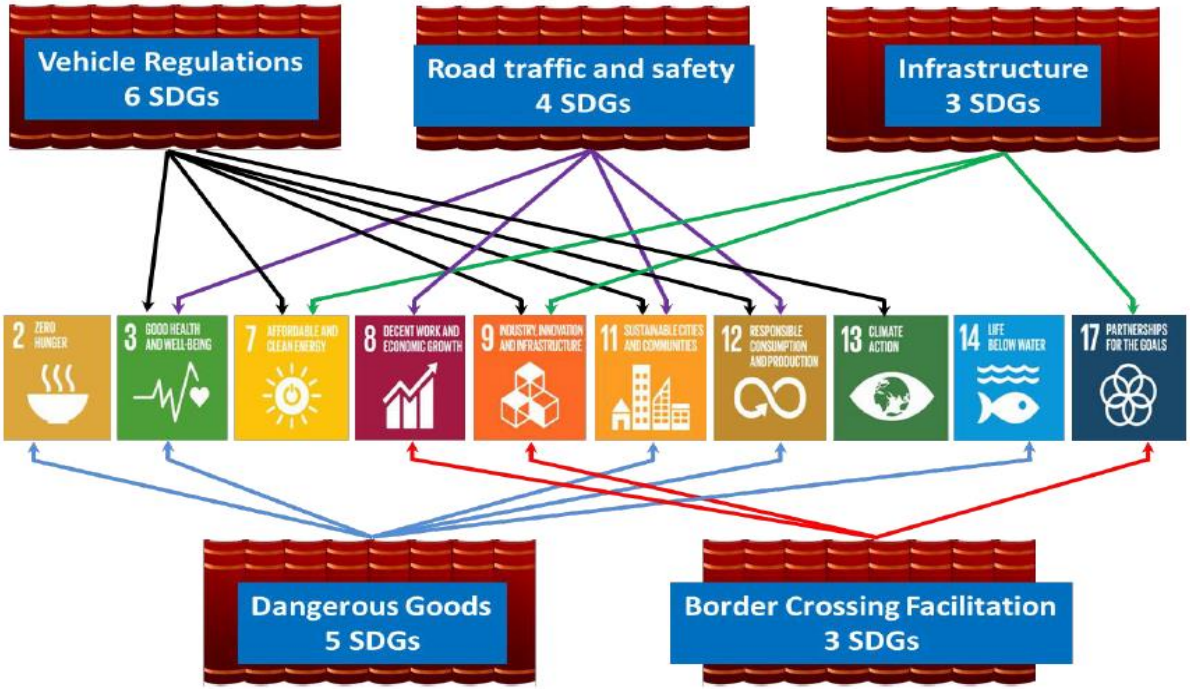

Figure 1 - The transport factors affect the achievement of the SDGsV
Source: UNECE Workshop on How to achieve Transport- and Trade-related SDGs, Chamber of Commerce (2017)

Vehicle Regulations affects six SDGs: Good Health and Well-Being, Affordable and Clean Energy, Industry, Innovation and Infrastructure, Sustainable Cities and Communities, Responsible Consumption and Production, and Climate Action.

Road Traffic and Safety – four SDGs: Good Health and Well-Being, Decent Work and Economic Growth, Sustainable Cities and Communities, Responsible Consumption and Production.

Transport Infrastructure affects three SDGs: Affordable and Clean Energy, Industry, Innovation and Infrastructure, Partnerships for the Goals.

Dangerous Goods affect five SDGs: zero hunger, Good Health and Well-Being, Sustainable Cities and Communities, Responsible Consumption and Production, life below water.

Border Crossing Facilitation– three SDGs: Decent Work and Economic Growth, Industry, Innovation and Infrastructure, Partnerships for the Goals.

3 INDICATORS OF SUSTAINABLE DEVELOPMENT OF TRANSPORT

The United Nations Economic Commission for Europe has identified the following key indicators for sustainable transport development:

- accessibility associated with the integration of countries into a wider market to eradicate poverty;
- the affordability of goods and services for the poor;
- life safety of the inhabitants of the planet;
- ecological state of the environment (Sustainable transport in the post-2015 sustainable development agenda, 2013).

UNECE also called on member states to promote sustainable housing and land management, intending to create compact cities for sustainable urban transport.

In turn, the Pan-European Programme on Transport, Health and Environment (THE PEP)

identified the following priority sustainable development goals in the field of transport:

- to promote sustainable economic development and job creation through investment in environmentally friendly transport and health.
- to ensure environmentally sustainable mobility and promote the development of more efficient transport systems.
- to reduce emissions of greenhouse gases and atmospheric pollutants of transport origin, as well as transport noise levels.
- to promote the implementation of strategies and the implementation of measures aimed at ensuring healthy and safe transport;
- to integrate goals in the fields of transport, health and the environment into urban development policies and spatial planning (The PEP Partnerships, 2019).

The World Bank focuses on poverty alleviation by simplifying small business start-ups and doing business to ensure employment, as well as expanding access to a wider market and transport services in rural areas, which will provide greater potential for economic growth (World Bank: Central Asia Poverty Reduction Slows Down, 2019).

The Asian Development Bank believes that the rapidly growing fleet of private vehicles in the poor countries of Southeast Asia will aggravate the environment, which will lead to climate change and reduce road safety in the region (ADB adopted a strategy until 2030 in response to the changing needs of the Asia-Pacific region, 2019).

The United Nations Economic Commission for Latin America and the Caribbean underlines the fundamental role of public transport in reducing the growing external factors of economic growth and in ensuring the savings and benefits of improved transport services, which helps reduce social and economic inequality, which remains a serious problem in the region (Road transport in Latin America: evolution of its infrastructure and impact between 2007 and 2015, 2019).

The International Road Transport Union has proposed expanding the transport of buses and taxis in the development of transport policies to double their volumes and achieve sustainable mobility for all segments of the population.

In this regard, for the sustainable development of transport, it is necessary to develop integrated approaches to land-use policies, infrastructure development, public transport systems, and the goods delivery network to ensure affordable, efficient and safe transportation, improve energy efficiency, reduce environmental pollution and reduce the effects of congestion.

4 METHODOLOGY AND INDICATORS OF EVALUATION OF SUSTAINABLE DEVELOPMENT OF TRANSPORT

The transport system is a complex organizational, economic and technical mechanism consisting of infrastructure facilities, vehicles, organizations, and workers providing its work. The work of this mechanism is complicated by the presence of various modes of transport, a multitude of regulatory legislative bodies and regulatory legal acts, a wide range of interacting parties and facilities, various financing and co-financing methods, and many other factors. Therefore, it is not possible to assess the current state and progress of transport sustainability based on a single indicator. It is advisable to establish a set of indicators to determine the current situation and trends in the field of sustainable transport. Moreover, the indicator must meet the requirements of its measurability based on available statistics.

It is possible to determine indicators for assessing the state and development of sustainable transport based on the stability of the total capital of society, which can be determined in the form of the following types of capital: economic, social, human and environmental.

Economic capital, in this case, is seen as the ability of transport to provide access to various markets, create jobs, connect people and business, forming high added value. From this point of view, transport is important for sustainable economic development.

Social capital is associated with relationships and norms that shape the quality and quantity of social benefits in society. Transport carries out the movement of people and provides access to basic social services.

Human capital is a combination of knowledge, skills used to meet the diverse needs of man and society as a whole. Through transport, various human needs are realized, in particular, access to sources of knowledge and skills, study of the world by moving people and various objects to research areas not only on earth but also in space.

Environmental capital is a natural character and includes land, natural resources and the ecosystem of the earth and the cosmos. Unlike previous capital, transport negatively affects environmental capital by polluting the environment, emitting harmful substances and greenhouse gases, using large amounts of non-renewable energy, generating waste and reducing the quality of the natural habitat (table 1).

Table 1 - Goals of sustainable development of transport and its indicators

Indicators	Effect on capital	Sustainable Development Goals	
1. Density and quality of transport infrastructure. 2. Volumes of transportation and cargo turnover 3. Volumes and cargo turnover of international transport. 4 Border crossing time.	***Economic capital:*** access to markets and employment. ***Social capital:*** access to basic social services. ***Human capital:*** access to sources of knowledge and skills.	To increase the volume of cargo and passenger traffic. To increase the share of paved roads. To ensure the growth of the export of transport services. To minimize the proportion of people without access at any time of the year to land transport. To develop strategic international relations, especially in landlocked countries. To develop effective border crossing methods.	Transport Accessibility
1. The costs of personal transport in total revenue. 2. The cost of fuel for private vehicles. 3. The volume of public and private investment in transport.	***Economic capital:*** accessibility to employment; long-term sustainable investment. ***Social capital:*** access to basic social services. ***Human capital:***	To ensure accessibility of income for all segments of the population. To implement long-term investment plans. To conduct a thorough analysis of pre-investment.	Individual Accessibility
1. Number of traffic accidents 2. The use of seat belts, driving with traffic violations 3. The share of active railway crossings.	***Social capital:*** safe transport for individuals. ***Economic capital:*** financing for safe transport to reduce the cost of eliminating the consequences of accidents	To minimize the number of casualties and injuries on the roads. To minimize the number of fatalities and injuries caused by rail and inland waterways. To minimize accidents involving dangerous goods. To prevent terrorist threats, attacks, and criminal activities.	Safety
1. The proportion of late delivery of goods and passengers 2. The amount of deviation from the appointed time of departure and arrival of transport.	***Social capital:*** transport should ensure the standards of human activity. ***Economic capital:*** transport must be safe to reduce infrastructure losses.	To ensure reliable year-round operation of transport. If necessary, to ensure the operation of the transport on schedule.	Reliability
1. Energy consumption in transport 2. The volume of greenhouse gas emissions. 3. Environmental pollution. 4. The noise level from vehicles.	***Environmental capital:*** transport should help reduce energy consumption, emissions of harmful substances and the use of other resources to maintain global natural capital.	To reduce dependence on non-renewable energy sources. To minimize greenhouse gases and pollutant emissions. To minimize traffic noise. To minimize waste from transport and improve its recycling.	Environment

Source: Luksha & Molokovitch (2020)

As the world economy develops, it is important to ensure the minimum negative impact of transport on the state of environmental, social and human capital, which are closely interconnected and ensure the sustainable development of society.

Assessment of the condition and risks associated with the sustainability of transport should be carried out based on the dynamics and forecasts of data in the field of transport and individual accessibility, reliability and safe environmental impact.

Transport accessibility can be measured by indicators of the density and quality of transport infrastructure. Important in transport accessibility are of international transport links, which can be determined by the volume of freight and freight traffic, the time and costs of border crossing. Since access to basic goods and services requires mobility, an accessible transport system is a prerequisite for the social and economic development of society.

Transport systems should also be accessible to society, so individual accessibility can be estimated by the share of private transport costs in total revenues, the cost of fuel for private transport, the volume of public and private investment in transport.

Transport poses a potential danger to society in the form of road traffic accidents that result in significant social and economic losses. Transport safety can be assessed by such indicators as the number of accidents, the number of fatalities and injuries, the use of seat belts while driving, driving with violations of traffic rules, drunk driving, the share of active railway crossings, and others.

The reliability of transport is determined by the share of untimely delivery of goods and passengers, as well as the deviation from the appointed time of departure and arrival of transport.

Since transport negatively affects the environment through the consumption of non-renewable energy sources, produces huge emissions of harmful substances and greenhouse gases, creates increased noise and destroys the ecosystem, then for assessment, it is possible to apply such indicators as the amount of energy consumed, the volume of greenhouse gas and harmful substances, the degree of environmental pollution by transport, the noise level from transport and others.

5 IMPLEMENTATION OF THE SDGs IN THE FIELD OF TRANSPORT IN BELARUS

Sustainable development of the transport system of Belarus until 2030 is aimed at meeting the needs of the economy and society in high-quality transport services while ensuring environmental requirements and road safety.

The criteria for achieving this goal are:

- increase in freight turnover of transport for 2016-2030 by 1.2 times.
- increase in passenger traffic by 1.4 times.
- increase in the proportion of paved roads in the total length of public roads from 86.3% in 2015 to 90.0% in 2030 (The national strategy for sustainable socio-economic development of the Republic of Belarus for the period until 2030, 2017).

The achieved and planned indicators of transport development within the framework of the SDGs are given in table 2

The data in table 2 show that for the period from 2016 to 2019 the growth rate of freight turnover amounted to 4.3%, and the passenger turnover - 12.8%. Consequently, there is a high probability that by 2020 the planned growth rate of freight turnover will be met, and the growth rate of passenger turnover has been exceeded that already planned by 2019.

Also, a network of high-speed motorways of the first category is being created in the republic with a bearing capacity of at least 11.5 tons per single axis and a speed of 120 km/h or more. The main international transport corridors connecting the republic with neighboring countries are of the first category. The network of local hard-surfaced local roads with year-round accessibility for the population and business entities is developing at an accelerated pace.

The volume of freight forwarding services in 2018 amounted to 2146.9 million US dollars. At the same time, 66.8% of the services were provided under contracts with non-residents, which indicates a low activity of domestic business entities. The total volume of freight forwarding services is dominated by road transport services -

50.8%, and railway transport - 44.1%. Water and air transport services are negligible. Although the volume of air cargo in the world is growing rapidly, in Belarus these services make up only 1.4% of the total.

Table 2 - Indicators of transport development

	Actual Value					Plan		
	2015	2016	2017	2018	2019	2020 to 2015	2025 to 2020	2030 to 2025
The growth rate of cargo turnover, as a percentage of the previous period	100.0	100.0	106.0	104.1	94.2	107.4	107.0	106.6
Passenger turnover growth rate, as a percentage of the previous period	100.0	100.0	103.5	103.6	105.7	111.8	112.5	113.0
The proportion of paved roads in the total length of public roads, percentage	86.3	86.5	86.5	-	-	87.5	88.0	90.0

Source: Transport and Communications in the Republic of Belarus (2018)

Despite the growth in freight forwarding services, the revenue of freight forwarders in this volume is falling. If in 2016 it was 12.5%, then in 2018 - 10.3%.

The study of cargo transportation volumes shows that until 2017, for all types of transport, they decreased and only in 2017 did a turnaround occur (Figure 2).

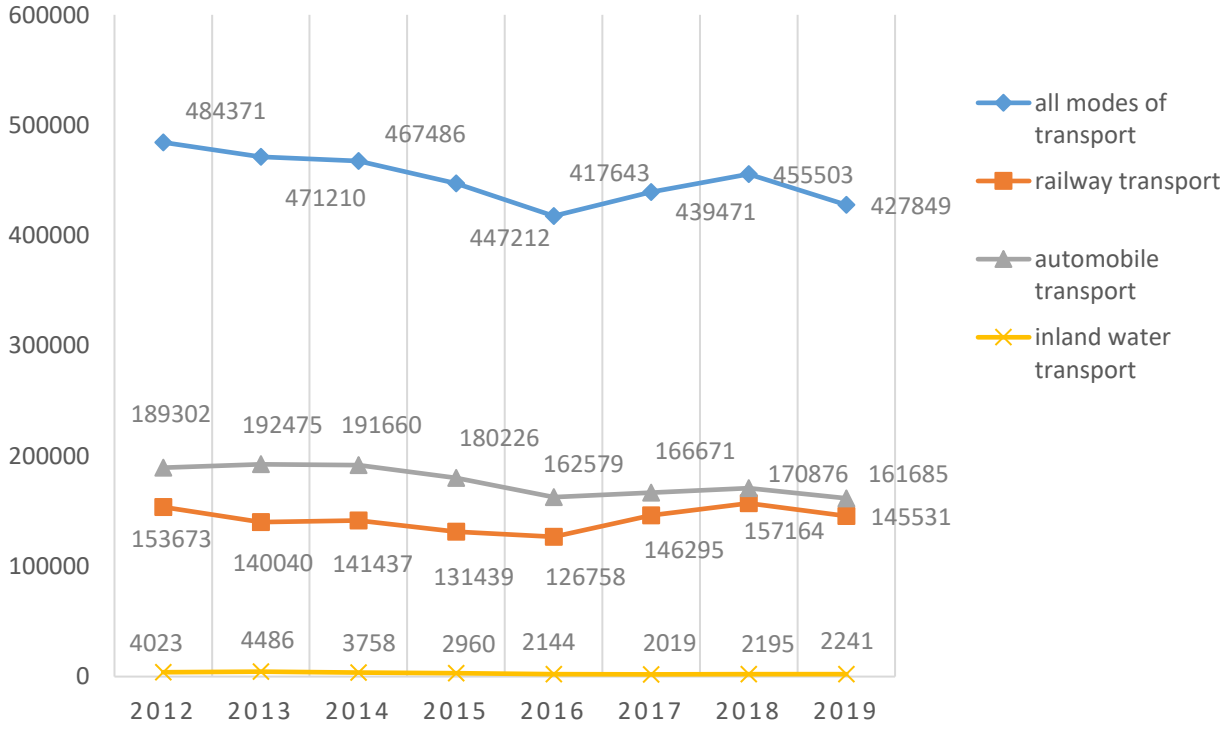

Figure 2 - Transportation of goods by mode of transport, thousand tons.
Source: Transport and communications in the Republic of Belarus (2018)

First of all, the recovery was associated with the revival of the economy in Russia, which had a positive effect on transportation in Belarus. At the same time, rail transport grew more rapidly. Recently, a gradual rapprochement of road and rail transportation has been observed. So, if in 2012 the share of road transport in the total

volume was 39.1%, and for rail - 31.7%, then in 2019 - 37.8% and 34.0%, respectively.

An analysis of the transport of goods by rail by types of communication showed that international traffic is growing, and transit is declining. In international traffic, goods are transported mainly to neighboring countries, since the average transportation distance is about 340 km. These are Russia, Poland, Ukraine, Lithuania, and Latvia.

Cargo turnover structure for the period 2011-2018 almost unchanged. International carriage of goods by road is much less than in the whole country. At the same time, the share of transit is only 1.7%. The average distance of road transport in international traffic is over 1400 km. Consequently, goods are transported to foreign countries. However, the volume of such traffic is negligible. Freight by road is transported mainly in urban, district and inter-district communication.

For the Republic of Belarus transit transportation by land as a part of China-Europe-China traffic is important. In modern conditions, an increasing range of goods requires fast delivery, as a result of which the volume of transportation by land will increase. From China to Europe and Russia, goods can be transported by land through Kazakhstan, Mongolia, Kyrgyzstan, and also directly to Russia. The shortest and most economical route from the western regions of China is through Kazakhstan.

In international traffic, Kazakhstan rail transport specializes in the transportation of bulk cargo, which occupies more than 80% of the total. Loads are transported from Kazakhstan to Russia or transit in the north-south direction.

Even before 2015, transit through Kazakhstan exceeded transit through Eastern Siberia and the Far East. However, already in 2017, transit through Kazakhstan became less than the volume of transit through Eastern Siberia and the Far East. Only 5.5% of transit cargo is transported through Kazakhstan to and from Russia and Europe, which amounts to 1,100 million US dollars per year.

Russia is intensively improving its international transport corridors, especially of the Trans-Siberian direction, which will affect the decrease in cargo transit to Europe through Belarus. Such a development of events will make it difficult to meet the SDG indicators related to transport. Therefore, it is necessary to diversify trade relations with foreign countries, gradually reducing dependence on the Russian market.

6 CONCLUSION

In the study were presented the main indicators of sustainable development, which determined the strategic approach to the definition of sustainable transport development. To assess the sustainable development of transport, a methodology and a system of indicators (Luksha & Molokovitch) based on dynamics and forecasts in the field of transport accessibility, individual accessibility, reliability, and safe environmental impact are proposed. For each of these areas, particular indicators are determined to depend on their impact on economic, social, human and environmental capital. Measures that ensure the implementation of sustainable transport indicators are proposed.

Study of the work of transport for the period 2016-2019 shows that it is necessary to make great efforts to find new markets for products of the export-oriented economy of Belarus in order to achieve the planned indicators of the SDGs for transport in 2020. The situation is complicated by the fact that recently Russia has been making great efforts to develop the infrastructure of its own transport corridors, especially the Baltic ones, which will negatively affect the volume of cargo flows through Belarus. Oil supplies from Russia to Belarusian refineries in the first quarter of 2020 also decreased significantly, which led to a decrease in pipeline cargo turnover. A decrease in traffic and cargo turnover has been observed in recent months due to the suspension of production in European countries and Russia, as well as the closure of the borders of these states due to the rapid spread of Covid 19. Therefore, it is necessary to intensify the work of transport in the second half of 2020 by increasing domestic demand for transportation and creating favorable conditions for the transit of goods through the territory of the Republic of Belarus. The level of achievement of the established indicators of sustainable transport development in Belarus will depend on the recovery of the economies of its main trading partners.

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IMPROVING SSTI FOR INNOVATIVE ECONOMIC DEVELOPMENT: EXPERIENCE OF BELARUS

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Abstract

The development of the state system of scientific and technical information of the Republic of Belarus (SSTI) in the context of the modern world trends, such as the transition of countries to the innovative economy, an increase in the volume of information exchange at the international level, liberalization of access to the results of scientific research, development of the Internet and IT-technologies, etc., is considered in the current article. The author observes the peculiarities of the development of the foreign scientific and technical information systems appealing to the decentralized STI systems in the United States of America, Germany, France, and Finland. A special emphasis is given to the history, prerequisites of its origin, organizational structure, and principles of the state system of scientific and technical information of the Republic of Belarus, which at the present stage is a growing and disordered set of resources with variable structures, themes, and functionalities. The article demonstrates advantages and disadvantages that are characteristic of the current stage of development of this system in the Republic of Belarus, and also lists some main directions in which it is planned to develop the SSTI of the Republic of Belarus to compose a single republican and world digital information space and to provide consumers with the scientific and technical information required in the context of the development of an innovative economy.

Keywords: *state system, scientific information, technical information, digital economy, information centers, development trends*

1 INTRODUCTION

The management of information resources and information flows in the scientific and technical areas plays an important role in the innovative development of the country. In its turn, the functioning of an innovative economy is not possible without the use of an effective state system of scientific and technical information (hereinafter - SSTI), designed, on the one hand, to provide the needs of scientists, engineers and technicians, managers and students in scientific and technical information (hereinafter - STI), and on the other hand, to present national scientific and technical products at the global information market.

The State System of Scientific and Technical Information (SSTI), currently operating in the Republic of Belarus, on the one hand, has inherited many components and principles of

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operation from SSTI of the former USSR. On the other hand, the transformation of the system was influenced by the economic and administrative reforms that began in the Republic of Belarus in the early 1990s, as well as the revolutionary changes in information technologies that led to the emergence of the Internet and the development of IT technologies. Significant improvements are required in the current SSTI of the Republic of Belarus for ensuring the innovative development of the country's economy.

To identify possible areas for improvement, it is necessary to identify the main trends in the context of which this development is carried out and to analyze the inconsistencies and development bottlenecks in the state system of scientific and technical information of the Republic of Belarus.

The problems of the functioning and development of the SSTI of the Republic of Belarus at the present stage are reflected in the works of Grigyants R.N (Grigyanets R., at al., 2016), Enin S.V. (2017), Kosovsky A.A. (2017), Ugrinovich E.V. (Ugrinovich E., at al., 2017), Shumilin A.G. (2017) and other researchers.

2 EXPERIENCE IN THE SSTIS DEVELOPMENT

Decentralized STI systems operate in many western countries. The main component of such systems is a multifunctional information center. The internal organization and structure of information centers are aimed at the effective accumulation and processing, transferring of information to industrial enterprises, firms, and institutions to ensure an innovative economy. To improve aggregation, processing, and translation of information, the centers are equipped with modern information systems that enable the digitization, storage, and processing of large amounts of information, as well as automated information search.

The main sources of information for such centers, as a rule, are research institutes, universities, libraries, research funds, government agencies, and other organizations of both national and international levels.

An example is the activities of The US National Technical Information Service (NTIS). This body was established after the Second World War and was designed to accumulate STI, and is publically funded. NTIS currently stores more than 3 million units of documents in 350 industries, 600 thousand of which are available online. Access to information is provided to companies for some fee, but this type of activity is just a small part of the Center's income. The Center receives the main financial returns from related services in the field of information and communication technologies. The Center is currently reviewing its package of services, considering initiatives to disseminate open access and open data

Since 1970, a system of centers of technical information (Fachinformationszentrum - FIZ). has been operating in Germany. It includes such well-known scientific and information centers as "FIZ Chemie", "FIZ Technik", "FIZ Karlsruhe (Energie, Physik, Mathematik)" and others. Taking into account modern requirements, in 2002 the German Federal Ministry of Education and Science, as well as the German Research Foundation supported a project to integrate distributed electronic resources of information centers, scientific and technical libraries, universities, research institutes in Germany, as well as to provide wide access to full texts in a single interface based on modern search methods. Initially, the project was designed as a part of the Vascoda scientific portal. The portal aggregated the resources of STI organizations, that have united in an association in Germany, including those resources that are located on the deep web.

In 2011, the information resources of the Vascoda consortium members were integrated into the WorldWide Science international resource portal, which appeared on the network in 2007 on the initiative of the British Library and the US Department of Energy. Currently, this portal is represented by more than 100 national and international scientific databases from 70 countries, providing the possibility to search in the deep web and automatically translate into 10 of the most common languages.

France's largest Center for Scientific and Technical Information (INIST) maintains a scientific portal and generates databases, including large ones such as the Francis database, which was founded in 1972 and contains 2.6 million records in 15 disciplines, as

well as Pascal abstract database, which includes 20 million links and has been maintained in 1973. In addition to providing access to databases, the portal possesses services for translating articles into English, promoting publications, scientometric measurements for scientists, assigning digital object identifier (DOI), etc. The system contains more than 700 thousand entries. The portal also offers its users the capabilities of the OpenGrey system, which specializes in grey literature published in Europe. The system allows to export records and finds documents that are poorly indexed by virtual search engines.

A special emphasis should be given to VTT - the Finnish center for technical research. "Here, we managed to create one of the most effective transfer models of ready-made high-tech solutions for business in the field of energy, ecology, and infrastructure".

The current stage of development of STI systems is characterized by the following phenomena:

- the transition from print to electronic versions of scientific literature.
- creation of thematic electronic libraries and storage of digital objects of general access.
- dissemination of open, free access to scientific publications.
- publication of row data from experimental studies.
- creation of educational information resources.
- constant access via the Internet to scientific publications using DOI and a standard set of metadata (Dublin Core) describing a digital object.
- development of the technological base of STI systems using specialized computer networks and cloud technologies.
- usage of artificial intelligence systems for the search and analysis of STI.

The following main world trends that determine the development of national STI systems at the present stage can be distinguished:

- the transition of many countries to innovative economic development. The core, ensuring the innovative development of the national economy, is the national innovation system, which proves to be non-viable without an effective STI system.
- an increase in the volume of information exchange on an international scale. The acceleration of the generation of new knowledge and the growth of its role in socio-economic progress are accompanied by an increase in the exchange of information worldwide.
- liberalization of access to research results for all categories of users. In particular, the concept of Open Science is being further disseminated and developed.
- the development of the Internet and IT-technologies. The development of the Internet and IT technologies in many countries, has resulted in the formation of a single information and research space, providing access to the allocated resources of STI.

3 CURRENT STATE OF SSTI IN THE REPUBLIC OF BELARUS

The currently functioning SSTI of the Republic of Belarus, which was formed in the 1960-1980s, has inherited many components and operational principles from the SSTI of the former USSR. The organizational principles of this system corresponded to the management structure of the national economy with appropriate subsystems organized by territory and industry, as well as specialized by types of documents and topics of information services. It was organized according to the principle of centralized processing and decentralized use of STI. A distinctive feature of the system was the hierarchically structured algorithm of processing published and unpublished national and foreign documentary STI sources based on the principles of single entry and processing of the information, that they contain, in institutes, libraries, archives, enterprises. An effective system of access for specialists to almost all sources of open information was formed, regardless of their storage location.

Economic and administrative reforms in the Republic of Belarus at the beginning of the 1990s. coincided with the revolutionary changes in information technology that led to the emergence of the Internet, the development of mobile communications, and personalization of access. As a result, many STI bodies were closed, others changed their profile. SSTI as an integral system

has ceased to exist, although a number of its components continue to function at present.

Today in Belarus, the state system of scientific and technical information unites many organizations whose main tasks are to ensure the formation and effective use of scientific and technical information resources, their integration into the global information space, and the promotion of the creation of a market for information products and services.

The following bodies operate within the SSTI of the Republic of Belarus:

- republican information centers.
- libraries.
- industry centers and STI services.
- regional centers of STI.
- the system of publication and distribution of scientific and technical literature.
- information and telecommunication infrastructure.

Republican information centers are simultaneously inter-sectoral information centers:

- State Organization “Belarusian Institute of System Analysis and Information Support for Scientific and Technical Sphere” (SO “BELISA”) is responsible for unpublished documents (reports on research, development, and experimental-technological works and deposited manuscripts).
- RPRUE “Belarusian State Institute of Standardization and Certification” is responsible for technical normative legal acts in the field of technical regulation and standardization.
- State Institution “National Center for Intellectual Property” is responsible for patent information.

The functioning of SSTI is complemented by the emergence and development of non-state systems of STI. A certain amount of local STI resources is generated by individual scientific institutions, university departments, individual scientists, also in social networks.

As a result of the development of the Internet, Belarusian users have access to foreign STI systems. In particular, scientific, educational, and budgetary organizations have the opportunity to access global computer networks via the Pan-European GEANT network, which unites 40 million users from more than 8 thousand research and educational organizations from 40 European countries. Among Russian resources, the Scientific Electronic Library, Cyberleninka, Integrum can be singled out.

To develop the interstate exchange of scientific and technical information, the Republic of Belarus cooperates with the Interstate Council on Coordination in the Sphere of Scientific-Technical Information and Innovation (ICCSTI) and the International Center for Scientific and Technical Information (ICSTI). ICCSTI is one of the bodies of the Commonwealth of the Independent States responsible for the development of the interstate exchange of scientific and technical information. ICSTI is an interstate organization, the main task of which is to provide informational, analytical, consulting, and organizational support for cooperation in the field of science, technology, and business at the international level.

It should also be noted that in the context of global trends, new information technologies, including semantic technologies, big data, artificial intelligence, machine learning, are developing and finding applications in the Republic of Belarus.

As a result, the SSTI currently represents a growing and disordered set of resources having various structures, themes, and functional purposes. Attempts to integrate STI resources are non-systemic.

The following disadvantages of the SSTI of the Republic of Belarus at the current stage can be singled out:

- low degree of integration in the system. To date, the SSTI of the Republic of Belarus does not function, it contains an unordered set of resources, serving mainly the interests of various departments to which these resources belong.
- low degree of optimization in the system. The system of SSTI of the Republic of Belarus in its current state is not optimized to meeting the needs of the innovative economy in the Republic of Belarus. It does not provide mechanisms for tracking the full life cycle of innovative developments. There is no mechanism for information support of the process of commercialization of the results of R&D.

- There are some deficiencies in managing the development of the system. To date, there is no state-approved SSTI development strategy that would contain an evidence-based understanding of the future use of the SSTI of the Republic of Belarus.
- The system has a low degree of digitalization. The SSTI of the Republic of Belarus is characterized by the insufficient application of modern IT technologies in comparison with other countries.
- insufficient degree of integration with other countries' STI systems. The exchange of the results of scientific activities of the Republic of Belarus at the international level is unsystematic.

4 DIRECTIONS OF SSTI IMPROVING TO ENSURE THE INNOVATIVE DEVELOPMENT OF THE REPUBLIC OF BELARUS

An increased role of knowledge in socio-economic progress, an enlarged volume of information exchange on an international scale, and the transition of the Republic of Belarus to the digital economy have led to new requirements for the STI quality. To meet the requirements imposed by current world trends and to provide consumers with the STI required, the State Scientific and Technical Institute of the Republic of Belarus needs to be improved in some basic directions:

- The SSTI should ensure the maximum possible coverage of the STI created in the world, primarily in lead countries in areas of scientific, technological, and innovative development, and should provide users in the Republic of Belarus with the access to the world resources of STI.
- The SSTI should ensure the maximum possible coverage of the STI created in the Republic of Belarus, including 100% coverage of the results of scientific and technical activities publicly funded.
- The SSTI should provide effective information support for promoting the results of scientific, technical, and innovative activities of the Republic of Belarus, for their transfer, commercialization, and their implementation in innovative technologies, goods, and services.
- The SSTI should provide users with the possibility to search for information about scientific, technical and innovative activities results based on user-specific search parameters, specific areas of scientific and technological development, variable sectors of the economy, etc. and to distinguish these results taking into account the stages of the innovation life cycle (from concept, idea through basic research, applied research to launching innovative technology of goods, services to the market).
- The system should provide collection, accumulation, processing, search, and provision of information based on the principle of centralized one-time processing of the global information flow of documents in the area of science and technology and its multiple uses by consumers via the Internet.
- The system should provide effective navigation of users through information resources using a user-friendly interface and provide information to the end-user in the most convenient form, as systematic and detailed as possible, even though this information can be extracted from heterogeneous sources. The system should combine. access to all types of STI in a single interface – electronic and conventional library funds, depositories, archives, combine and systematize information from geographically distributed resources.
- The system should provide automation of technological processes for collecting, processing STI, and the formation of electronic resources using automated software implementation.
- The integration of the SSTI of the Republic of Belarus with the STI systems of other countries should be ensured at the national level.

For the SSTI to be able to fulfill the above-mentioned requirements, some technical and economic measures are necessary. Soon, the following activities can be implemented:

1. Creation of an automated system for collecting and processing information about events, research and studies on the development of the state system of scientific and technical information will be aimed at eliminating the existing problematic aspects

in the field of SSTI, improving the quality of data processing and more efficient analysis of the activities of public administration, improved monitoring.

2. The creation of the **Office of Commercial Proposals**, first of all, is aimed at using the already existing research and development results presented in the State Register of R&D. Taking into account the world experience of such activities, the office's tasks will include copyright regulation, activities in the field of patenting and licensing of scientific and technical activities, communication with potential exploiters of scientific and technical products, implementation of activities for transfer, use of new knowledge, technologies, products, services, manufacturing, and public sectors. The office should be a kind of a bridge between science, business, government, and industry.
   The office must perform the following tasks:
   - analysis of patentability of technical solutions to define the chances of patent obtaining.
   - preparation and support of applications for patents of all types of intellectual property.
   - preparation and maintenance of applications for registration of computer programs in the Copyright Office of the Library of Congress and the countries of the Berne Convention.
   - establishing a fund of patented national intellectual property objects.
   - conducting patent analytics using the analysis of the above-mentioned fund of patent documents.
   - analysis of the data available in the State Register of R&D.
   - support of negotiations of the parties on the issues of commercialization of R&D.
   - preparation of agreements on the creation and disposal of intellectual property rights (license agreements, agreements on the alienation of exclusive rights, copyright contracts, R&D contracts, etc.).
3. Modernization of epy State Register of R&D which will allow providing effective information support for promoting the results of scientific, technical, and innovative activities created in the Republic of Belarus, support for their transfer, commercialization, their implementation in innovative technologies, goods, services.
4. Optimization of the costs of maintaining the server infrastructure of scientific and technical libraries by accumulating stored information in the cloud and storing backups from the delegated body.

The SSSTI system contains 5 libraries that have their electronic resources and databases, as well as their server capacities for their storage.

When deploying information resources on cloud services, one of the ways to utilize (use) the freed-up server equipment may be to accumulate it in a single place for creating backup copies, which will save space on rented disk space and money.

5 CONCLUSION

Today, the most important national priorities of economically developed countries include the creation of an effective national innovation system (NIS) that ensures the competitiveness of the national economy in the context of globalization, and the creation of a lifelong education system that ensures the reproduction of "human capital", capable to generate, perceive and implement innovations. It seems to be impossible to solve these problems having no effective state system of scientific and technical information

While decentralized STI systems operate in many Western countries, a centralized-structured STI system is presented at the national level in such countries as the Republic of Belarus, the Russian Federation, and in several other countries of the post-Soviet space. The following global trends had a decisive influence on the development of the STI system in the world and the Republic of Belarus: the transition of countries to the innovative economy, an increase in the volume of information exchange at the international level, liberalization of access to the results of scientific research, the development of the Internet and IT technologies.

The National Innovation System of the Republic of Belarus follows current global trends, striving to create a single republican and global information and digital space. Moreover, the SSTI should, first and foremost, provide effective informational support for promoting the results of scientific, technical, and innovative activities of the Republic of Belarus.

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PREVENTION OF MONEY LAUNDERING IN THE BANKING SECTOR

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JEL Category: **G21, K42**

Abstract

One of the key issues in the organized crime world is the financing of criminal activities. Therefore, to successfully provide the necessary means for criminal actions, it uses various illegal methods and crimes. The money laundering attempts to hide the trace of money acquired through the act of a criminal offense in a way that it is inserted into legal cash flows. For this purpose, banks are often used in many ways - through deposits, money transfers abroad, and payment of counterfeit bills, credit transactions, and similar actions. Also, the so-called correspondent banking should be mentioned here, which effectively traces money in the co-operation of several banks. The central place of this work is the prevention of money laundering by the abuse of the banking sector. This is achieved through a strong control of the banking sector and operations by the central bank, then by drafting and adopting legislation and bylaws, which regulate mechanisms for reducing money laundering and financing terrorism and organized crime through financial institutions. The Central Bank is tasked with issuing recommendations for the improvement of the money-laundering system, cooperating with specialized bodies working on the prevention of money laundering, both at the national and international level, direct control over the taxpayers, and contacts with them. In the system of the Republic of Serbia, the National Bank of Serbia has the role of a supervisor in the banking system. In the case of detection of weaknesses in this system, the National Bank shall take appropriate steps in the form of correction of the minor system of money-laundering prevention and take corrective measures, following the legal regulations.

Keywords: *Money, laundering, crime, prevention, measures, banking sector*.

1 INTRODUCTION

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Money laundering is a criminal act that can be defined as concealing the origin of money coming from illegal sources, with the tendency to act as

legal money. Money laundering is closely linked to corruption, smuggling, financial fraud, and organized crime, and as a criminal offense, it falls into the category of derivative offenses, as it usually follows after some other work through which the money is illegally acquired. The very concept of money laundering is related to the United States, in the 1930s when money launderers were illegally acquired from the sale of alcohol, which at that time was banned, reported as their legal profits from car wash and laundry. In this regard, the term money laundering has been adopted, which is today very widespread in all countries of the world and represents one profoundly serious problem.

Money laundering is particularly important for the functioning of criminal organizations, which mainly from illegal funds finance their criminal activities. It is a complex work because it includes a series of actions aimed at concealing the origin of money illegally obtained and presenting it as a legal one. Given the complexity of this operation itself, it is clear that persons from criminal structures have to devise various money laundering mechanisms, which could, in a more efficient way, achieve their ultimate goal. Also, the money laundering process has its own three phases. These are the investment phase, the concealment stage, and the integration phase. Of this, it is also the most complex for the perpetrators of this part, the most important second phase, because it practically means legalizing the controversial money. (Bejatovic & Bejatovic, 2017, pp. 331-340)

The harmfulness of money laundering can be addressed in several aspects. Firstly, money laundering negatively affects the business of legal entities that directly violate business ratings and rules of free economic activity and competition. The tax burden is also borne by the tax sector, which is deprived of a significant amount of money, which avoids regular taxation. Money laundering seriously undermines the stability of the domestic currency exchange rate, and the stability of interest rates, money demand, and so on is jeopardized. (Boskovic, 2004, pp. 277-288)

In countries that are in the process of transition and development, the phenomenon of money laundering is much more prevalent. This is because these countries went through a very turbulent and non-transparent process of ownership transformation and that a significant amount of new capital entered those countries, for which it was often not possible to establish the origin with certainty. Money laundering in these countries results in unfair and unlawful privatization of the public sector, in which favored those who have come to the capital often illegally, which has denied investors who operate legally. Unfair competition and the creation of a certain suspicious layer of extremely rich individuals, who, apart from having a capital of dubious origin, have a very high political and social impact, contribute to the establishment of corruptive business conditions and unfair selection of market participants.

2 AMOUNTS OF MONEY LAUNDERING IN BANKING SECTOR

Money laundering in the banking sector is very widespread. Money laundering mechanisms in the banking sector are diverse, and the essence of this money laundering is the deposit of cash in cash or the purchase of payment instruments, the transfer of money abroad, and the subsequent integration of money into legal frameworks through repayment of loans, payment of simulated and falsified accounts. These three phases can be played at the same time, at the same time interval, and maybe time separated.

Money laundering can be done through correspondent accounts, when the banking services of a bank are provided through another bank, with the existence of a correspondent account on which the funds are located. By establishing global correspondent relationships, banks perform international transactions, both for themselves and their clients, even in those countries where they do not have their branches. Correspondent banking includes interbank deposit activities, international electronic system transfers, cash management, payments, and payments and transfers from foreign bank accounts. The space for abuses is created by avoiding direct contact between the bank and the client, but the services are performed without prior authentication. As a result, users of correspondent banking services are often "offshore" companies, there are no clearly defined anti-money laundering mechanisms and there is no possibility of

controlling individual transactions that are part of large transactions.

Also, electronic money transfers are often like money laundering. It is about online banking, where the transaction is done via the Internet and using modern technological means. The bank does not have any insight into these transactions, and whether or not the account was accessed by its owner or another person. This allows persons dealing with criminal acts of money laundering to make illegal activities easier, and it is also more difficult to get into electronic money because it can be transferred to the whole world without any difficulty.

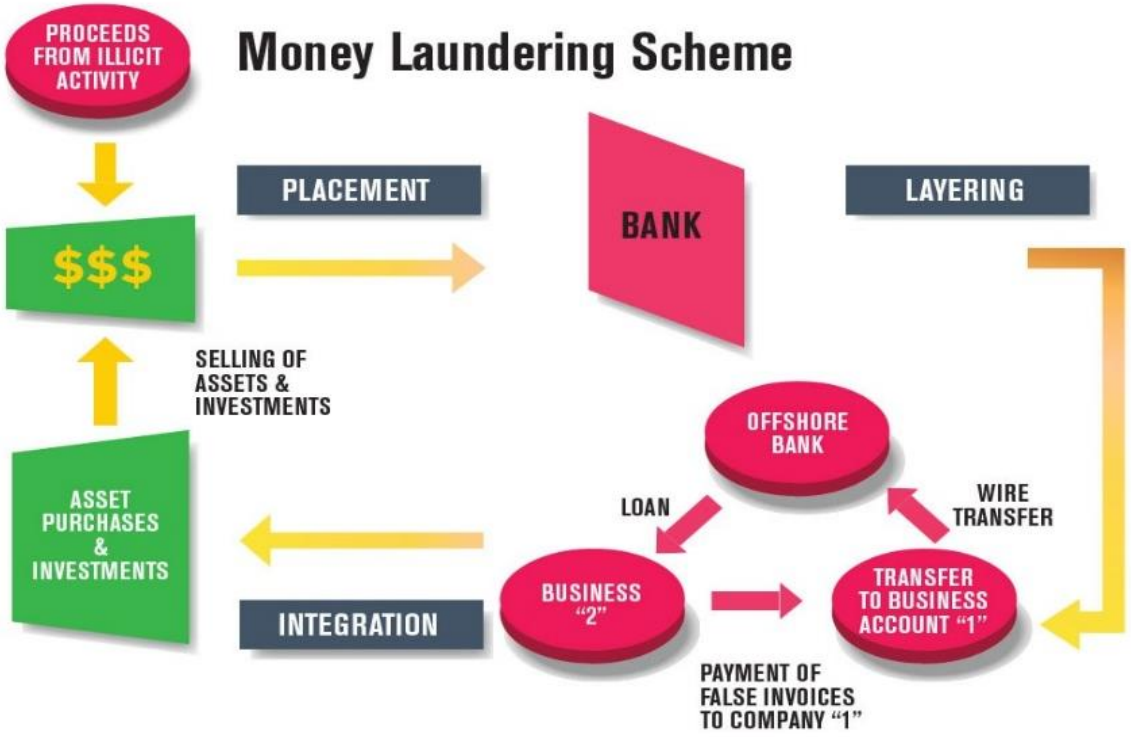

Figure 1. Basic money laundering scheme
Source: ACAMSTODAY, The Magazine for Career-minded Professionals in the Anti-Money Laundering Field

In the United Kingdom, the so-called "offshore" banking, which is characterized by extraterritoriality, developed. Offshore Banking includes branches of major international banks intending to collect deposits, managed, and disposed of by the parent institutions. A field of suspicious transactions occurs in unmanaged or insufficiently monitored locations, such as the Maldives, Marshall Islands, Cook Islands, the Dominican Republic, Luxembourg, Cyprus, Malta, Ireland, and others, in which the coefficient of monetary institutions' total funds relative to national GDP is higher. (Zirojevic, 2017, pp 16-26)

As a special type of money laundering, banking transactions performed by extremely wealthy individuals in a country should be noted. Given the reputation and material distinction these individuals possess, they also enjoy certain privileges with banks. This creates a private relationship on a bank-individual relationship, creating perfect conditions for illegal actions. Such a private relationship between the client and the bank allows certain transactions to be concealed, implemented beyond the provisions and regulations, for which the bank charges its "commission" and thus compensates for its risk of illegal work. Among the jobs that are done in this private relationship are counseling on property planning, investment, tax regulation, the opening of "shore" accounts, and involvement in complex procedures that involve the provision of financial transactions. The world's most famous is "City bank", based in the United States dealing with this type of business. It operates all over the world, has $ 700 billion of well-known assets, and over $ 100 billion in secret accounts of clients in private banks.

3 PREVENTIVE MEASURES IN COMBATING MONEY LAUNDERING

As can be deduced from the previous exposure, money laundering is a complex and damaging action, with several different enforcement mechanisms. As it falls within the category of recent criminal offenses in the relatively recent past, new and more effective measures to prevent money laundering are still being developed. (Cudan & Fijat, 2015, p. 144.)

In the fight against money laundering, both national legislation and international law institutions and institutions of supranational domestic legislation take part. Thus, in June 2015, the European Union adopted the Directive (EU) 2015/849 — prevention of the use of the financial system for the purposes of money laundering or terrorist financing. It enhances the application of risk-based approaches through strengthening oversight, rules for determining the actual owner, politically exposed individuals, and monitoring measures and good customer knowledge. Also, on the international level, bodies have been established, whose task is international prevention of money laundering and suppression of its harmful consequences. Thus, in 1997, the Committee of the Council of Europe established the Committee of Experts on the Evaluation of Anti-Money Laundering and Financing of Terrorism (MANIVAL), whose task is to assess the compliance of anti-money laundering and terrorist financing systems in member states with international systems. For this purpose, MANIVAL collects information and evaluates anti-money laundering measures in each Member State. After that, a draft of the harmonization is being drafted, and then the final version adopted at the plenary session. The final report contains an analysis of the situation, assessment of the situation, and recommended measures to improve the fight against money laundering. This body also has certain repressive measures, which it can apply to those members who do not respect the given recommendations. Repressive measures are reflected in the obligation to send regular reports, to send a diplomatic mission to that member, and to exclude that state from the community, as the most stringent measure.

In addition to MANIVAL, the Basel Committee, which deals with the supervision of banks, was established. He works on international cooperation to improve the control of banks' operations. It consists of the USA, Japan, China, France, Germany, Great Britain, Italy, Belgium, Russia, Australia, Canada, Argentina, Brazil, India, Indonesia, Korea, Luxembourg, Mexico, the Netherlands, Saudi Arabia, Singapore, South Africa, Spain, Sweden, Switzerland, and Turkey. Within the framework of the Basel Committee, four groups operate, and these groups for the implementation of standards, the development policy group, the accounting groups, and the consulting group. In addition to these groups, there are two subgroups within the committee. (Vukotic, 2012, pp. 14-22)

In 1989, a Financial Action Task Force against Money Laundering (FATF) was established in Paris, which promotes the policy of effective fight against money laundering and terrorist financing. FATF monitors the prevention of money laundering and cooperates with international institutions dealing with this activity. Also, this body has issued Guidelines for the Assessment of Money Laundering Risk, which defines money laundering and defines principles for assessing the risk of money laundering. (International standards on combating money laundering and financing of terrorism and proliferation of weapons of mass destruction, 2012.)

It primarily focuses on business risks and risk assessment methods, and principles of risk recognition are given. Among the risks is the risk of the state, that is, the geographical risk, then the risk of the client, and the risk of the transaction. The country risk or geographic risk is associated with the location of the client and the destination of the transaction. Which location has the category of high or low-risk location, determine parameters such as the country's exposure to sanctions, embargoes, then the level and degree of state co-operation with the IMF or the World Bank, then there are indications that the state finances terrorist organizations and its activities, as well as the rate of corruption in a given country. The risk of a client is a risk on the side of the party itself in a business relationship. Based on risk, clients are selected according to whether they perform their transactions in the usual way and under normal circumstances, whether on the client's side the

ownership structure is evident, whether clients use cash, including informal money transfer agencies, exchange offices, and casinos, humanitarian organizations that are not subject to controls, then whether they are politically-motivated clients, as well as persons carrying out transactions of higher value. (Strategy of the risk assessment of money laundering and financing of the Government of the Republic of Serbia, 2018.)

When assessing the risks of transactions, services, and products, it is based on international standards that determine certain services as high-risk services. These are international correspondent services and private banking services. Then, high-risk services include banknotes and precious metals trading, services that guarantee customers anonymity, value-added services, betting services, and casinos, services without direct contact with customers, and one-time transactions. (Pantelic, 2016, pp. 48-52)

4. CONCLUSION

Money laundering is a criminal offense with a high degree of social danger. In its character, it is derivative, because it follows after some other criminal offense, by which its perpetrator has obtained unlawful material gain. By money laundering, this illegally acquired money is placed in legal frameworks, thus legalizing the capital of those persons who have acquired it through the act of criminal offense. It is usually a capital that is acquired through a corrupt activity, trade-in influence, smuggling, wholesale trade, war profiteering, and in some other similar way. I am prancing money, except that money that is acquired is illegally given legality, these funds are directed to some other illegal and socially dangerous activities, such as terrorism and organized crime.

Consequently, the international community has passed strict regulations that detect the risk factors of money laundering and develop mechanisms for combating money laundering internationally. Also, bodies have been set up to carry out a supervisory function over the states in the implementation of norms that suppress money laundering, with the possibility of imposing certain sanctions in case of non-compliance with given norms and instructions.

If there are many money-laundering mechanisms, it can be seen from this paper, which emphasizes some of the key money laundering methods. Of course, the banking sector plays an important role in the money laundering process, especially in the onslaught of private banks and similar financial institutions with a very liberal way of working, with the absence of control measures, which creates a perfect ground for the development of money laundering. In addition to banks, investment funds, casinos and bookmakers, humanitarian organizations, then modern forms of electronic business and electronic banking, investment banks, companies, and the like should be mentioned.

In the end, money laundering as a detrimental social phenomenon should be eradicated. However, absolute eradication cannot be described from a serious point of view. Strict supervision of the banking sector, good knowledge of banking clients, and transparency of banking operations are a good way to suppress this type of money laundering. Also, a consecutive international policy on monitoring international financial transactions can result in a good effect and a reduction in the share of money laundered in legal financial flows internationally.

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TRANSFORMATION OF CAREER MANAGEMENT APPROACHES IN THE DIGITAL SOCIETY

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JEL Category: **J53, M12**

Abstract

The paper deals with the main preconditions for changing the views on the process of career management in modern conditions characterized by the alignment of the traditional hierarchical structure of the company and integration of digital tools into the processes of labor market regulation and company management. Arguments are given in favor of a new approach to considering the process of career management as a process of participatory cooperation of a company (representing the career space), a person (career self-management, through the development of skills, knowledge, and skills necessary for the company), with constant assistance from the state. Recommendations for all subjects of labor relations on the harmonization of career management in modern society have been systematized and given.

Keywords: *digital society, consciousness change, career management, participatory cooperation, organizational space, management*

1 INTRODUCTION

Before disclosing the essence of this article, it is necessary to define the terms. The meaning of the very definition of "career" in recent decades is changing rapidly. In traditional notions, a "career" is defined as an employee's vertical advancement in his or her career, both within the scope of his or her professional activity and outside it. At the same time, the phrase "to make a career" itself was a priori seen as a vertical growth achieved through a "gentleman's" agreement between the applicant and the company, when, in exchange for the loyalty and efficiency of the employee, the company, for its part, provides him with a guarantee of employment and decent pay, increasing in time. In other words, the main task of career management was to achieve certain stages

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in an employee's working life that would facilitate his or her advancement.

2 RESEARCH ISSUE

Today, in the period of the digital transformation of all life processes, change of patterns of behavior of participants of labor relations, change of views on the efficiency of employees and attractiveness of the traditional working schedule, there was a smooth rethinking of the process of career management, the main changes in the environment, the formation of which is presented in Table 1.

Table 1 – A paradigm shift in career management in the XX-XXI century

Indicator	Until the '90s the twentieth century	After the '90s the twentieth century	2010-2035 years	Moving force
Type of employment	Long-term	Temporary	Temporary	Modification of economic situations and legal norms
Employment Guarantee	Full	Not guaranteed	Not guaranteed	
Workplace	Stationary	Stationary	Stationary The lack of	
Working schedule	Installed by	Coordinated by	Flexible	
Specialization	Narrow	Wide	None	The objective is to provide employment
Career development	Vertical	Vertical, horizontal	Horizontal	
Personnel Development	Employer's objective	Coordinated task between employee and employer	Employee's task	
The source of replenishment of the staff	Internal	External and internal	External	Mobility
Staff rotations	Predictable	Agreed upon by the parties to the employment relationship	Not predictable	

Before discussing the problem of transformation of approaches to career management in the conditions of digitalization, we consider it necessary to give a clear idea of what should be understood by the term "career".

As social relations developed, the meaning of the definition of "career" underwent significant changes. Thus, in traditional notions, a "career" means a vertical promotion of an employee up the career ladder, both within the scope of his professional activity and outside it. At the same time, the phrase "to make a career" itself was a priori regarded as a certain vertical growth achieved through a "gentleman's" agreement between the applicant and the company, when in exchange for the loyalty and efficiency of the employee, the company, for its part, provides him with a guarantee of employment and decent pay, increasing in time. Thus, the main task of career management was to achieve certain stages in an employee's working life that would contribute to his or her advancement.

A change of views on the career management process was facilitated by the international integration of the business, strengthening competition, which required reducing the costs that could be found by changing the view on the traditional bureaucratic model of the company. The pyramidal structure of the company began to level out, absorbing a large layer of "office plankton" - a new competitive structure of the company was dominated by many one- and two-level structures. At the same time, this led to a sharp status and resource difference between the first and the second tier. Now for "career-building", an employee needs not so much quantitative (length of service in the company, loyalty to the management) as qualitative development, and

this care within the framework of a new paradigm of views becomes a task of an employee, not of the company. "Career building" for an employee is performed not so much up the career ladder but horizontally, which is career growth. This is exactly what Canter's research has shown (Kanter, 2016) that "instead of predictable progress, modern workers are forced to face the unpredictability of their position. They no longer have the certainty that they will work in the same profession and activity for which they were trained; they cannot be sure of retaining their place in the company, let alone being promoted to new positions and positions. They are offered a variety of alternative employment contracts, and none of them involve full and permanent employment. The main reason for the appearance of such contracts is that they help companies to reduce costs. The only asset of an employee is the ability to choose a job within or outside a company. As they improve their professional skills in the internal and external labor market, they also improve their career opportunities. The middle class now feels as insecure about job security as the working class; their position has become as determined by the unstable and volatile labor market" (Herriot & Pemberton, 2018, p. 23).

But, at the same time, the career takes an important place in the structure of modern man's needs - the need for self-expression and self-affirmation (i.e., one of the highest needs according to Maslow A.), thus influencing his satisfaction with work and life in general. A person's desire to anticipate career development with the help of management is also connected with the peculiarities of the Russian mentality - the desire to get everything and, if not at once, as soon as possible.

Each person is free to use his or her labor potential, free to choose the ways of his or her movement in the social structure and social space of society. But it is this freedom that generates competition between people, which poses the problem of each person's competitiveness, achieving personal success against the background of being ahead of others.

This is hugely different from the Asian notion of the professional development of an employee (smooth and long). It is noteworthy that, since 1950, the Japanese have started to implement the idea of Deming W. by motivating and eliminating the fear of being fired. Deming U. argued that the fear of losing his job prevents sincere communication and the desire to work well and blocks creativity. The Japanese applied these ideas in the post-war years by introducing a system of lifelong employment. The lifetime employment system covers about 35% of Japan's labor force employed in large companies and government institutions, which is one of the most important driving forces in the labor sphere, as shown in Table 1 (Bettli, 2007, p. 143).

Table 2 shows the main differences between the European and Asian approaches to human resources management, examining which we can see the smooth "expansion" of Asian approaches in the practice of European countries and Russia.

Table 2 The dualism of traditional approaches and the impact of digitalization during the personnel management process

European	Asian	Digital
For any task, you can find a person who exactly meets the requirements of the position and the requirements of the social system.	Everyone can be trained and precisely tuned to the right wave, to the requirements of the social system.	Everyone must be prepared to work under the proposed conditions from the outset.
You cannot change people; you can only replace them with others. Their qualifications and connections - everything can be restored by selecting the right people for the job. *There are no irreplaceable employees.*	You do not have to look for the perfect people. The most effective and reliable thing is to train and tune those who already work. *No untrained employees.*	In the age of digitalization in the world of the Internet, you can always find the most appropriate. *Perfect employees are*

European	Asian	Digital
What are the criteria for selection? On what categories, qualities, formal attributes to rely on? What methods to diagnose and evaluate?	Teach what? What do you set it up for? What methods to tune, motivate, stimulate?	What is the level of remuneration to motivate?
Short-term employment	Lifetime employment	One-time recruitment
Staff rotation system	Gradual, slow assessment and promotion	Lack of guaranteed staff rotation
Specialized activity	Unspecialized activities	Polyvariate activity
Quantitative control mechanisms	Informal mechanisms of control	Quality control mechanisms
Individual decision making	Collective decision making	External control
Individual responsibility	Collective responsibility	Individual responsibility
The secondary importance of using the human factor in governance	Primordial attention to the use of the human factor in management	The secondary importance of using the human factor in governance

The essence of the Asian system of personnel rotation is that the recruitment of the workforce is carried out once a year and coincides with the mass graduation of young specialists from educational institutions. Promotion is carried out only among persons who have worked in the company for a long time. For the first time, young employees are rotated ten years after they joined the company. All this does not contribute to the promotion of personal ambitious projects by young employees who are of immediate importance for the company, as in the future these projects may not only lose their importance but even bring losses to the company. By doing so, Japanese managers demotivate young employees to "support" their older colleagues and cultivate in them a trusting attitude to the elders, which is developed through the mechanism of group decision making (so-called rings). Group responsibility for solving a set of company's tasks is one of the keys to the success of Japanese companies (Ouchi, 1984, p. 184). In many respects thanks to it Japan today is a part of a world technological core (Lipsits & Neshchadin, 2017).

Hiring in European companies is usually short-term. Annual turnover can reach 50% of technical and clerical staff and up to 25% of senior staff. In response to high turnover, European companies employ rapid assessment and rapid promotion mechanisms. Naturally, with such turnover, a career that can be built is deeply specialized. Specialists name high career specialization as one of the reasons for high turnover in European companies, which carries with it the monotony of work, provoking the staff to seek diversity on the side.

The question arises, why then should modern European managers manage the career of their employees? The answer is obvious: managers are always focused on making full use of the potential of their employees, and the motivation for "career development" is unusually attractive to the employee. At the same time, employees are habitually oriented towards professional and job requirements, but the main reference points for them, as a rule, are time indicators: the speed and pace of job growth in the company, managerial age, which allows correlating the degree of progress in the hierarchy of the management system and the age of the applicant.

It is also impossible to bypass the issue of forming the organizational space of the company. The goal of the employee is socialization in the organizational space, while the company's goal is to preserve the integrity of this space, which is especially important for its professional and job-related component.

Traditional career management was a process of professional, personal, social development of a person, expressed in his or her advancement in

positions, qualifications, statuses, accompanying resource support for the expansion of the company's organizational space, or the development of social space (inter-organizational career). Career management touched upon such important factors as staff satisfaction with work in the company and related productivity and loyalty; continuity of professional experience and company culture; ensuring necessary and rational replacement of key positions; an internal increase of implicit knowledge of the company and growth of its competitiveness in the market.

In modern conditions, when not only the flattening of organizational structures affects the formation of personnel policy, but the whole range of digital tools, career management issues become a personal matter for most hired employees.

It should be noted that through career management issues the state has traditionally solved the problems of satisfaction with growth and development in the work of its citizens, which had an impact on reducing or increasing social tension in society, and the professional potential of each - on the dynamism and quality of economic and administrative reforms as a whole.

That is why, in the digital age, the state cannot allow self-management of careers and transfer of all responsibility to the level of each employee.

Career management in the digital age should be a participatory process of cooperation between the company (representing the career space), the employee (self-management of the career, through the development of competencies necessary for the company), with constant assistance in the field of employment and retraining from the state.

Let us consider the main stages of managing an employee's career in a modern company, which represents a systemic unity of company and employee.

Using the methodology of modern management, we will divide all stages of career development management into strategic, operational, and tactical.

2.1 Strategic stage of career choice.

Career strategy is very dynamic, as it is influenced by many different factors - mainly the market, changes in which conditions have a great influence on professional preferences and final career goals. The demand for different professions passes the test of time and does not always stand it. Saturation of the labor market with individual professions reduces the demand for them, "slows down" career expectations, while the demand is cyclical. The accuracy of forecasting trends in the development of the labor market and society directly affects the success of a career strategy. Special attention should be paid today to the Atlas of Future Professions, which require knowledge in the field of high technology and artificial intelligence. Modern HR-specialists believe that in the new digital labor market professional competencies will be replaced by sub-professional competencies, which will include effective communication and teamwork skills, knowledge of the foreign language, and robotics. Approximately 35% of basic skills will not be in demand in the new labor market.

Therefore, when building a career strategy, it is important to decide on the following positions, namely:

- how much the selected professional profile is in demand on the labor market (level of competition among the owners of this profile).
- the extent to which the chosen profession is opportunistic/status in the society.
- what other career paths/profiles adjoin the given profession, what are the requirements for additional education.
- which job position is the limit for the development of this specialization in the market/company.
- the extent to which the chosen professional profile depends on the specifics of the regional market (monocity).

If there are answers to these questions, and they allow one to conclude that the desired profile will allow to adequately self-realize, then this point is the starting point for the formation of a future career profile, which depends largely on the literacy of the person and often his parents. The company's influence at this stage arises only in two cases - in case of payment for the training of own employees, or in case of access of parents of a potential employee to informal power resources of the company, through payment for target contract training of a future employee in a higher education institution.

Evidence of the need to identify patterns in strategic career planning is provided by a study

showing that 23% of MBA students experienced significant career failures early in their careers (e.g. a period of inactivity of more than one month) and 13% experienced mid-career breakdowns (Schneer & Reitman, 1994).

2.2 The operational phase of career development

Despite the large number of random factors affecting the process of career management, it is worth trying to identify the main desired goals and set a sequence of actions to achieve them. This is the moment when both the employee and the company become full partners. In contrast to the past views, when the process of career building was considered by a person as a continuous action, continuing throughout professional life, today it is more appropriate to consider this process as a sequence of projects, that is, actions with a certain result, limited in time and resources.

It is known from management theory that it is always necessary to define a foreseeable goal for the foreseeable period, with tangible control points. Psychologists advise young specialists to go from the opposite - not who I would like to become within the professional trajectory of growth, and whoever I would not like to become. That is to define the specialties adjoining to the received professional field which are not the desirable object of a career soon. Today, most people proceed in their daily life from the following - they earn their living in one way, but self-actualization is provided differently - through hobbies, through non-commercial activity.

Having control points of future career development, it is necessary to pass to the definition of a logical sequence of the decision of a series of problems leading to career building. To take into account all the possible tasks that will need to be solved, it is better to conduct a small brainstorming session, gathering various participants who can "throw" a large number of steps required for the successful course of a career - and this, of course, is the company's task. Each of the tasks should be linked to the terms, conditions, and resources needed to complete the task.

The final document at this stage is an optimized career plan, which represents a real logical sequence of tasks and actions to implement them, considering the available resources and time constraints and opportunities.

Then we should proceed to direct implementation.

During execution, it is necessary to outline certain "reconciliation points" - usually they are bound to time. For example, once a month we look at all the achieved results, compare them with the tasks, perform analysis of actions, choose the most effective ones, and refuse from others.

Also, career management should pay attention to career risks, which include social risks; resource risks; and natural risks.

Social risks are heterogeneous, including social origin, gender, race, religion, educational demand, and the economic situation of the educational institution, the lack of necessary connections among those in power, disability since childhood, or sexual orientation. Social risks are risks related to an individual's origin, inherited and acquired social and property status, and personal and physiological characteristics. The presence of social risk does not mean that the development of a successful career will be impossible, but that a separate resource must be put in place to overcome the consequences of risk.

Resource risks are the degree of control over the resources needed to build a career, which largely determines a person's freedom to build their career. The initial stages of career-building usually require serious investment, and they begin to generate income after a long time.

Natural risks - the impact of factors beyond the control of the will of the person building his or her career: changes in market conditions, a ruin of the company, critical changes in legislation (political orientation) by the state and fiscal authorities, the collapse of the socio-economic formation, war, earthquake, flood and so on. Natural risks do not lend themselves to adequate forecasting when planning a career project, so their overcoming is connected, as a rule, with the beginning of building a new career.

Well-known researchers Buckingham and Coffman, who conducted several decades of research by the Gallup Institute on management efficiency, including career-building by internationally recognized successful managers, advise to remember six key issues at the initial stage of career building and listen to the following advice (Bakingem & Koffman, 2019, p. 123):

- Do I know what is expected of me at work?

- Do I have the materials and equipment that I need to do my job properly?
- Do I have the opportunity at work to do what I do best every day?
- Have I received appreciation or approval for a job well done in the last seven days?
- Do I feel that my immediate supervisor or someone else at work is taking care of me as a person?
- Do I have someone at work who encourages my growth?

These questions include details that are important for my role as a "catalyst". To achieve positive answers, the manager must perfectly fulfill four tasks: to choose the person, to formulate a "package of expectations", to stimulate and develop.

To select a person, to formulate his expectations from his work, to stimulate him, and to promote his career development - these are the four main components of the manager's role as a "catalyst", as a provider of the company.

At first glance, it seems to be the right advice. Many companies are guided by them. However, these tips miss the point. You will not create a great team by simply hiring people based on their experience, intelligence, and willpower. By observing the sequence of actions and working on the shortcomings of your employees, you are unlikely to ensure consistently high results. And preparing an employee for the next step of the ladder does not mean development at all.

Buckingham M. and Coffman K. rightly conclude that:

- employees should be selected based on their abilities, not just experience, mind, or willpower.
- When formulating expectations, it is necessary to clearly define the desired result, not to describe the work step by step.
- While stimulating the subordinate, we should focus on his or her strengths, not on his or her weaknesses.
- a person should be developed, helping him/her to find his/her place, not to climb the next step of the service ladder (Bakingem & Koffman, 2019, p. 23).

When forming an employee's career development strategy, it is particularly important to consider some psychological phenomena of "carte blanche" and "cooling". Usually, an employee who comes to the company or goes up the career ladder has a kind of "carte blanche" for the period from 3 months to half a year (the higher the post, the longer the period) for self-realization from the management. During this period, the employee pays 100%, regardless of some "cold" of the team, which arises because they managed to get used to it but did not have time to be accepted as "their". In response to this "coldness", the employee "cools down" himself. If during this period the employee can force himself to invest almost 100%, then the period of "carte blanche" will return, but with a shorter duration. And so, it will be until the company begins to react confidently to him as its "own". The period of equalizing the attitude to the employee is directly proportional to the level of his authority: the more authority, the longer this period is. Sometimes an employee may make an emotionally wrong decision to leave the company at the stage of "cooling down" to himself.

3 CONCLUSIONS

Since the satisfaction of employees with their work (including career advancement) is one of the factors to increase the competitiveness of the company, a career management system is necessary.

Such a system should apply to all employees holding (or applying for) management positions, not only those selected for the personnel reserve.

The career management system should be based on an analysis of work and competency models for each organizational level, which is increasingly fragmented.

If the career management system functions correctly, employees share responsibility for their development and are sufficiently motivated. Employees should be aware that their career is in their own hands and depends on their efforts.

The Company opens new ways for them and must provide them with resources (possibly on co-financing terms).

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INNOVATIVE TECHNOLOGIES IN MANAGEMENT

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Abstract

Almost all innovation is the result of a concerted effort. Research shows that when developing a new product, businesses are constantly interacting with their suppliers, users, and research institutes, and the quality of such interaction has a clear impact on the innovation process. The relevance of the article is that innovative technologies in management play an important role in the growth of the enterprise and serve as an important competitive tool. The purpose of the article is to explore innovative technologies and the effectiveness of their implementation. Innovation management is also investigated, which should guarantee the effective use of innovations and directions for improving the efficiency of functioning and development of enterprises in competitive environments, taking into account innovative technologies. The article aims to structure innovations depending on the aspects of accounting, their types, and economic effects. We have proposed a generalized system of innovative management technologies based on other studies. A structured system of information support for innovations has also been developed to make effective decisions. The expediency of the application of innovative technologies in management is substantiated and their influence on the development of the enterprise is revealed. Although the relationship between innovation and financial performance is not straightforward and straightforward, our research indicates a strong interaction between sales growth and various innovations in business processes related to R&D spending work.

Keywords: *technologies, innovations, innovative technologies, innovative management, technologies in management.*

1 INTRODUCTION

The modern era of economic and social development is often called the era of technology. In technology, they see the saving of resources, the rational use of time, environmental protection of human beings, the safety of life, waste-free production, opportunities for automation of operations, and many more.

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That is, modernity is an era of technology, and to succeed, it is necessary to improve technologies that will lead to efficient, quality production. Equally important are the technologies of management, which solve consistently, purposefully, timely, economically and successfully set tasks (development and implementation of management decisions)

2 TECHNOLOGIES OF THE INNOVATIVE APPROACH

The word "technology" means, based on individual principles, methods, and patterns,

methods of action or a set of actions over an object, raw material, resource, to obtain a result, product, or new quality, condition (Kondratiuk, 2017).

In the works of O.G. Melnik and O.E. Kuzmin states: "management technology is a consistent flow of general management functions (planning, organizing, motivating, controlling, regulating), which implements specific management functions (production management, finance, sales, etc.). In other words, it is the process of implementing specific management methods using common management functions" (Kuzmin, 2003).

But Griffin R. believes that: "... it is a conversion process used to transform attachments (materials or information) into the release of goods or services." (Griffin, 2001).

Therefore, today requires significant reforms in the activity of enterprises, for successful development, and therefore it is necessary to introduce innovative technologies. It should be noted that information technologies ultimately contribute to improving the competitiveness and efficient development of enterprises.

The result of innovative technologies is innovation, which, from the moment of adoption to the dissemination of innovations, acquires new quality, and becomes innovation.

The uniqueness of the innovation process is explained by the integration into a single system of science, technology, enterprise economics, and management (Resler, 2017).

Thus, innovation is an innovation related to the scientific and technological process, which consists in the restoration of fixed assets and technologies, in improving the management and economy of the enterprise. Innovation is a prerequisite for the development of production, improvement of quality, and quantity of production, the appearance of new goods and services.

Technological innovations can rarely be developed by one firm in the space industrial environment. It usually takes a lot of additional innovations before the technology is suitable for commercial use. Many innovative strategies are based on the unique application of an integrated set of technologies in the market, rather than the need for a technological breakthrough. The technological innovation process consists of four main stages (Dasgupta, Sahay, & Gupta, 2009):

1. problem recognition.
2. idea generation.
3. the choice of technology.
4. development and implementation of solutions.

Given the above, Innovation management creates an entity that acts as a carrier of innovation, favorable and beneficial competitive advantages. Tearing resources from a routine cycle, the entrepreneur uses them in a new way. There can be at least five possible varieties of innovations:

- creation of a new product (service).
- creation of a new method of production.
- opening a new market for sales.
- use of a new source or type of raw material, energy.
- introduction of new principles of organization of activity of the firm.

Success or failure in the activity of an innovation manager fully opens the market, which places strict requirements on the results of its activity.

Innovation in a broad sense means the profitable use of innovations in the form of new technologies, types of products and services, organizational, technical, and socio-economic decisions of industrial, financial, commercial, administrative, or other nature (Fig. 1).

Innovation management must ensure the effective use of innovation and direction to improve the performance and development of organizations in a market environment, considering innovative technologies. The main functions of innovation management are analysis; prognostication; planning (strategic, ongoing, and operational); organization; motivation; accounting; control; coordination; regulation; leadership.

DNS technology management in general includes:

- development of plans and programs of innovative activity.
- supervision of the development of new products and technology, its implementation.
- consideration of new product and technology development programs.
- ensuring a unified innovation policy and coordination.
- providing financial and material resources for innovation programs.
- approval of temporary target groups for complex solutions of innovative problems - from idea to average production of products.

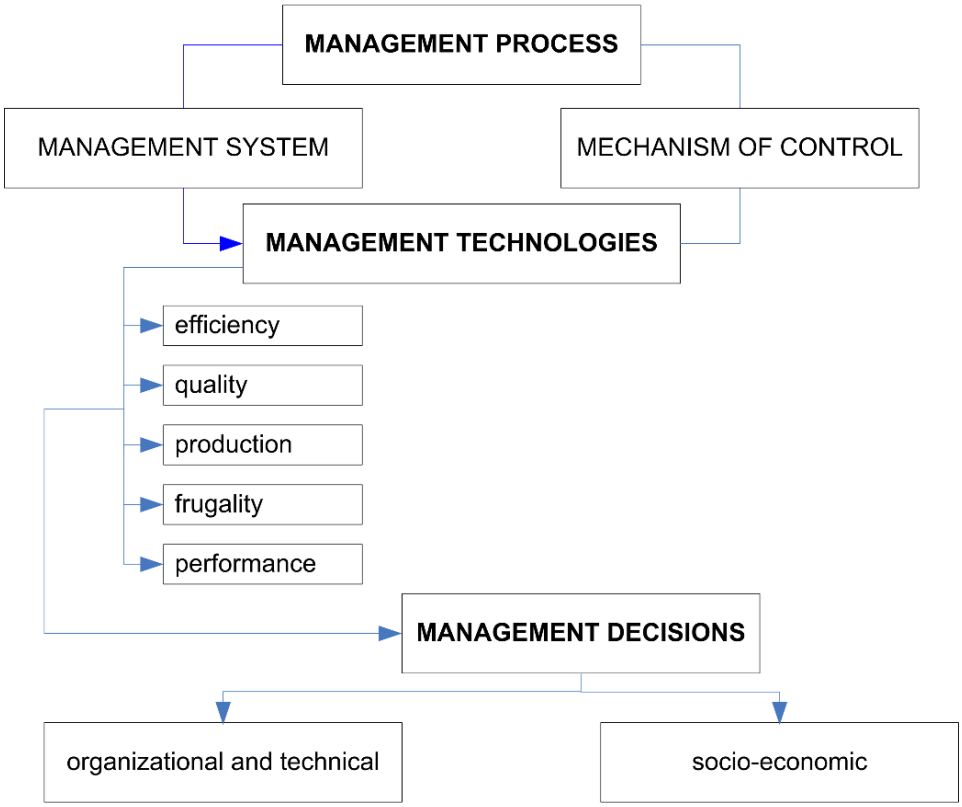

Fig. 1 Management technologies

Thus, the key role in innovative management technologies is played by the scientific sphere, which is regulated by the Law of Ukraine "On Scientific and Scientific and Technical Activities" (Zakon, 2020) and defines:

- the role of the state in the development of science and technology, the use of scientific and technical results to transform social production and meet the needs of people.
- the main goals, directions, and principles of the state scientific and technical policy.
- Forms and methods of state regulation of scientific and technical policy.
- the form and methods of state regulation in the scientific and technical sphere.
- powers of state bodies in the implementation of scientific and technical policy.
- economic and legal guarantees for the development of scientific and technical activities.

Innovation at the present stage of economic development is becoming the main means of maintaining competitiveness and becoming an integral part of business activity. Management of innovations is carried out in parallel with the management of the existing traditional enterprise. Innovation management methods are different from traditional production management methods since innovation processes are aimed at creating previously non-existent products, qualitatively updating production forces, and production relationships.

It should be borne in mind that time is constantly devaluing existing products and technologies so that to avoid technological backlog, innovations should be forecasted and dealt with constantly, and not only when critical circumstances arise. Product, technological and organizational innovations are interconnected, so they must be comprehensive. The main principles of innovation management are:

- the principle of continuous forecasting of the innovation situation.
- the principle of dynamic prevention of technological backlog.
- the principle of systematic introduction of news in the interconnected spheres of business activity.
- the principle of combining investment with innovation.
- the principle of combining financial and engineering analysis of innovation performance.

The main product of the innovation market is the scientific and scientific-technical result - the product of the intellectual activity, which is subject to copyrights, designed following the current international law and the current legislation of Ukraine.

Market development and competition not only stimulate but also force commercial organizations to take part in shaping the market for innovations in the following areas:

- development of a personal scientific, scientific-technical, and experimental basis for carrying out research works.
- researching on a commercial basis with other organizations.
- placing orders for research or experimental work with another organization.
- acquisition of licenses for the right to produce goods or services.
- purchase of finished products, technologies, know-how, and other intellectual property.

The main condition for the formation of the innovation market is the volume of investments in the field of scientific as well as scientific and technical activity. Given the length of the innovation process in 3-5 years, long-term and medium-term investments play a key role in ensuring that innovation is funded throughout the life cycle.

It should be borne in mind that innovations are always risk-related but refusing them is even riskier. Very often, the need to upgrade a product or technology arises when the financial results of the enterprise are looking good and the mistaken impression is that the enterprise may continue to exist traditionally for a long time.

The task of the innovation manager is to overcome this contradiction, to persuade the management and the whole team to make changes if it is possible at the expense of a temporary decrease in revenues to ensure their significant growth in the future. The fact is that the decline in investment income from existing traditional technology may initially seem insignificant, but if competitors make the breakthrough in new technology, consumers can very quickly favor competitors' new products.

Technology management requires large resources, the accumulation of a large amount of knowledge and information, the coordination of many performers, the formation of demand for new products, the psychological preparation of the team to receive news.

The innovations are related to the painful redistribution of resources between the existing and the new production, with the disturbance of the equilibrium in the economic system by the reorganization of production, the retraining of workers. Sometimes the decision of the management on innovations seems such that by artificially slowing down innovations, it is possible to lose perspective in the market of goods and services or to bankrupt the enterprise altogether.

Scientific and technological progress, identified in the world as the most important factor in economic development, is increasingly associated with the concept of innovation. It is a one-of-a-kind process that combines science, technology, economics, enterprise, and management. It lies in obtaining innovation and extending from the origin of an idea to its commercial realization.

The flow of the innovation process is conditioned by the complex interaction of many factors. The results of activity in the innovation sphere not only affect the society and the NTP, but also test for its reverse influence, and in all aspects: scientific, technical, organizational, social, industrial, economic.

To characterize the innovation process, a category is used to designate its most important internal component - the concept of "diffusion of innovation" (transfer and application of advanced innovation).

It should be emphasized that diffusion is not always a consequence of innovation, and possible reverse situations.

The following phases (stages) should be distinguished in the innovation process:

- achievement of fundamental science.
- applied research.
- research and development.
- primary development (production).
- widespread implementation.
- using.
- aging of innovation.

The higher the spread of innovation, the more "automatic" the channels of diffusion of innovation. Different methods are used to regulate innovation processes in different phases, as these goals have different goals.

Successful commercialization of technological innovation is largely determined using additional assets and knowledge that can be embodied in the marketing, production, and marketing activities of firms. The result of applying innovative technologies to an enterprise management system is determined by economic indicators such as (Zdobuvach, 2010) :

- the amount of increase in profit obtained by saving on cost reduction.
- the volume of increase in revenue from the growth of sales of innovative products due to its new quality.

The global survey of 201 companies in 9 cities showed that half of the companies believe that innovative efforts to significantly affect the increase in their income due to increased sales. Every fifth innovation leader expects a 15% increase in profits over the next five years. PwC studies have shown that the revenues of companies that spend more than 25% of their R&D budgets on software are growing faster than those of key competitors that allocate less than a portion of their development budgets. The last ten years of the Global Innovation 1000 Annual Survey have found no statistical correlation between the amount of R&D money and financial results.

That is, how innovative dollars are spent is more important than their number. According to polls, traditional scientific research is twice as inferior to models of operational cooperation. One-third of companies say that customers are their most important innovative partners. From the outside, technology partners are most important, and from the inside, our employees. However, to become an innovation driver, employees need innovative behavior and culture, fresh thinking, and innovative leadership from top executives (Zhmerenets'kyy, 2017).

The use of innovative technologies in management leads to:

- increase in productivity and flexibility of the enterprise.
- shortening the duration of the production cycle and/or increasing the speed of service provision.
- improving the quality of goods and services provided.
- Expansion of market presence.

3 CONCLUSIONS

The study found that the creation, development, and application of innovative technologies can serve as a basis for the success of the enterprise. Not only are innovative technologies an important competitive tool, but they also play an important role in enchanting enterprise efficiency. Although the relationship between innovation and financial performance is not only straightforward, our research indicates a strong interaction between sales growth and various innovations in business processes related to R&D spending. It has been found that innovations in the management process have a positive effect on financial results and market position.

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PROSPECTS FOR THE IMPLEMENTATION OF BLOCKCHAIN TECHNOLOGY IN RUSSIA

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Abstract

This article explores the best practices of the use of distributed registry technologies that are currently in place in different countries, formulates proposals for the use of blockchain technologies in Russia. Blockchain technology has enormous potential for applications in sectors such as banking, finance, management, and cybersecurity. This technology can be applied in the field of healthcare to solve the problem of reliability and confidentiality of the information and improve the quality of medical services. The scope can be maintained by registers, cadasters, etc. The article substantiates the need for the development of state regulation of distributed registry technologies. The work provides examples of the implementation of blockchain technologies in various sectors of the economy, including in the field of public administration and the provision of public services. It is noted that the current state of the legal framework for the use of blockchain technologies in Russia is at the initial stage of development. It is concluded that blockchain technology, being an effective tool on its basis, contains relevant solutions to the problems of the digitalization of the Russian economy. This indicates the serious potential of blockchain technologies, and there is every reason to believe that blockchain will become one of the most important components of the emerging digital economy and those innovations that will take the development of Russia to a fundamentally new level.

Keywords: *blockchain technology, digital economy, distributed registry*

1 SETTING OF A PROBLEM

The report of the World Economic Forum (WEF) gave the following definition of blockchain technology or distributed ledger technology (DLT): it is a technological protocol that allows direct data

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exchange between various contracting parties within the network without the need for intermediaries. (Bosenko, 2019)

A Cisco study says that by 2021, the blockchain market will be capable of reaching $9.7 billion. By 2027 10% of global GDP will be stored in blockchains due to the rapid development of technology. According to Cisco and IDC, the blockchain industry will grow at an incredible pace, as it lays the foundation for the development of the so-called programmed economy, which is projected to reach $ 3 trillion by 2030. The big driving force in this revolution is related to the growth of the API economy and the way technology is used in corporate business. Despite the technological development, methods of operating a business through the Internet are facing new challenges. Today's organizations are increasingly facing processes of managing data and transactions between many unreliable parties. It follows from this that blockchain technologies should first solve the tasks of transparency, complexity, and security.

The current interest in blockchain technology is because two approaches are used to ensure the reliability of the information, and each of them matters if there is another, namely:

1. **Proof-of-Work** - participants in the transformations solve cryptographic problems of changing complexity. The more information resources on the network, the more difficult the task. This approach led to a craze for mining in the world of cryptocurrencies.
2. **Proof-of-Stake** - participants do not solve cryptographic problems but validate transactions by “freezing” as a mechanism for confirming ownership of this good. When an agreement is reached on the network, transactions are added to the blockchain, when defrosting, the miner gets back the amount with a commission for recording the transaction on the blockchain. (Belokrylova & Goncharova, 2019)

As for the main advantages, special attention should be devoted to the following of them: the trust of Blockchain entities to each other, eliminating external interference in the system; constant open access to the possibility of control over the operations performed "from within", that is, by the system users themselves; stability of the integrity of the stored data due to the distributed storage system, which does not allow the performance of data without the consent of all entities involved in the data chain; increasing transaction speed.

As for the thread of use of the blockchain, experts identify the following areas:

- finance.
- banking.
- management of land and property complexes (both at the regional and municipal levels).
- healthcare.
- logistics.
- trading.
- construction and others.

The advantage of the blockchain, first of all, as a reliable way to ensure the security of the transmission, use, and storage of information in a huge network of interconnected elements, is determined by the need for synchronized changes in each of them, the identification of dangerous software using hash functions, etc. The most certain advantage of the blockchain, in our opinion, is its definition as the Internet of things. Security in the context of information is currently associated with this technology to a large extent.

The impossibility of gaining access immediately to all the components of the chain, where each of them contains the necessary information, the lack of the possibility of the inverse transformation to obtain the initial code - these are some of the components of reliability.

Transparency is another advantage of the blockchain.

The use of blockchain technologies in the design and operation of smart cities, the creation of which is receiving increasing attention in many countries of the world, is crucially important, in our opinion. So, smart healthcare can only work on the principles of this technology discussed above. The preservation of patients' data, the impossibility of changing them, falsification, using for criminal purposes is a solution to social, economic, and moral-ethical problems in this area. This becomes fundamentally important in the face of the emergence of new threats to humanity when the prompt use of reliable information determines not only national security.

Smart transport. If we consider only a part of it, namely, haulage, it should be noted that in this industry various types of transport are combined into a complex network distributed all over the world. Blockchain in transport routes allows you to reduce costs and time, increase competition, reduce the likelihood of errors and risks. The introduction of blockchain in logistics requires the creation of standards in the field of transportation. Currently created platforms (for example, ship chain) allow you to track the location of the cargo, and this information is available only to official participants in the process.

In Russia, the blockchain has been widely used in complex, large trading networks that have created independent decentralized systems that can reduce costs while increasing the reliability of the provision of goods to individual units. Of interest is the Factorin platform, which was created for the Dixie group of companies, and the development and implementation required only a year and a half and gave positive results. The transition to this platform will reduce the need for partners in working assets because in this case, banks and factoring campaigns take over the lending function. All this allows, among other things, to reduce transaction costs.

We should separately highlight the problem of smart contracts that are still not widespread in Russian business and worked out from the point of sight of the law. Identification of the terms of the contract and the actions performed by the parties to the contract allows for automatic payments, transfer of ownership, currency exchange, and other operations. Virtual agreements on the rigidity of control, including due to the maximum reduction of the human factor, the obligation to fulfill the originally pledged obligations, surpass traditional forms.

The use of blockchain technologies can be significantly hampered by an insufficient elaboration of legal issues, namely patenting the results of intellectual activity. Many questions will arise if you need to use several technologies. The prospect of such a combination is undeniable.

Particularly acute is the competition for the possession of the rights to commercialize the development results in the United States, where blockchain technologies are most developed. Most likely, patent holders will act not only for protection but will also transfer the patents they receive to consortia that seek to facilitate the implementation of blockchain in the financial sector. Thus, patent protection will become an integral element in the development of blockchain technology.

We note the traditionally weak position of the developers of the Russian Federation in the global patent business, which today is an inhibiting circumstance in the issues of security of the proposed blockchain algorithms.

Thus, Blockchain technology is one of the bricks in the foundation of the new formation, and the future position on the world stage and the role in global relations depend on how actively the state will contribute to its implementation.

2 EXPERIENCE IN IMPLEMENTING BLOCKCHAIN TECHNOLOGY IN OTHER COUNTRIES

Estonia is the leading country in adopting blockchain technology primarily in healthcare and property management. Citizens and residents of Estonia can use cryptographically secure digital ID cards equipped with blockchain infrastructure, which provides access to various public services. On the blockchain platform, users can verify the safety of personal information located in state databases. Voting by members of stock companies is also possible through the blockchain. (Tsvetkova, 2017)

Estonia is one of the leading countries in the field of cybersecurity, state subsidies go to the development of many projects that make it possible to simplify the use of public services by citizens as much as possible. (e-estonia, 2020)

The E-Estonia program covers such global spheres of life and society as:

- Electronic identification (ID-cards, Mobile IDs, Smart-ID, "Electronic Resident").
- Internal operational services (X-Road, Land Register, Population Register).
- Security (Electronic Signature System, Electronic Justice, Electronic Law, Electronic Police).
- Healthcare (Health Register, Electronic Ambulance, Electronic Prescriptions for Medicines).

- Government services (Government Cloud, Information Embassy, Electronic Voting, Government Meeting Information System).
- Mobile services (Smart Transportation System, Mobile Parking, Landing Queue Manager).
- Doing business and finance (Electronic tax, Electronic banking, Electronic business registry).
- Education (Estonian Educational Information System, E-school, E-portfolio) and others.

Briefly describing the system for the provision of electronic services that has been formed to date in Estonia using Blockchain technology, it is necessary to note the fact that it is the concentration of these services within the framework of an integral state project that allows Estonia to maintain decades of global pace. After analyzing the structure of services, on can note that similar projects are presented in many countries of the world, but it is precisely the systematic nature that gives the Estonian experience uniqueness.

The city of Seoul for the Republic of Korea is, literally, a litmus test in the application of various technologies and innovations. Being the capital of the state, Seoul was chosen as the center for the initial implementation of Blockchain technology in the everyday life of citizens.

On the territory of the city, large-scale programs for working in the information and management field have been launched, which include smart metro projects, projects to minimize the cost of unprofitable transport, solve the multi-factor taxi problem, minimize traffic accidents involving children and older people, the smartphone-for everyone ", as well as the u-Seoul Safety Service, which contribute to Seoul's technology system.

When making this or that decision, a huge number of indicators are considered, which, together with a well-established system of civic inquiry, give the city's socio-economic growth as a result.

New technologically and advanced services are being tested at Living Lab. Also, the decision to abandon or eliminate an innovation is not made by officials, but by a community of citizens who may be affected by the changes through the M-Voting voting system. (pwc, 2015)

As a result of a careful collection of statistical data, one can judge the changes occurring from a project. For example, having formed a system of night routes, Seoul can serve as a good example of the effects of the implementation of Blockchain projects. Thus, the creation of 9 optimal night routes, considering the load on transport hubs, reduced the number of vehicles used at night to 50 buses.

The following can be considered as examples of initiatives by some governments of the application of blockchain technologies. In November 2019, Indian Minister of Electronics and Information Technology Sanjay Dhotre announced the launch of a national blockchain deployment program in the country. The Government of India has already allocated $ 900 thousand to launch a project called the Distributed Blockchain Technology Center of Excellence, which will bring together the Center for Advanced Computing Development (C-DAC), the Institute for Development and Research in Banking Technologies (IDRBT) and the Institute of Technology Veermata Jijabai (VJTI). The project is aimed at the development and pilot implementation of blockchain solutions.

The Indian state of Telangana is already testing a blockchain platform for registering property. Although landowners have noted the clear benefits of blockchain that make it easier to obtain documents, the problem of corruption remains. The data stored in such a system cannot be changed after entering, but so far, no way has been found to prevent government officials from entering deliberately incorrect information.

In India, the Proof-of-Existence (PoE) blockchain structure will be used to authenticate diplomas, certificates, contracts, and other documents. Also, the PoE platform can be used to control vehicles and hotels. (Ivanov, 2019)

Blockchain in Great Britain. Blockchain found practical application in the work of state bodies when registering transactions related to social security. It is believed that blockchain can help in areas such as reducing fraud, protecting critical infrastructure, and registering assets.

Blockchain is accepted for use in management systems in countries such as Finland, Singapore, Dubai, Switzerland, and this list will only increase. (Tsvetkova, 2017)

3 IMPLEMENTATION OF BLOCKCHAIN TECHNOLOGY IN THE RUSSIAN FEDERATION

In the Russian Federation, the use of blockchain technology to maximize the creation and development of the digital economy is established in the Digital Economy of the Russian Federation Program. The government supports development, including through pilot projects to protect the results of intellectual activity in the field of the digital economy. It should be noted that back in 2016, a working group of the Central Bank of Russia was formed to study the prospects for introducing new technologies in the financial sphere. In the same year, it was announced about the creation of the Central Bank of the Fintech blockchain consortium in partnership with the ten largest banks in Russia, for "... a comprehensive study of the technology of distributed registries and their capabilities. The consortium is created in the form of an association. Among the goals of the consortium are technological, regulatory, practical, and communication. (Tsvetkova, 2017)

A center was created at the National Research Nuclear University MEPhI whose main goal is to create its blockchain technology platform and applications for industries.

It should be noted that many companies have signed agreements on the creation, implementation, and promotion of blockchain-based technology products. The technologies under consideration provide a trusting relationship due to the reliability and safety of information because errors or fraud are not possible without stating them. (Ivanov, 2019)

Sberbank of Russia carried out 15 pilot projects, some of which found practical application. For example, it is planned to use the blockchain platform for processing real estate transactions. German Gref, Chairman of the Board of Sberbank, noted that to use this technology, it is necessary to amend the Russian legislation the Federal Law "On Personal Data". (Bulgatova & Sandakov, 2018)

Blockchain technologies have prospects for widespread use in voting. The first such experience in Russia was successfully acquired when testing the Blockchain with the holding of the meeting of bondholders of the National Settlement Depository. (Belokrylova & Goncharova, 2019)

In 2019, the Skolkovo Foundation and Waves created a blockchain center, the purpose of which is to help businesses and government agencies to implement distributed registry technologies.

By generating ideas on the practical application of the blockchain, testing them, prototyping, supporting promising startups, and helping businesses to implement the blockchain, the center expects to popularize this technology in the country. Waves Enterprise, the Waves Enterprise unit focused on corporate projects, will deal with expert and analytical support for the blockchain center. Skolkovo and Waves expect the company's customers and partners to be large companies and departments in which bureaucratic and business processes can be simplified using technology. The center is going to invite world experts on the use of blockchain in business in Russia and organize its educational programs. (Ivanov, 2019)

These advantages give reason to think about the need to accelerate the transfer of technology in large volumes to areas that go beyond the usual notion of Blockchain, for example, in areas related to state and municipal administration. Several projects are proving that the application of Blockchain order technologies opens new opportunities for a society that government agencies are not able to give in the usual sense.

Using blockchain technologies will achieve significant results:

- in the field of technology (independence from foreign developments in financial infrastructure; maintaining confidentiality, including the number of medical data; increasing the security of state information systems).
- in the field of economics (obtaining significant economic direct and indirect effects by increasing GDP, reducing costs and losses).
- in the social sphere (accessibility of services, including banking, improving the quality of public services, increasing the level of services to the public, including medical).

Considering the specific prospects for the introduction of technology in Russia, it is necessary to highlight the conceptually promising

and most likely projects for early implementation. (Butusov, 2019)

These should include, first, the implementation of Blockchain in the activities of portals providing state and municipal services. One of the primary and socially significant projects in this area may be the reform of the existing queuing system for social benefits, which includes queues for kindergartens and other educational institutions, as well as subsidiary queues.

Building a system of social queues based on a distributed data registry will at least simplify the process of transferring data to the conduct of similar departments when changing places of residence, as well as monitor all processes occurring within the queue.

These measures can minimize the cost of transferring data from one territorial unit to another, as well as reduce the burden on the employees of departments. Also, this “ferry” system would reduce paperwork, which is still the scourge of Russian office work.

For a comprehensive solution to the problem of transferring from one territorial unit to another, it is necessary to create a concomitant system for assessing and analyzing personal data, as well as data on the previous position in the queue, etc., which would help determine the position in the new queue.

4 CONCLUSION

The introduction of technology at the level of state structures should be accompanied by a multivariate analysis of the advantages and disadvantages, and the economic assessment of the expected results based on the principles of saving budget funds and the profitability of these measures should also serve as a basis.

Today in Russia there is a relatively large body of successful mathematicians and programmers, in this regard, the development of blockchain technology may allow Russia to gain an advantage over other countries

The undoubted advantage of Russia is lower electricity prices compared to a sufficiently large number of countries, which is becoming increasingly important with increasing energy costs necessary for the operation of blockchain technologies

We would like to note that the blockchain has every reason to become the main driving force for the development of both the digital economy and the country's economy. There are a large number of problems both tactical and strategic levels that need to be addressed quickly. Significant financial resources will be required for complex, systemic transformations.

A review of Russian developments gives reason to note their rather high competitiveness, unique staffing, which gives reason for a positive outlook on the development of blockchain technologies in Russia.

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THE "RATCHET EFFECT" IN THE GROWTH OF GOVERNMENT: A VIABLE HYPOTHESIS FOR THE CASE OF ARGENTINA?

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Abstract

The present work analyses the "Ratchet Effect" theory as developed by Robert Higgs, originally presented to explain the dynamics in the growth of government for the case of the US, to study its possible application to the case of Argentina. The theory explains that the government grows during recessionary periods and later decreases but in a lower proportion than the initial expansion. Hence, a ratchet is identified in the government growth dynamic. For this purpose, a quantitative analysis is presented based on the econometric model by Hercowitz and Strawczynski, by using the data of Public Expenditure of Argentina corresponding to the years between 1961 and 2009. Although a qualitative analysis of the kind presented by Higgs is not developed in the present work, a quantitative analysis does not corroborate the application of the theory to the case under study. Therefore, our study claims that the government growth dynamic in Argentina is different than in the US, or any other country that registers a specific government growth compatible with the "Ratchet Effect" theory. Although our analysis does not invalidate the possibility of the existence of a specific dynamic in the growth of Argentina´s government compatible with Higgs' hypothesis based on qualitative data, we believe that a quantitative corroboration of the theory is relevant to identify its applicability in any given case.

Keywords: *Government Growth, Ratchet Effect, Argentina, Robert Higgs, Business Cycle*

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1 INTRODUCTION

The present work analyses one of the thesis for explaining the growth of government, as developed in the work *Crisis and Leviathan: Critical Episodes in the Growth of American*

Government by Robert Higgs (1987). Since the author studies the application of the Ratchet Effect in the case of the US, our goal is to analyze the possibility of corroborating such a hypothesis for the case of Argentina.

First, we will present a brief exposition of the hypothesis and the analytical and methodological framework developed by Higgs. Then we will apply such hypothesis to the case of Argentina to test its soundness using the data of Public Expenditure corresponding to the years between 1961 and 2009 (Rodriguez, G. & Borrrone F., 2012), and applying the econometric model developed by Hercowitz and Strawczynski (2004) in their work "Cyclical Ratcheting in Government Spending". Finally, we will conclude with some final remarks.

2 THEORETICAL FRAMEWORK OF THE RATCHET EFFECT IN HIGGS (1987)

Higgs (1987) begins his analysis by presenting a brief exposition of methodological criteria and several approaches concerning the growth of government in general, to justify the alternative hypothesis chosen as the proper ones in explaining the growth of government in the US.

Under such analysis, the author identifies those hypotheses which are often presented as the most common causes for the growth of government. The first one is *Modernization* (1987, 6-10), being this one a core cause since when the economy becomes more complex concerning production and exchanges, the function of delimiting property rights tends to become in turn more complex. This is why government intervention is presented as necessary, as to provide a solution to the problems derived of the delimitation of property rights, and also as an agent that could promote the internalization of negative externalities which, in the absence of the state, would be allegedly imposed by the market to those agents that do not enjoy the benefits which created such externalities in the first place (thus promoting inefficiencies and disequilibrium).

Higgs then remarks about the existence of Public Goods (1987, 10-11). The author says that the ambiguity in their definition is the main cause that allows and even promotes its expansion because the principles of "non-excludable" and "non-rivalry" carry by themselves such conceptual vagueness that it is difficult to concretize their application to specific goods and services. Thus, it could be said that such definition could end up applying to every conceivable good or service which is identified by an observer as one which "the market does not provide efficiently"[1][2]. Therefore, the road to government expansion is opened always that new necessities are identified to be currently dissatisfied by inexistent Public Goods (which, in turn, "have" to be created).

The Welfare State (1987, 11-12), also becomes relevant among the hypothesis analyzed. Its origin could be traced to certain policies of the government in Prussia during the 19th century, but its application was widespread for western countries after WWII. Although the provision of goods and services[3] by the government, which translates into "welfare" for the population, is the main goal of such conception, its moral, philosophical and legal justification is based on the concept of "Second Generation Rights". A big hypostasized concept, "Society" represented by the government, is now in charge of their provision. To this, we must add that the spectacular growth of economies has generated affluence of goods and services which has created in the population a sort of anxiety of progress which in turn promotes them to demand the government the provision of such goods and services considered as "basic". In other words,

[1] Note that in this case the reason provided is a negative one, without a proper analysis of whether the government could, in efficiency and efficacy, replace the action of the market.

[2] On this regard, even Paul Samuelson (1969 (1991), 502), said: "Thus, consider what I have given in this paper as the definition of a public good, and what I might better have insisted upon as a definition in my first and subsequent papers: 'A public good is one that enters two or more persons' utility.' What are we left? Two poles and a continuum in between? No. With a knife-edge pole of the private-good case and with all the rest of the world in the public-good domain by virtue of involving some 'consumption externality'."

[3] One of the economic effects of progress – from the perspective of the tool of the price elasticity of demand – is that at first the new good and services tend to be considered as a luxury, and as such of high elasticity, but when their use is generalized, they are considered indispensable, i.e. low elasticity.

while new goods and services are created in a growing economy, they tend to constitute and be identified as "essential", which is why the government is demanded to provide them. These goods and services change and increase in time at the same pace as technology and knowledge. Thus, the Welfare State is not to be conceived as a provider of *fixed* goods and services, but rather *necessarily in expansion* due to the very nature of human progress as such.

Higgs also pays attention to the so-called *Political Redistribution* (1987, 12-15), not only concerning the provision of goods and services by itself but also regarding the conception of the idea itself. The government is considered, in this approach, as an entity that must provide "Social Justice", by providing a "fair distribution of rent". The origin of this idea could be traced in the egalitarian ideologies as well as the mistaken dichotomy Production-Distribution as developed by John Stuart Mill. This is so because this last gives a theoretical basis for the distinction between production and distribution, this establishing a conceptual difference between both processes, which in turn presents them as not necessarily correlated nor connected. This is what gives legitimacy to the idea that government intervention provides a more "fair distribution", being "fair" the criteria of the bureaucrat now. Redistribution has, necessarily and always political criteria, because the market would have had other outcomes (otherwise redistribution becomes irrelevant).

Another reason identified by the author, which would be studied in detail later, is *Ideology* (1987, 15-17). It mainly consists of the climate of ideas which will later promote some or every cause for government growth (or, of course, its retrenchment).

Finally, the author concentrates on the concept of *Crisis* (1987, 17-18) as one of the essential reasons for government growth (in fact, the second most relevant after Ideology). Once a crisis appears, is this due to war or economic crack (bust phase of the business cycle), the prevailing climate of ideas collapses for it is incapable of explaining what is happening or its possible solutions, and thus it is viewed as mistaken by the population. Then, people have no other choice (except that new ideas are presented) but to reject these and adopt new ideas to find alternatives to solve the present crisis. More specifically, people demand from the government to "do something" to overcome the situation, and therefore the government expands as a result. The key to the analysis is that, once the crisis passes, the government contracts its scope, but not in the same proportion as its expansion after the crisis. Thus, the state grows as a new crisis appears throughout time by a process of *expansion and later contraction, non-proportional to the initial expansion*. This phenomenon is defined as the *Ratchet Effect*.

The author explains that, although we may isolate more relevant causes in the growth of government, this is not a *mono-causal* phenomenon (1987, 18-19).

Because ideology is the main factor in the explanation of such growth, we take the definition that the author makes of the concept:

"By ideology, I shall mean a somewhat coherent, rather comprehensive belief system about social relations. To say that it is somewhat coherent implies that its components hang together, though not necessarily in a way that would satisfy a logician. To say that it is rather comprehensive implies that it subsumes a wide variety of social categories and their interrelations. Notwithstanding its extensive scope, it tends to revolve about only a few central values-for instance, individual freedom, social equality, or national glory.

Ideology has four distinct aspects: cognitive, affective, programmatic, and solidary. It structures a person's perceptions and predetermines his understandings of the social world, expressing these cognitions in characteristic symbols; it tells him whether what he 'sees' is good or bad or morally neutral, and it propels him to act following his cognitions and evaluations as a committed member of a political group in pursuit of definite social objectives. Ideologies perform an important psychological service because without them people cannot know, assess, and respond to much of the vast world of social relations. Ideology simplifies a reality too huge and complicated to be comprehended, evaluated, and dealt with in any purely factual, scientific, or another disinterested way." (1987, 37-38).

Thus, four aspects of ideology are presented: *Cognitive*, *Affective*, *Programmatic* and *Solidary*.

Cognitive because it becomes into a conceptual structure by which the individual identifies the concretes in the world and acts accordingly; *Affective* because it has emotions associated with such identifications based on his concepts and the ethics derived of them, which in turn promotes its acceptance or rejection of the facts which presents to him; Programmatic because of the aforementioned actions which derive of it; and *Solidary* because relationships are generated with those who share the same or similar ideas.

To apply it and illustrate the implications of ideology among individuals, the author makes use of a neoclassical tool, the utility function, being ideology an essential part of the explanation of why the individual gains satisfaction or dissatisfaction from his actions. The utility function (i.e., the utility which the individual receives by consuming *C's*, goods and services which he acquires in the market) must be re-defined in the following manner (1987, 43):

$$U = f\,(C_1, C_2, C_3, \ldots, C_n, I)$$

Being *I* the level of identification of the individual with the ideas which derive from the group to which he is part of, being for mere chance or voluntary acceptance, thus conditioning the utility reported by the goods and services consumed.

Under this approach, it is pointed out that the political discourse tends to influence decisively the climate of ideas, mainly through the usage of certain words or phrases, which pertain to certain relevant concepts to promote the acceptance of certain ideas (1987, 48-52). For this, the author distinguishes *Universalistic Flag Words* from *Discriminating Flag Words*, being the first of universal acceptance by antagonistic ideologies (e.g. both libertarians and communists use terms such as "Freedom"), and the second, deriving different meaning concerning the ideas of the listener (such as "Private Property"). Thus, political discourse influences the transmission of ideas using keywords or phrases such as "from each according to his ability, to each according to his needs". Language, this, is a relevant factor in the climate of ideas, and therefore of its transformation.

The reasons for the Ratchet Effect could be summarized (chronologically) in the following order (1987, 57-74):

1. The change of ideas logically before the change in the government (because if there is no idea of change, there is nothing to change to).
2. The citizens demand the political class to "do something" during the crisis.
3. Pressure Groups work to perpetuate the privileges they obtained during the crisis, whether they are private (Lobbies, Unions or Entrepreneur Associations, etc.) or Public (Public workers, program directors, etc.)
4. The taxes which increased during the crisis tend to perpetuate later, thus increasing the scope of action of the government to act and keep its expansion; without any reason to reduce its size.
5. The crisis affects how people view reality and their ideas for the role of government.
6. Government actions hide the costs of its interventions and dilute the payment among the citizens in a way such that it cannot be easily identified who are the net payers and net receivers of the benefits. Nor it is easily identifiable what are the costs and benefits of its actions. Thus, those who are damaged for these actions not necessarily identify so. On the other hand, those who benefit from this tend to promote the continuation of government expansion, i.e. its new size.
7. Ideological change reaffirms itself and tends to mold "public opinion".

In this context, and under this analytical framework, the necessary elements of study to understand and comprehend government growth are (1987, 74):

"(1) socioeconomic and political conditions before, during, and after the crisis; (2) prevailing ideologies before, during, and after the crisis; (3) leading persons and elites and the interest groups they favor or represent; (4) emergency legislation and executive orders; (5) emergency agencies and their leadership; (6) operation of and reaction to the emergency measures; (7) court challenges, resulting decisions, and innovations of legal especially constitutional-doctrines; and (8) institutional legacies and perceived 'lessons' of the episode."

To illustrate the concept of the Ratchet Effect, we reproduce the schematic figure made by the author[4]:

[4] Republished with permission by Robert Higgs.

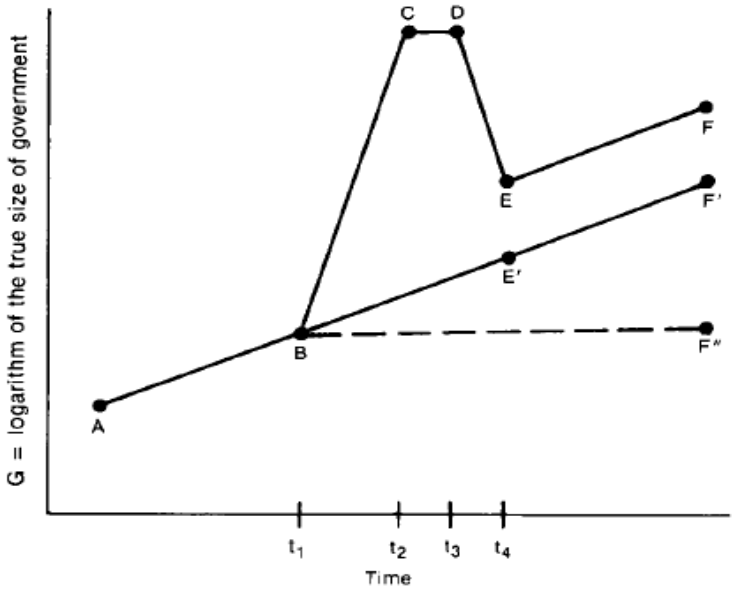

Figure 1 Schematic representation of the Ratchet (Higgs, 1987, 60)

This figure represents an episode in the growth of government where it is showed what the author defines as the Ratchet Effect. Thus, we can say the scheme consists of five steps (Higgs, 1985; 1987, 60-1):

1. Pre-crisis normality (segment AB): it is characterized by a constant rate in the growth of government (positive by the author's assumptions).
2. Expansion (segment BC): a sudden increase in the growth of government appears, created by an acceleration in the rate of growth.
3. Maturity (segment CD): in general, it is a stage where government growth does not change.
4. Retrenchment (segment DE): Government size decreases (at the same rate as the one registered during the expansion, for the assumptions of the author) but to a higher level than the one that could be achieved if the rate registered during normalcy would have been obtained (counterfactual segment AF'); thus retrenchment is "incomplete".
5. Post-crisis normalcy (segment EF): The government again grows at a rate of pre-crisis, which is why the size does not converge to the level that would have been attained if there would not have been a crisis (counterfactual point F').

The author concludes that in the US the growth of government appears in the context of successive crises, during which the traditional ideology (free markets, small government, etc.) changes for interventionism, to retrench later, less than proportional to the pre-crisis state. This is a key point since ideology does not change before the crisis, but *because* of it, and it later comes back to the traditional, but modified to a *higher degree of interventionism*.

Considering the intention of making an integral analysis, and not merely quantitative, the author complements his statistical information with data and elements of qualitative character. In this context, the author points out that "The ratchet applies not only to many aspects of governmental growth as measured by standard quantitative indexes; even more importantly it applies to the essence of the emergence of Big Government, the rise of government's coercive power over economic life." (1987, 33).

Next, the analysis is focused on the methodological question of how to measure the growth of government (1987, 20-34). As such, the measures will depend on the variables which are considered. We may analyze such growth based on government purchases of goods and services as a percentage of GNP, Public Expenditure as a percentage of GNP, Public workers concerning the economically active population, analysis in the growth of regulations, laws, ministries, etc.

In this respect, Higgs (1985, 3) tells us that:

"In my forthcoming book (Chap. 2), I have shown that several commonly employed indexes of the size of government display the 'ratchet phenomenon' during the 20th century: government grew suddenly much bigger with the onset of each

great crisis; after the crisis, it receded but usually not to the pre-crisis level nor even to a level that would have been reached had the pre-crisis rate of growth persisted instead of being displaced by the events of the crisis. Thus, crisis typically has produced not just a temporarily bigger government but also the permanently bigger government, *according to several conventional measures*. Further, we have good reason to believe, as documented in my book, that a more informative measure of government, which ideally would gauge the scope of government's effective authority over economic decision-making, would also show this ratchet phenomenon. Henceforth, I shall simply take for granted that this has been the characteristic shape of the true time profile of the growth of government in the United States in the 20th century" (emphasis added by present authors).

Therefore, in the author's analysis statistical information is complemented with elements and data of qualitative character to increase the application of the Ratchet Effect theory.

3 METHODOLOGICAL CLARIFICATIONS

Due to the difficulty at the time of analyzing qualitative and quantitative data together, by trying to perform comparative analysis through indexes or series, we have decided to use only quantitative data. This is so because the analysis by Higgs goes beyond the data that could be provided by, e.g. the indexes of economic freedom, which precisely use quantitative *proxies* to analyze specific qualitative data to test their economic impact (such indexes have been compiled by methodological apriorists such as Walter Block (2006; 1991)[5] at the Fraser Institute, as by mainstream economists). Given that Higgs' analysis includes social, legal and political factors, we have decided that we would not make this sort of analysis for the case of Argentina, given that we could not find a proper methodology to combine and weigh both classes of data.

In this respect, we must also make clear that the Ratchet Effect hypothesis, since it is not derived by an axiomatic deductive system such as praxeology, is a hypothesis that could be tested by empirical testing. Using the concepts developed by Ludwig Von Mises (1949 [1996]), this hypothesis is Theory to interpret History (Mises, 1957 [2007]), but since it is not derived *a priori*, we could not say that it must be necessarily true. In this context, the qualitative analysis which would complement the quantitative analysis is nothing more than *Verstehen* (understanding), for which we have decided to limit the scope of our analysis to test the hypothesis in quantitative terms.

Thus, the only way of making a quantitative analysis in this regard, of an econometric nature, is to analyze the series of Income and Public Expenditure (among others), homogenized by specific treatments.

4 THE SELECTED MODEL

To test Higgs' hypothesis for the case of Argentina, we based our analysis in the model presented by Hercowitz and Strawczynski (2004) in "Cyclical Ratcheting in Government Spending".

In this work, the authors try to corroborate the Ratchet Effect in the countries of the OECD. To achieve this, they use a data panel model which considers long-range considerations, as well as cyclical considerations, in the determination of public spending. Using this model, it could be determined the existence of increases in the relation expenditure/GDP, as a result of an asymmetric behavior – a "Ratchet Effect". According to the findings of the authors, the model presents evidence of the existence of an increase in the ratio of public expenditure to GDP ("size of government"), for the OECD countries during the period 1974-1998. This is partially explained by a cyclical ratchet effect with an accumulated effect of 2% of GDP (2001, 352). Let us now present the model.

The dynamics in government expenditure is determined by cyclical and basic considerations.

Basic considerations:

$g_t = g_t/y_t$ is the ratio of Government Expenditure (g_t) and GDP (y_t), which in turn represents government growth.

Thus, the dynamics in the growth of government is presented as:

[5] *See* also Easton & Walker (1992).

$$\Delta(g_t)^* = \pi[\beta(\gamma - g_{t-1}) - (c + \omega g_{t-1})]$$

$\beta(\gamma - g_{t-1})$ represents the marginal benefit for the government, of increasing its size, and $(c+\omega g_{t-1})$ represents the marginal cost; where $0 < \pi < \infty$; and where β, γ, c y $\omega > 0$.

Thus, concerning basic considerations, it is assumed that the size of the government is formed by the difference between the benefit and marginal cost. Therefore, if the marginal benefit exceeds the marginal cost in the previous period to the one understudy, the rate of growth increases. In the opposite case, if marginal benefit is below marginal cost, the rate of growth decreases.

Cyclical considerations:

It is defined

$$(\Delta y_t)^p \equiv (\Delta y_t - \overline{\Delta y})d_t$$

$$(\Delta y_t)^n \equiv (\Delta y_t - \overline{\Delta y})(1-d_t)$$

where $\overline{\Delta y}$ is the rate of average growth.

$$D_t = \{1 \text{ if } \Delta y_t \geq \overline{\Delta y} \; ; \; 0 \text{ if } \Delta y_t < \overline{\Delta y}\}$$

From the variables previously defined and through the following equation,

$$(\Delta g_t)^c = \alpha_1(\Delta y_t)^p + \alpha_2(\Delta y_t)^n$$

it is expressed the behavior of cyclical expenditure, where coefficients α_1 and α_2, capture the pattern of expenditure under expansion and retrenchment, respectively.

In this context, the following behaviors could be presented: symmetric and asymmetric.

In symmetric behavior, the rate of growth has the same effect in periods of expansion and retrenchment, the case where α_1 and α_2 equal α. When α is zero, there is no relation between the rate of growth and the cycle.

And if α is positive the rate of growth increases during expansion and decreases during contraction, giving rise to a pro-cyclical effect. The opposite case appears when α is negative, being in the presence of a counter-cyclical case.

Under asymmetrical behavior, the effect of expansion is different from that of retrenchment, which could come, for example, from the application Keynesian policies, and indicate a Ratchet Effect. In this situation, it is presented the case where $\alpha_1 > \alpha_2$.

To summarize, we have the following *cyclical patterns:*

a) Symmetrical behavior:
   $\alpha_1 = \alpha_2 = \alpha$ → the same behavior during expansion and retrenchment.
   If $\alpha = 0$ → no relation between the cycle and ***g***
   If $\alpha > 0$ → ***g*** is pro-cyclical, or
   if $\alpha < 0$ → ***g*** is counter-cyclical.

b) Asymmetrical behavior:
   If $\alpha_1 > \alpha_2$ → ***g*** increases through time.

Through a regression equation, it is defined as the rate of government growth in which are considered as explanatory variables both the cyclical and basic behaviors.

Considering both basic and cyclical aspects, ***g*** is modeled by the regression equation:

$$\Delta g_t = (\Delta g_t)^* + (\Delta g_t)^c + e_t =$$
$$= \alpha_0 + \alpha_1(\Delta y_t)^p + \alpha_2(\Delta y_t)^n + \lambda g_{t-1} + \varepsilon_t$$

where $\alpha_0 = \pi(\beta\lambda - c)$, $\lambda = -\pi(\beta+\omega)$ and ε_t is white noise.

5 APPLICATION TO THE CASE OF ARGENTINA

In this section we make a study of the possible application of the hypothesis of the Ratchet Effect to the case of Argentina. For this goal we make use of the data series developed by Rodriguez and Borrrone (2012) in "La política fiscal en la Argentina y su relación con el ciclo económico: evolución de las cuentas públicas presupuestarias y del producto bruto interno para el período 1961-2009. Based on these series of current expenditure, total expenditure, and GDP we can make the following observations (Fig. 2).

The size of government as measured by the ratio TE/GDP registers a fall between 1961 and 1965 from 25.99% to 22.03% due to a growth rate of GDP above the growth rate of TE. Later, between 1966 and 1974 there is an increase in the size of government, getting to 29.42%. This is due to the increase in TE, in the years 1973 and 1974 as well, when rates of 20% and 28% were registered, respectively, with an increase in GDP of 9.66% and 10.12%, respectively. For 1977, we note a fall to 23.58% due to positive rates of product growth along with a fall in the rate of total expenditure.

From this year on, we could say that growth in government begins until the year 1981 when it reaches a point of 30.92%. This is caused by the fact that total expenditure increases above the product in such a period, and even in 1981, where GDP falls by 6.47%, total expenditure increases by 2.6%. If we observe the period 1981-1991, we see a tendency towards a decline in the size of the government, from the prior 30.92% to 22.10% in 1991. This fall was caused by an increase in GDP and a fall in TE.

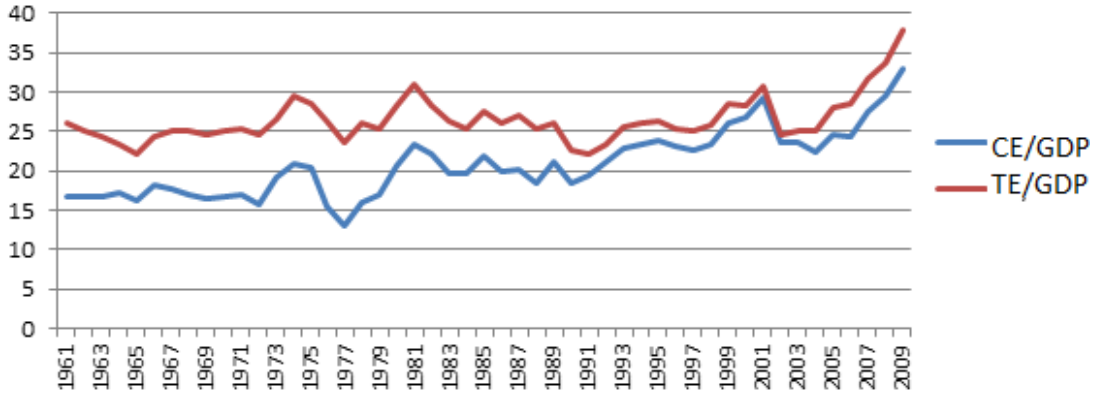

Figure 2 Total Expenditure/GDP and Current Expenditure/GDP in percentages – Constant prices of 2009
Source: Authors based on data of Rodriguez and Borrone (2012)

In the period 1991-2001, we observe that the size of government increases from 22.10% to 30.64%. In the year 2002, a big fall in the size of the government is registered, to 24.6% due to an even bigger fall in total expenditure by 38.34%, than that of GDP which was 10.9%. From this point on the size of government always increases until getting to a high of 37.62% in 2009. This happens because of an increase in total expenditure above the increase in the rate of growth of GDP (from 2004 on).

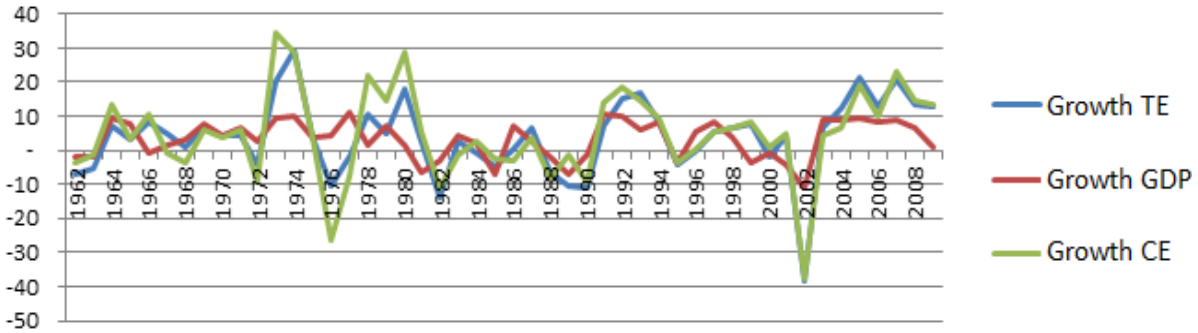

Figure 3 Rates of growth of GDP, current expenditure, and total expenditure – constant prices of 2009
Source: Authors based on data of Rodriguez and Borrone (2012)

Before a deeper analysis by the application of econometric tools, we can observe that the hypothesis of the Ratchet Effect is not corroborated in the case of Argentina for the period 1961-2009. Further, the ratio of public expenditure to GDP is always between two points with an approximate low of 20% and an approximate high of 30%.

Thus, to evaluate the ratchet effect under an econometric analysis, we make use of the aforementioned equation (in section 4), taking into account the official data on total expenditure and GDP.

There we take as a variable of study the increase in the ratio total expenditure to GDP and as explanatory variables those which indicate the periods of expansion and retrenchment, and the previous period total expenditure/GDP ratio.

Such analysis gave us results presented in Table 1.

Thus, according to the presented model, we can conclude with a significant level of 5%, that there is no significate effect to GDP in periods of expansion (a positive increase of GDP), in periods of retrenchment (a negative increase of GDP), as

well as the increase in the differentiated ratio total expenditure/GDP. In other words, there is no relation between the differentiation in the ratio total expenditure/GDP and the differentiated GDP in expansion, nor for the differentiated GDP in contraction. Also, the ratio expenditure/GDP in a period does not depend on the previous one (see the column of *p-value* in the Parameter Estimation table).

Table 1Parameter Estimation

Parameter	Estimated Value	P-value
α_0	0.139	0.008*
α_1	-3.5*E-13	0.199
α_2	3.23*E-13	0.095**
Λ	-0.404	0.009*

Notes:
** significant at 5%; ** significant at 10%.*

To a significant level of 10%, the GDP in periods of contraction turns significate, for which it is related to the differentiation of the ratio total expenditure/GDP (*p-value* = 0.0910).

The conclusions of the model are valid because its assumptions take place, i.e. Independence, constant variance, and normal distribution of residuals (see ANNEX A). Also, there is no multicollinearity among the explanatory variables.

6 CONCLUSION

Based on the previous quantitative analysis, we were not able to find insights that prove the existence of a cyclical ratchet effect in Argentina. Thus, the case of this country does not provide evidence of an asymmetric fiscal behavior which gives rise to an expansion in the ratio public expenditure/GDP during the bust phases of the business cycle, followed by retrenchments at a rate less than proportional to the increase phases. Therefore, we can say that the hypothesis of Higgs, tested using the model of Hercowitz and Strawczynski, cannot be applied to the case of Argentina for the period 1961-2009.

Finally, we would like to remark that our results do not invalidate the possibility of the existence of a specific dynamic in the growth of Argentina´s government compatible with Higgs hypothesis based on qualitative data. So, the doors are still open for future research applying qualitative analysis in this regard.

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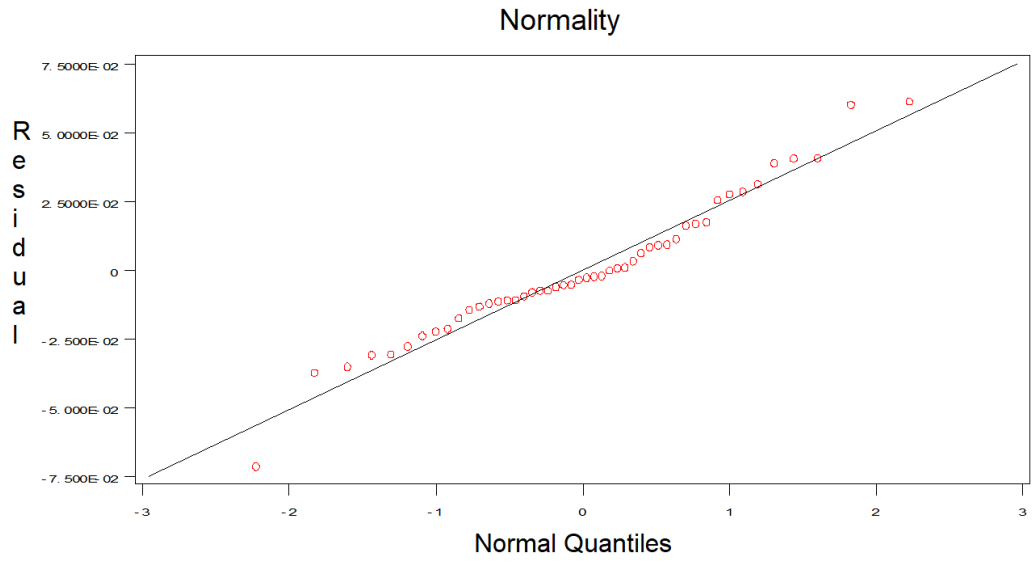
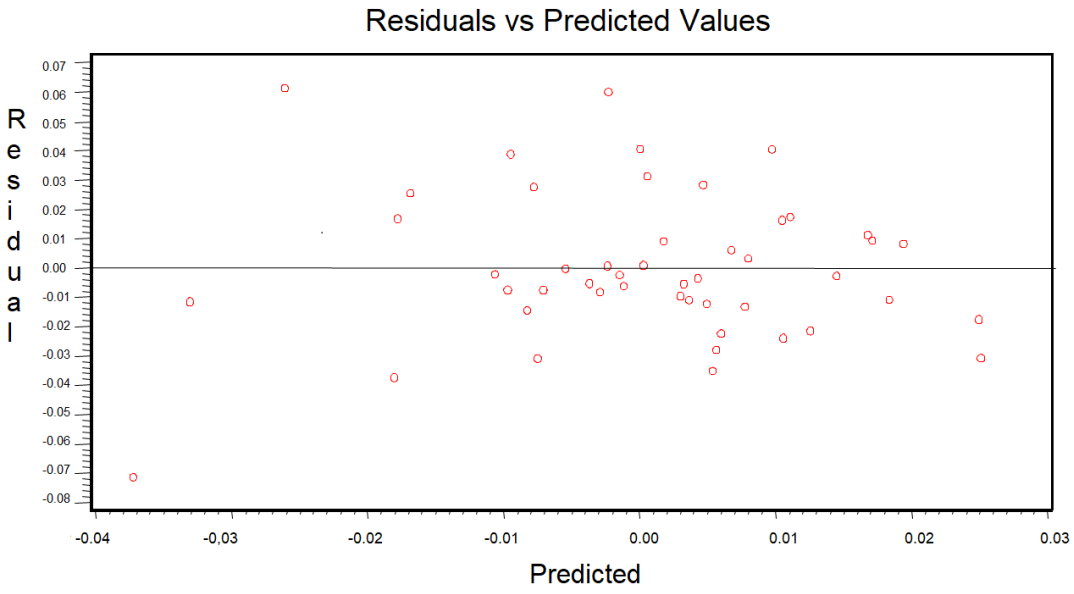
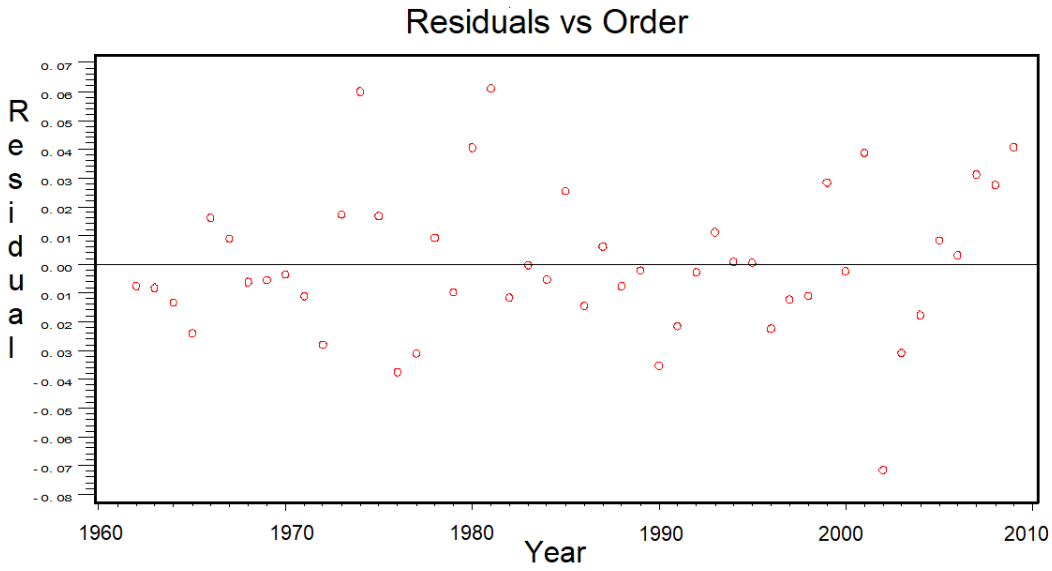
ANNEX A

To corroborate that the adjusted model is correct, we made an analysis of residuals (in the following figures), which indicate that the adjustment is adequate.







Normality Test		
Statistic	*Value*	*p-value*
Kolmogorov-Smirnov	0.121	0.08

NOTE

The present work was prepared in the context of the Investigations Group at Bases Foundation, and a former version of this paper was presented in the Fifth International Congress "The Austrian School in the 21th Century", Nov. 19, 2014, Pontificia Universidad Católica Argentina UCA, Rosario, Argentina, https://www.youtube.com/watch?v=qS9aLQ1VvcU.

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COHESION POLICY AS A FACTOR FOR THE DEVELOPMENT OF THE ECONOMY OF BULGARIA

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JEL Category: **I23, I25**

Abstract

The urgency of this article is dictated by the importance of one of the largest sources of financial support at the European Union level, namely the Cohesion Policy. Its purpose is to promote economic and social cohesion by reducing disparities between the Member States and allowing all regions to compete effectively in the European market. The article presents the possibilities of the cohesion policy for the development of the Bulgarian economy. The idea is that through the implementation of various projects, using the financial instruments of cohesion policy, economic, social, and territorial convergence of the Bulgarian economy is achieved. The article analyzes various economic indicators affecting the investment climate of Bulgaria as a member state of the European Union. Cohesion policy is proven to be a modern and effective tool that promotes the implementation of progressive ideas and approaches and helps to create better-living conditions for European citizens, promoting economic, social and territorial cohesion between the regions of Europe.

Keywords: *cohesion policy, competitiveness, development, economy, integration.*

1 INTRODUCTION

The characteristic feature of the European Union is that it develops economic relations and creates a single common market between the member states of the Union. Thus, the Common Market

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enables the free movement of goods, services, capital, and people within the EU internal market.

The process of political, legal, economic, and socio-cultural cohesion of European countries must discuss integration issues. European integration is carried out through the Council of Europe and the European Union.

To achieve convergence of economies, five basic criteria and a fixed exchange rate regime need to be met:

- Inflation rates in the year are mostly left by people who are no more than 1.5% and the average plains are on three pages with the lowest inflation.
- the ratio of domestic debt to GDP should not exceed 60%.
- the long-term interest rate in the year immediately before the accession of the country should not be higher than 2% compared to the 3 countries with the lowest interest rate.
- during the last 2 years, it has previously joined the Union to be developed in the exchange rate mechanism and not to devalue its currency, together with it is included in the exchange rate range.

The main objective of the Maastricht Treaty is to develop and implement economic and monetary policies that ensure price stability, exchange rate controls, cash management, and coordination of Union banks.

1.1 Convergence criteria

The convergence criteria aim at ensuring balanced economic development within the European Monetary Union (EMU) and avoiding tensions between the EU Member States. (ECB, 2018)

Convergence criteria are evaluated:

- Price developments
- Fiscal developments
- Convergent stability
- Exchange rate developments
- Long-term interest rate developments

They are measured by taking into account the harmonized level of consumer price inflation, the budget deficit as a percentage of GDP, government debt as a percentage of GDP, the interest rate on long-term loans, and the deviation from the central rate.

The convergence criteria have been established to assess the readiness of Member States' economies to adopt the single currency

1.2 Eurozone

With the declaration of the euro as the European Union's official base currency in 1999. the Eurozone appears. It covers the EU Member States that have adopted the euro as their currency. In fact, this is the next stage of the European Economic and Monetary Union (EEMU).

The eurozone currently includes 19 countries using the euro as its official currency. To become a member of the Eurozone, it must fulfill the main Maastricht criteria.

1. Exchange rate stability, with deviations of +/- 15% in both years.
2. Fiscal sustainability measured by two indicators: a budget deficit of up to 3% of GDP at the end of the year and a level of the public debt of up to 60% of GDP.
3. Low inflation not exceeding HICP by more than 1.5% in the three EU countries with the lowest positive inflation.

For the moment, the obstacle to Bulgaria's accession to the Eurozone is still the wait for joining the currency stability mechanism, or the so-called. "Eurozone waiting room".

The fulfillment of the Maastricht criteria and the evaluation of Eurostat benchmarks (Eurostat, 2020), debt and deficit data of the General Government sector based on the EC forecast are listed in Table 1.

What are the benefits of Bulgaria's joining the Eurozone?

- No currency risks.
- Low-interest rates.
- Lack of transaction costs.
- Increase in foreign investment.
- Price transparency.
- Maintaining smaller foreign exchange reserves.
- Support from the European Central Bank (ECB) and the European Stabilization Mechanism (ESM).

Table 1. Nominal criteria for inclusion in the Eurozone and the values of Bulgaria indicators

	2009	2010	2011	2012	2019
Budget balance					
Reference value	Up to 3.0% of GDP	Up to 3.0% of GDP	Up to 3.0% of GDP	Up to 3.0% of GDP	Up to 3.0% of GDP
Bulgaria	-4.3%	-3.1%	-2.0%	-1.4%	0 %
Gross national debt					
Reference value	Up to 60.0% of GDP	Up to 60.0% of GDP	Up to 60.0% of GDP	Up to 60.0% of GDP	Up to 60.0% of GDP
Bulgaria	14.6%	16.2%	16.3%	18.5%	19.0%
Inflation (HICP)					
Reference value	0.6%	0.8%	3.0%	3.0%	2.1%
Bulgaria	2.5%	3.0%	3.4%	2.4%	1.2%
Long-term interest rate					
Reference value	6.5%	8.6%	7.7%	5.0%	3.3 %
Bulgaria	7.2%	6.0%	5.4%	4.5%	1.6 %

**Source:* (Economix, 2014)

What are the disadvantages of Bulgaria's joining the Eurozone?

- Price speculation
- Providing a high initial ESM contribution (around EUR 300 million)
- Guarantee the ability to provide several billion liquidities when needed.

The use of multiple currencies invariably leads to price increases and makes price comparisons difficult.

The single currency (the euro) enables these shortcomings to be eliminated and benefits consumers and businesses on the one hand. The single currency fully contributes to the creation of a single market.

Bulgaria's membership in the Eurozone has greater benefits than disadvantages for economic development and investment. (Todorova D. , 2015)

1.3 Schengen area

The Schengen Agreement is a treaty between European countries for the establishment of a single visa system, the removal of border controls at internal borders, and the harmonization of control at external borders.

The Schengen area already covers 25 countries, forming the Schengen area.

The purpose of the Schengen Agreement is to create a Europe without borders, within which movement is completely free for EU citizens, legal immigrants, and third-country nationals with a 'Schengen visa'.

The countries have a common visa policy, abolished internal border controls, jointly control the external borders of the area, have a database of criminals and stolen vehicles.

What are the benefits of Bulgaria from joining the Schengen area?

- Freedom to travel and work for Bulgarians in the other Member States.
- Development of the economic space
- Growth of the economy
- Increasing jobs
- Increasing the number of tourists from the EU and Schengen countries
- Membership of the EU Common Market (with free movement of goods, people, and capital) will have a serious effect on trade flows.

What are the challenges facing Bulgaria?

- Negative consequences of emigration for Bulgaria.
- Due to the demographic crisis and the departure of the country, the population decreases by about 40,000 people a year, which means the complete disappearance of a medium-sized city every year.
- Preventing illegal immigration

Bulgaria's desire to become a full member of the Schengen area, as well as EU requirements for countries with external borders are a prerequisite for completing the necessary reforms in key sectors.

Bulgaria's entry into the Schengen area has a multiplier effect because entry into the country will mean free access to travel to any point in the Schengen country. (Lesenski, Angelov, & Bogdanov, 2008)

Table 2 compares some of the key economic indicators of the Eurozone and the EU with the United States and Japan:

Table 2. Comparison of key indicators of the Eurozone, the European Union, the USA, and Japan

№	Economic Indicators	Eurozone -15	EU - 28	USA	Japan
1.	Population (million)	333	504	314	128
2.	GDP (trillion euro)	9.5	13.4	12.3	3.5
3.	GDP per capita (thousand EUR)	28.5	26.6	39.3	27.6
4.	Share of the world GDP (%)	13.7	19.4	18.9	5.6
5.	Exports - goods and services (% of GDP)	26.8	18.3	14.1	15.4
6.	Gross fixed capital formation (% of GDP)	18.4	17.9	15.8	21.2
7.	Gross Savings (% of GDP)	20.2	18.9	12.9	24.5

**Source: Author based on sources for:*
- the Eurozone and the EU: ECB, Eurostat, IMF
- the United States and Japan: IMF.

Evidence shows that the Union-Eurozone agreement is a strong and open trade bloc that plays a huge role in developing the global market.

1.4 Bulgaria and the European Union

Bulgaria's membership in the European Union enables Bulgaria to:

- new markets,
- increase of foreign investments translated,
- major financial projects from financial institutions and funds in the enlargement of the European Union
- achieving a higher standard of living,
- improved economic well-being,
- higher international prestige,
- strengthening democracy,
- increasing competition,
- free movement of labor, goods, services, and capital,
- a liaison between the Balkans and the Black Sea regions and a bridge for relations between the European Union and Turkey,
- improving the long-term transport infrastructure,
- transparency of taxation rules and business accounting,
- simplified business administration procedure for exports to another EU Member State. (Todorova D. , 2015)

The main objective of Bulgaria's economic policy is directed towards the socio-economic integration of Bulgaria, as an equal member in the EU, through achieving higher growth and increasing competitiveness.

Growth, restructuring, and stability must be combined, not opposed. To improve the quality of life of people, it is necessary to pursue policies aimed at raising incomes, employment, social justice, free access to education, science, and healthcare.

Bulgaria's EU membership favors the economic development and competitiveness of the economy by absorbing funds from the respective funds.

One of the important prerequisites for the development of Bulgaria is the ability of the country to absorb the funds from the EU structural funds. Globalization of the economy, European integration, and new market conditions are determining factors for the development of Bulgaria. (Todorova D. , 2015)

What we can characterize the investment climate in Bulgaria?

The main economic factors that characterize investment activity have a favorable impact, namely:

- A strategic geographical location that provides the link between Europe and Asia - providing access to markets with millions of users,
- Stable macroeconomic and financial stability - The Bulgarian lev is pegged to the euro according to the currency board arrangements,
- Comparable taxes compared to those in the European Union,
- Highly skilled workforce,
- Incentives to encourage investment,
- EU funding - over € 8 billion from EU funds in the coming years
- Free movement of capital, etc.

One of the important conditions for the successful investment activity is the efficient use of the funds. It is of importance to maximize the return on each unit of investment.

Effective management and rational use of investments is of importance for every company and is related to the formulation and resolution of several basic issues related to the definition of investment policy:

1. Where and what will be invested in?
2. What are the necessary investment funds?
3. What are the possible sources of funding?
4. What is the effectiveness of investment projects?

Attracting foreign investment is one of the main tasks in the development of each country. Free world capital is channeled where an adequate economic environment, clear government guarantees, security, and return on investment are provided.

In the competition for attracting foreign investments Bulgaria has the following advantages:

- Improving general macroeconomic conditions,
- Stabilization and adequate implementation of liberal foreign investment legislation,
- Purposeful government policy to encourage foreign investment by outlining clear priorities,
- Regulate your own and limited real estate rights,
- Granting concessions to activities and activities in maritime and river ports, civil airports, the Republican road network, and the public rail transport,
- Review and refinement of legal texts regulating the necessary guarantees for foreign investors. (Crosssectoral, 2016)

An additional factor influencing the investment climate in Bulgaria is the existing tax system, which provides additional stimulation of the investment activity by offering:

- 10% corporate tax
- 10% personal income tax

The acceleration of Bulgaria's economic growth is also associated with maintaining a significant rate of investment growth. The positive economic development expectations related to Bulgaria's membership in the European Union attract significant financial resources for foreign direct investment and foreign loans.

In the shrinking export markets, some foreign producers are faced with the need for rapid restructuring, cost reductions, and efficiency gains, targeting substitutes for imports.

In this respect Bulgaria has several advantages:

- EU and NATO membership
- proximity to the European market
- a stable exchange rate linked to the euro,
- low production costs.

For 2019 According to the World Economic Forum ranking, which covers 141 countries, Bulgaria is ranked 49th in competitiveness (Schwab, 2019). The score is 4.4 points out of 7.

Switzerland is the most competitive economy in the world, with 5.7 points. Followed by Singapore, the USA, Finland, and Germany. The top 10 are complemented by Japan, Hong Kong, the Netherlands, the United Kingdom, and Sweden.

“Economies that are constantly ranked high in the competitiveness rankings are those that can develop, attract and retain talent and are constantly bringing new high value-added products and services to the market, ”the World Report said. economic forum. (Schvab, 2018) (Schwab, 2019)

The financial support that Bulgaria receives from the European Structural Funds generally affects the development of the country's economy, international trade, trade in goods, tourism, integration of transport services, attracting foreign investors.

Collaboration between business, government, and society is an effective formula that leads to increased investment and greater productivity and competitiveness of Bulgaria. (Todorova D. , 2014)

As a member state of the European Union for Bulgaria, it is of the utmost importance to explore the link between economic integration, monetary integration, and convergence.

Analyzing the various economic indicators affecting the investment climate of Bulgaria gives an idea of the place Bulgaria occupies in the common European market.

The environment that surrounds us shows the unequal social and economic development of individual European countries, which in turn raises

the problem of their ability to compete on an equal footing. It is for this reason that the idea of pursuing a Cohesion Policy in the European Union is born, which uses a system of instruments to help reduce the established economic and social disparities in the European Member States.

2 WHAT IS THE SIGNIFICANCE OF COHESION?

Cohesion has an impact both on the economic development of the countries and on the policies pursued:

- Opportunity for a single European policy
- It promotes the proper functioning of the single European market
- Provides good trade and economic positions
- It implies lower investment costs for companies
- The economic development of countries
- Democratic development of European countries
- Bridging Europe's partition
- Promoting the sustainable development of EU Member States while respecting environmental and social standards.

The disparities in the degree of economic development of individual economic regions within and outside the European Union are very tangible.

They are based on differences in the natural environment, namely geographically, as well as economic and social differences.

The Structural Funds are the main financial instruments of the EU cohesion policy and represent the second-largest item in the overall European budget.

The Structural Funds provide financial support for the economic and social development of poorer and less-favored European countries and regions so that they can successfully cope with the requirements of the common market and align their standard with that of the more advanced Member States.

The European Union provides about 37% of the Union budget as structural instruments for accession assistance and structural projects in the new Member States. Each of the Structural Funds covers a specific thematic area:

- European Regional Development Fund (ERDF).
- The European Social Fund (ESF).
- Cohesion Fund.

3 HOW CAN WE DESCRIBE A NATIONAL COHESION?

The main objective of the economic policy of Bulgaria is aimed at the socio-economic integration of the country, as an equal member in the EU, through achieving higher growth and increasing competitiveness. Growth, restructuring, and stability must be combined, not opposed. To improve the quality of life of people, it is necessary to pursue policies aimed at raising incomes, employment, social justice, free access to education, science, and healthcare.

The main means of achieving these goals are:

- Competitive growth.
- Increasing investment.
- The rapid development of the latest scientific and technical fields.
- Creation of modern infrastructure.
- Structural and technological modernization of the economy.
- Development of the financial system.
- Creating efficient and effective institutions.
- Reducing crime and corruption

The professional and rational use of these funds will help to bring our economy closer to the economies of the EU Member States. Achieving good results and high competitiveness will lead to a better life for people.

The main macroeconomic indicators that make it possible to assess the Bulgarian economy are shown in Table 3.

The degree of absorption of the Structural Funds is essential for increasing economic growth and reducing unemployment in Bulgaria, as European funding is the main financial resource flowing into the Bulgarian economy. It equals 4% of the country's GDP.

The use of European financing is a highly effective form of development of the Bulgarian economy, the opportunities of which should be used to the maximum extent to increase the economic growth and employment in Bulgaria.

Table 3. Macroeconomic indicators of Bulgaria

Indicator	Measure	2007	2009	2010	2019*
Population	million people	7.6	7.6	7.5	7.1
GDP	billion euro	28.9	32.8	31.0	52.8
Real GDP growth	% temp	6.2	-6.3	-2.0	3.1
GDP per capita	euro	3782	4328	4123	7798
Export of goods and services	% real temp	5.2	-12.3	-3.8	1.5
Import of goods and services	% real temp	9.9	-19.5	-6.1	6.8
Average annual inflation	%	7.6	2.3	2.2	0.9
Unemployment	%	6.9	12.0	16.0	4.1
Budget deficit (-) / surplus (+)	% of GDP	3.5	-2.5	-3.0	2.0
Foreign direct investment, net	billion euro	8.3	2.3	1.9	0.9
Foreign direct investment, net	% of GDP	28.7	6.9	6.0	2.0

Source: (NSI, 2020)

Bulgaria is one of the last places to absorb the Structural Funds. It is, therefore, necessary to take measures to overcome the existing problems. With the most transparent procedures, effective implementation of European regulations, simplification of documentation, and electronification of procedures, illegal practices can be avoided.

4 CONCLUSION

This article presents cohesion policy as one of the most important and important policies of the European Union, as it pays priority to the economic and social disparities between the Member States.

To reduce these disparities, cohesion policy promotes solidarity through economic, social, and territorial cohesion. The cohesion policy funding that European citizens benefit from aims to help improve the competitive position of the EU as a whole and its poorest regions.

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THE MARGINAL ANALYSIS AS A METHOD FOR RESEARCH AND MANAGEMENT OF OPERATING COSTS IN RAIL FREIGHT TRANSPORT

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Abstract

It is a characteristic of the transport sector companies that operate in a highly competitive internal and external market environment. To survive and thrive in such an environment, they should strive for continuous improvement in the efficiency of their operations. An important role in achieving such an intention is to carry out constant monitoring and analysis of ongoing business processes in the enterprise, as well as to study their impact in the formation of its financial results. Besides, one of the main focuses of management is the monitoring and research of enterprise costs. The study of costs in freight rail transport enterprises is a determining factor for the elaboration of management decisions tailored to the economic reality and economic conjuncture. This raises the need for a comprehensive and in-depth cost analysis - based on the numerous schemes of systematization and models of functional dependencies between costs and other economic objects. In this regard, the purpose of conducting a cost analysis is to identify the changes that have occurred and to seek opportunities to optimize them. The great importance of research and analysis of costs also stems from the fact that their value, structure, and dynamics depend on the financial result. Any relative cost reduction has a positive impact on the financial result. The actuality of the research and analysis of operating costs in rail transport is driven by the fact that rail freight is faced with an extremely serious problem, such as increasing competition from other modes of transport. This paper examines one of the many management methods for cost research - the marginal cost method. The theoretical aspects of the method are briefly presented, as well as its practical application, which is illustrated by an example.

Keywords: *costing, estimation, databases, decision support, management effectiveness, transportation, rail, marginal analysis.*

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1 INTRODUCTION

The study of costs in freight rail transport enterprises is a determining factor for the elaboration of management decisions tailored to the economic reality and economic situation. This

raises the need for a comprehensive and in-depth cost analysis - based on the numerous schemes of systematization and models of functional dependencies between costs and other economic objects.

The main purpose of cost analysis is to identify the changes that have occurred and on this base to seek opportunities to optimize them. The great importance of research and analysis of costs also stems from the fact that their value, structure, and dynamics depend on the financial result. Any relative cost reduction has a positive impact on the financial result.

The costs associated with the implementation of the main activity (transport activity) in freight rail transport are commonly referred to as operating costs. The use of the term operating costs (rather than production costs) is necessitated by the fact that they are highly expressed in rail transport. In practice, the transport process involves a wide range of activities. Operating costs are divided into two main groups: conditional fixed operating costs and variable technological costs. Costs in each of the above groups are also stated by economic nature.

In the economic literature, there are various management methods for the cost study. The purpose of this study is to demonstrate the capabilities of one of these methods, the marginal cost method, in managing freight costs of freight rail transport. In this connection, the subject of the study is the operating costs of a hypothetical freight transport undertaking.

2 THE ESSENCE AND PRINCIPLES OF EFFECT OF MARGINAL ANALYSIS

At the heart of this analysis is the concept of the relationship between total, average, and marginal costs. These costs are crucial in the decision-making process of managers. The essential thing about applying the marginal cost method is that in the end, all three types of costs are functions of the quantity of output produced. At the same time, the existing ratio between these costs is essential. On the one hand, total costs are the sum (integral) of prior marginal costs. On the other hand, there are the following relationships between average and marginal cost: if the average costs increase, the marginal costs are greater than them; if average costs do not change, then they are equal to marginal costs; if average costs decrease, marginal costs are lower than them (Yonkova, 2006).

The subject of marginal analysis, similar to that of the critical point analysis, is the Cost-Volume-Profit relationship. In this case, the relationship between these indicators is examined in terms of how much the total costs, total revenues, and total profits change as a result of the increase of sales with unit production. However, there is a significant difference between these two methods of investigation. In the analysis of the critical point, a linear function of the Cost-Volume-Profit relationship is applied, which reveals that maximum revenues are realized when making maximum sales. In the marginal analysis, a nonlinear cost-volume-profit relationship is applied, which shows that, once a certain, high volume of sales is reached, the total cost exceeds the total revenue. This model produces two critical points. According to marginal analysis, the optimum production volume that guarantees maximum profit is achieved when marginal revenue equals marginal cost.

Marginal analysis is used to optimize business activity by several elements - operating costs, output, profit, prices. This analysis is based on economic theoretical backgrounds known in the economic literature (Pirimova, 1995), (Rakarova, 2008), (Savov & Mirkovich, Ikonomiks, 1998), (Savov & Sotirova, Mikroikonomika, 1998):

- Variable costs increase at the same rate as total costs increase - after the start of the activity, the difference between their values determines the number of marginal costs.
- The marginal cost curve has a U-shape, which indicates that they initially decrease and increase after a certain moment.
- The marginal cost curve breaks the average and average variable cost curves to their minimums. Before these minimums, the slopes of the curves of average total and average variable costs are negative, indicating that each additional unit of production will lead to a decrease in average total and average variable costs. After this

point, the slopes become positive and costs start to increase.
- The level of marginal cost is always equal to the slope of the variable cost curve.
- The point at which the variable cost curve changes its sign and begins to grow is a breaking point and corresponds to the minimum of marginal cost. This is the point at which the total cost curve also changes its slope.
- The average total costs are divided by average fixed and average variable costs. The relation between these costs and the volume of production is the following: the average fixed costs decrease with the production volume increases, while the average variable costs decrease to a certain level and then begin to increase.
- The U-shaped model of the curves of the mean total, average variables, and marginal costs is influenced by the law of diminishing returns.
- In the short run, production can only adapt to market demand through variable costs that depend on production volume.

The functional dependence of variable costs on the volume of transport production is the basis for building the model of marginal costs.

3 PRACTICAL IMPLEMENTATION OF MARGINAL ANALYSIS

The main purpose of the model construction is to show (analytically and graphically) characteristic points, showing minimal costs with optimal production volume. The model can identify the potential capabilities of the company and in this regard to develop adequate management decisions.

To demonstrate the marginal analysis, we will look at a hypothetical freight rail transport company, “ABC” Ltd. It is characteristic of the enterprises in this sector that they operate within the transport market together with many similar enterprises (including automotive ones). These undertakings cannot influence the market price. This indicates that the market structure is close to perfect competition. In such a market, the following principles of behavior apply:

- In the short run, to maximize profit, at the unit price (marginal revenue) above average total costs, or to minimize loss, at a price below average total costs (but above average variables), the enterprise should aim for the following: - marginal costs should be equal to marginal revenues, or at least very close; - marginal profit should be close to zero; - total revenues should be highest, observing the first two conditions;
- The volume of production should be within the boundary between the intersections’ points of the marginal costs curve with the curves of marginal revenues and the average variable costs.
- If the imposed market price of production is lower than the average total costs, one option is to leave the market segment. In such a situation, the enterprise suffers a loss that is justified only if it has a large fixed capital. In this case, the enterprise produces certain volumes and can cover its variable costs and some of its fixed costs. Such behavior is inherent for companies that expect to compensate for the accumulated losses in future periods.
- The point at which the marginal costs curve intersects the average variable costs curve is critical and is known as the sector escape point. If the selling price is below this point, there is no alternative for the undertaking other than leaving the sector.

The marginal analysis model is being built for a market with perfect competition. This contributes to its versatility. Some assumptions and limitations are made in the model implementation (Byrns & Stone, 1992):

- there are no barriers to access and exit for all interested operators in the sector concerned.
- the individual company has no control over the price, i.e. the market is dominated by a single price.
- individual companies have equal access to the price and volume information that is traded on the individual product markets. This means that the cost curves of all businesses are identical.
- the demand curve is eliminated because demand exceeds supply. The demand curve

for each undertaking is horizontal (with perfect elasticity).

The model enables the following tasks to be solved:

- determining the optimal level of costs when the enterprise is unable to influence production volumes and sales prices.
- determining the volume of production at which the total profit is maximized.
- setting a price level (for a given volume of production) that will maximize profits.

The steps to follow in building the model are as follows:

Step one: Gathering statistics for:

- Total operating costs – TC;
- Fixed operating costs – a;
- Variable operating costs – b;
- Average total costs – c_{TC};
- Average fixed costs – c_a;
- Average variable costs – c_b;
- marginal costs – c_m;
- the volume of production for the study period – q.

This information, for the company “ABC” Ltd, for six years, is presented in Table 1 and Table 2.

Table 1. Cost data and volume of shipments of "ABC" Ltd.

Year	Fixed costs (a)	Variables costs (b)	Total operating costs (TC) (thousands of BGN)	Manufactured products (mil. tkm) (q)
1	2	3	4 (2+3)	5
2014	71939	192598	264537	5214
2015	70529	188505	259034	5166
2016	74063	190985	265048	5227
2017	79329	208424	287753	4711
2018	66782	185147	251929	4031
2019	59472	103438	162910	2265

Table 2. Average cost values

Year	Average fixed costs Ca (a/q)	Average variable costs Cb (b/q)	Average total cost CTC (TC/q)
2014	13.79727656	36.93862677	50.73590334
2015	13.65253581	36.48954704	50.14208285
2016	14.16931318	36.53816721	50.70748039
2017	16.83909998	44.24198684	61.08108682
2018	16.56710494	45.93078641	62.49789134
2019	26.25695364	45.66799117	71.92494481

Step two: Establishing links between production volume and cost types:

- between total operating costs and production volume.
- between average variable costs and production volume.
- between marginal costs and production volume.

Well-known in economic theory is the fact that when the cost model changes (from linear to nonlinear) for the needs of internal company analysis, they are best described by a second-degree polynomial (Zhelezov, 1994), (Saykova & Todorova, 2000).

Considering this argument, the models for the three dependencies can be represented as follows:

(1) $c_{TC} = \beta_0^{TC} + \beta_1^{TC} q + \beta_2^{TC} q^2$

(2) $c_b = \beta_0^b + \beta_1^b q + \beta_2^b q^2$

(3) $c_m = \beta_0^m + \beta_1^m q + \beta_2^m q^2$

In these functions, costs are the dependent variable, and volume is the independent variable.

Here β_0 is a free member and corresponds to the fixed costs, β_1 and β_2 are the coefficients of the regression model.

The parameters of these functions are determined using the least-squares method, and the built-in statistical functions of the specialized software product STATISTICA-7 are used to facilitate the calculation process. The results for these parameters are summarized in Table 3.

Table 3. Function parameter values (1), (2) u (3)

Parameter / Dependent	β_0	β_1	β_2
C_{TC}	174.5838491598	-0.0377014772	0.0000023596
C_b	57.6479732517	-0.0060797080	0.0000040560
C_m	58.4546301384	-0.0123023021	0.0000012115

<u>Step Three:</u> Construction of a graphical model containing two figures.

The graphs are built on the reporting data for 2019. The secondary data in a short version needed to build the graphical model are presented in Table 4. The first figure (Fig. 1) shows the curves of the total, fixed, and variable costs. The revenue line is also depicted. The second figure (Fig. 2) presents the marginal, average total, and average variable cost curves. The marginal revenue line is also shown.

Based on the analytical and graphical results of the analysis of the marginal costs (marginal analysis), respectively, the marginal revenues of company "ABC" Ltd. the following conclusions can be drawn:

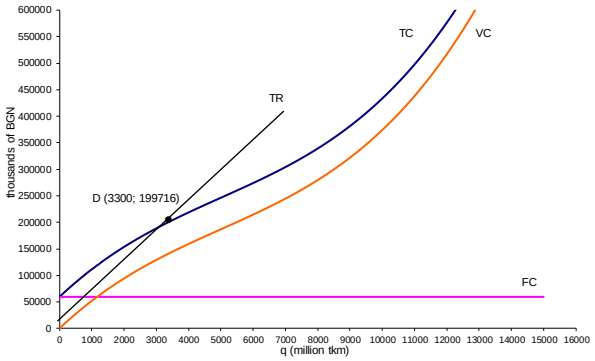

Fig. 1 General, fixed and variable cost cur

➢ The imposed equilibrium price in the freight the rail sector is disadvantageous for the enterprise under the given conditions because for 2019 it realizes volume of production with total costs above this marginal income (the realized volume is below the critical volume of 3300 million tkm - point E, Fig. 2 and point D, Fig. 1). However, in a fairly large range (to the right of point E), the average total cost of the enterprise is below the level of marginal revenue;

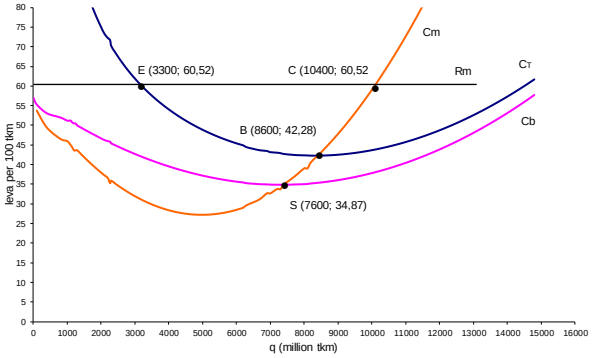

Fig. 2 Marginal, average total and average variable cost curves

➢ Minimum average total costs are reached for the production volume of 8600 million tkm (point C - Fig. 2). To the right of this point, the average total costs are gradually increasing, but the total profit increases (the profit per unit of production decreases);

➢ The minimum possible variable costs are achieved with a production volume of 7600 million tkm – point S, Fig. 2;

➢ Positive value of the financial result is obtained when the volume of production exceeds 3300 million tkm - point D, Fig. 1 and point F, Fig. 2. In these points, the total revenue equals the total costs - for point D, respectively for point E - the marginal revenue equals the average total cost. At volumes below 3300 million tkm, the company makes losses, and at volumes above the critical one, the company makes profits;

➢ The enterprise will receive the maximum possible profit, with a production volume of 10400 million tkm, at which marginal costs are equalized with the equilibrium price, i.e. in point C, Fig. 2.

Table 4. Data for the construction of cost curves for marginal analysis

Production volume (million tkm)	Total operating costs (BGN thousand)	Continuous operating costs (BGN thousand)	Variable operating costs (BGN thousand)	Total unit cost (BGN per 1000 tkm)	Variable cost per unit (BGN per 1000 tkm)	Marginal cost (BGN thousand)	Marginal revenue (BGN per 1000 tkm)
q	TC	FC	VC	Ctc	Cb	Cm	Rm
1	2	3	4	5	6	7	8
0	59472.00	59472	0		17.98		
100	61240.37	59472	1768.37	70.42	17.68	16.68	60.52
400	66202.44	59472	6730.44	68.85	16.83	15.54	60.52
800	72099.16	59472	12627.16	66.84	15.78	13.74	60.52
1000	74778.27	59472	15306.27	65.87	15.31	13.40	60.52
1100	76058.10	59472	16586.10	65.39	15.08	12.80	60.52
1150	76684.04	59472	17212.04	65.16	14.97	12.52	60.52
1200	77301.02	59472	17829.02	64.92	14.86	12.43	60.52
1250	77909.31	59472	18437.31	64.69	14.75	12.25	60.52
2900	94884.12	59472	35412.12	57.85	12.21	9.47	60.52
3000	95833.47	59472	36361.47	57.48	12.12	9.49	60.52
3100	96787.13	59472	37315.13	57.13	12.04	9.54	60.52
3200	97747.26	59472	38275.26	56.78	11.96	9.60	60.52
3300	98716.04	59472	39244.04	56.43	11.89	9.69	60.52
3400	99695.62	59472	40223.62	56.10	11.83	9.80	60.52
3500	100688.18	59472	41216.18	55.76	11.78	9.93	60.52
3600	101695.90	59472	42223.90	55.44	11.73	10.08	60.52
3700	102720.94	59472	43248.94	55.12	11.69	10.25	60.52
3800	103765.46	59472	44293.46	54.80	11.66	10.45	60.52
3900	104831.65	59472	45359.65	54.49	11.63	10.66	60.52
4000	105921.67	59472	46449.67	54.19	11.61	10.90	60.52
4100	107037.68	59472	47565.68	53.90	11.60	11.16	60.52
5300	123247.52	59472	63775.52	50.81	12.03	15.97	60.52
5400	124898.96	59472	65426.96	50.59	12.12	16.51	60.52
5500	126606.77	59472	67134.77	50.38	12.21	17.08	60.52
5600	128373.12	59472	68901.12	50.17	12.30	17.66	60.52
5700	130200.19	59472	70728.19	49.97	12.41	18.27	60.52
5800	132090.14	59472	72618.14	49.78	12.52	18.90	60.52
5900	134045.14	59472	74573.14	49.59	12.64	19.55	60.52
6000	136067.37	59472	76595.37	49.41	12.77	20.22	60.52
6100	138158.98	59472	78686.98	49.23	12.90	20.92	60.52
6200	140322.16	59472	80850.16	49.06	13.04	21.63	60.52
6300	142559.07	59472	83087.07	48.89	13.19	22.37	60.52
6500	147262.75	59472	87790.75	48.58	13.51	23.52	60.52
8400	210408.35	59472	150936.35	46.83	17.97	42.27	60.52
8600	219347.79	59472	159875.79	46.77	18.59	44.70	60.52
8800	228790.43	59472	169318.43	46.73	19.24	47.21	60.52
9000	238753.64	59472	179281.64	46.72	19.92	49.82	60.52
9200	249254.77	59472	189782.77	46.73	20.63	52.51	60.52
9400	260311.17	59472	200839.17	46.77	21.37	55.28	60.52
9600	271940.21	59472	212468.21	46.83	22.13	58.15	60.52
9800	284159.25	59472	224687.25	46.91	22.93	61.10	60.52
10000	296985.63	59472	237513.63	47.02	23.75	64.13	60.52
12200	483125.04	59472	423653.04	49.80	34.73	103.26	60.52
12400	504593.47	59472	445121.47	50.20	35.90	107.34	60.52
12600	526894.89	59472	467422.89	50.62	37.10	111.51	60.52
12800	550046.65	59472	490574.65	51.06	38.33	115.76	60.52
13000	574066.13	59472	514594.13	51.53	39.58	120.10	60.52

4 CONCLUSIONS

Against this background, one of the short-term alternatives for company ABC Ltd. is to look for ways to minimize the variable operating costs. Another alternative is to intensify its marketing research to open new markets and increase production.

In the long run, the firm can also rethink its fixed costs policy.

The application of the model for research and analysis of marginal costs, respectively marginal revenues, supports the process of forecasting total costs and revenues for the activity at different levels of production of transport production. This model provides information on the state of the enterprise, as well as information for determining the directions in which to orient the production policy.

The model also has its disadvantages, which are a consequence of the above limitations. Not including the demand curve for the entire transport market, which in practice ignores the wide variety of market conditions, creates a slight distortion of actual results. The model also does not express the need for technological restructuring.

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FORESIGHTING TECHNOLOGICAL AND INNOVATIVE DEVELOPMENT OF BELARUS

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JEL Category: **O14, O31, O32**

Abstract

This paper focuses on the foresight technological and innovative development of the Republic of Belarus. The main objective of the paper is to postulate the importance of foresight innovation for building a competitive economy. Approaches to conducting scientific and technological forecasting in the Republic of Belarus at different periods are described in this paper. World experience in conducting technological forecasting shows that most countries carry out systemic foresight studies to predict scientific and technological progress. Formation of the next Comprehensive forecast of scientific and technological progress for the Republic of Belarus for 2021–2025 and for the period until 2040 (CF 2025) was carried out in the period 2018-2019 in the Republic of Belarus. The methodology was based on the global experience of foresight research, which was adapted to account for the specifics of the functioning of the economy of the Republic of Belarus. CF 2025 makes possible: 1) to identify main promising areas of scientific and technical development of the Republic of Belarus; 2) to identify product groups and breakthrough technologies, and 3) to determine a shortlist of promising innovative products for the Republic of Belarus. The paper describes the basics of the methodology and the main stages of foresight and describes the possibilities of using the results of foresight for planning the implementation of various scenarios of economic growth and achieving sustainable development goals.

Keywords: *comprehensive prognosis, foresight, scientific and technological development, experts, objects of foresight, world trends.*

1 INTRODUCTION

Management of innovative development is based on the prediction of the emergence of innovations both in the field of technology and in the field of consumer goods, analysis of possible alternatives for technological and innovative development, and comparison of the economic potential of these alternatives.

The Republic of Belarus is among the countries with significant scientific potential, but not having a sufficient raw material base. In these conditions, the role of the use of intellectual resources and scientific and technological potential is growing sharply.

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A reasonable choice of medium-term and long-term priorities for scientific, technological, and innovative development allows us to increase the competitive potential of the national economy by increasing its comparative advantages in science, education, and high technologies and, on this basis, use new sources of economic growth.

By applying forecasting tools to select further priorities for scientific and technological development, the country gets high chances to enter the emerging world high-tech markets and to build a competitive economy.

In the period 2018-2019 in the Republic of Belarus work was carried out to formulate the next Comprehensive Forecast of Scientific and Technical Progress for the Republic of Belarus for 2021–2025 and for the period until 2040. This paper describes the basics of the methodology and the main stages of this study, as well as the possibilities of using forecasting results for planning the implementation of various scenarios of economic growth and for achieving sustainable development goals.

2 EXPERIENCE OF TECHNOLOGICAL FORECASTING AT THE NATIONAL LEVEL

Currently, the world forecasting practice covers a variety of approaches, which is the result of constantly changing economic conditions and of the opportunities available to researchers.

All countries that steer their economies along the path of innovation invariably turn to forecast in the form of systemic foresight studies. Foresight is a system of methods for expert evaluation of strategic areas of socio-economic and innovative development, for identifying technological breakthroughs that can affect the economy and society in the medium and long term.

At present, there is no single definition of foresight as a forecasting method. Nevertheless, several basic features are characteristic of foresight as a form of research:

- within the framework of the foresight, an assessment of the possible prospects for innovative development related to the progress of science and technology is carried out, possible technological horizons are outlined.
- foresight always implies the participation of many experts from all fields of activity, in a varying degree related to the subject of a specific foresight project.
- when conducting foresight research, a set of interrelated tasks of an economic, scientific, and technological nature is solved.

Each country chooses its foresight research structure considering national characteristics: goals of the government's socio-economic policy, key problems of its development, tasks of ensuring national defense and security. Features of the country affect the choice of areas of innovative development, the choice of sources of information reflecting the state of scientific, technological, and industrial activity in the country, as well as the choice of sources reflecting global scientific and technological trends. But the foresight platform is the same for everyone: studying current and future challenges arising under the influence of global changes, identifying key technologies, developing a strategy for the future development of the country's economy.

Foresight is used in many countries of the world, and not only in developed, but also in developing. Rich experience in this area has been accumulated in Japan, Great Britain, and Germany. Studies are conducted regularly in China, South Korea, South Africa, and Latin America. The number of studies in the world today is measured in the thousands. For example, the European Foresight Monitoring Network (EFMN) program covers more than 2,000 different studies conducted at the international level, at the level of countries, regions, industries, corporations.

Among the former Soviet countries, the Russian Federation and Kazakhstan have experience in conducting foresight research at the national level.

In the Russian Federation, the first major project at the national level was the long-term foresight of the scientific and technological development of Russia for the period until 2025, initiated in 2007 by the Ministry of Education and Science of Russia (Chulok, 2009). This document includes three major blocks:

- macroeconomic forecast of the Russian economy.
- prediction of the sphere of science and technology (in priority areas).

- industry foresight, the purpose of which is the working-out of technological development alternatives for the most important sectors of the economy.

In the next stage of scientific and technological foresight (2009-2010), the experience of foreign and international forecasts in the socio-economic and scientific-technological fields was generalized. Based on this experience, estimates were made of the future global economy and individual large world markets, considering the expected consequences of the financial and economic crisis (Blinkin, M.Y., et al., 2014).

The obtained results formed the basis of the macroeconomic forecast of the Russian economy, as well as the variant foresight of the technological development of many sectors. The project identified a group of promising technologies and products that meet the priorities of the technological modernization of the country.

In 2013 the development of foresight for the scientific and technological development of the Russian Federation until 2030 was completed. The purpose of this foresight was to identify the most promising areas of science and technology for Russia that would provide a significant contribution to solving socio-economic problems and realizing the country's competitive advantages (Blinkin, M.Y., et al., 2014).

As part of the work on this forecast, trends were identified that have the greatest impact on the field of science and technology, and the challenges they generate for the long-term development of the economy, science, and society in global and national contexts.

As a result, 7 priority areas for the development of science and technology were identified: “Information and communication technologies”; "Biotechnology"; “Medicine and healthcare”; "New materials and nanotechnology"; "Rational nature management"; "Transport and space systems"; "Energy Efficiency and Energy Saving".

The following activities were implemented for each of these priority areas:

- threats and windows of opportunity were identified for Russia based on the identified trends.
- promising markets, product groups, and potential areas of demand for Russian innovative technologies and developments have been identified.
- a detailed description of priority thematic areas for the development of science and technology has been compiled and more than 1000 priority tasks of research and development have been formulated, the implementation of which is necessary for the appearance of the considered groups of innovative products and services.
- the state of domestic research was assessed in these areas (“white spots” were identified, as well as parity and leadership zones, which could become the basis for integration into international alliances and positioning Russia as a center of global technological development).
- recommendations have been prepared to aim at enhancing the use of forecast results in the practice of scientific, technical, and innovation policy, including in the formation, adjustment, and implementation of state programs of the Russian Federation, including federal targeted programs of scientific and technological orientation.

The experience of conducting foresight research in the Russian Federation as a national program for forecasting the country's innovative development with the development of conclusions and recommendations of national importance seems to us to be a good example of a scientifically based comprehensive approach to solving such problems.

3 METHODOLOGY OF THE TECHNOLOGICAL FORESIGHT OF BELARUS

A system document that determines the procedure for developing the forecast of scientific and technological development in the Republic of Belarus is Decree of the Council of Ministers of the Republic of Belarus dated June 17, 1998 No. 945 “On the organization of developing a comprehensive forecast of scientific and technological progress of the Republic of Belarus and determining priority areas of scientific and technical activity in the republic”.

A comprehensive forecast of scientific and technological progress (CF STP), along with forecasts of socio-economic development, serves

as the basis for determining the system of priorities for scientific, scientific-technical, and innovative activities. Forecasting of technological development is understood as the prediction of development trends and the future state of engineering and technology in a certain field, made by scientifically sound methods based on the analysis and evaluation of previous stages of the development of engineering and technology and their current state (Law, 2012).

The state customer for the development of the CF STP of the Republic of Belarus is the State Committee for Science and Technology of the Republic of Belarus (SCST).

CF STP of the Republic of Belarus for the period 1998-2010 was developed by the State Institute of Economics of the National Academy of Sciences of Belarus. This organization has developed three CF STPs of the Republic of Belarus.

The development of the CF STP of the Republic of Belarus for 2016–2020 and for the period up to 2030 was carried out by the State Institute “Center for System Analysis and Strategic Studies of the National Academy of Sciences of Belarus”, and for 2021–2025, by the State Institute “Belarusian Institute of System analysis and information support of the scientific and technical sphere".

The Institute of Economics of the National Academy of Sciences of the Republic of determined the following sections of the CF STP:

1. Analysis of global trends in scientific and technological development.
2. Analysis of the state of the scientific and technological potential of the Republic of Belarus.
3. Forecast of scientific and technological progress in the sectors of the Republic of Belarus for the selected period.
4. Forecast of scientific and technological progress in the regions of the Republic of Belarus for the selected period.

The main emphasis was placed on forecasting scientific and technological development in the context of existing branches of the economy of the Republic of Belarus.

The structure of the CF STP developed by the State Institution “Center for System Analysis and Strategic Studies of the National Academy of Sciences of Belarus” included the following sections:

1. Forecast of economic development as the target dominant of scientific and technological development.
2. Priorities of scientific and technological development of the Republic of Belarus for 2016-2020 in the context of international comparisons.
3. The most important directions for the implementation of priorities in the system "science - technology - innovative economy" for the period until 2030.
4. Conditions and policies for the implementation of the forecast.
5. Projected results of the interaction of science and economics.

The main emphasis was placed on forecasting scientific and technological development in the context of the most important areas for the implementation of priorities in the system "science - technology - innovative economy".

In terms of the most important directions for the implementation of priorities in the system “science - technology - innovative economy” for the period until 2030, the following branches were considered: biotechnologies for the agro-industrial complex and medicine; aerospace technology; information and communication technologies; modernization and intellectualization of existing industries (machine-, instrument- and machine tool building, energy, chemical, and petrochemical production); logistics and container technology in transport; regions and territories; environmental imperative as a key factor in sustainable development.

The methodology for the development of the above-mentioned CF STP was based on the following method of collecting and processing source data. The developers of the CF STP through state bodies (ministries and concerns), supervising the relevant branches of the economy, sent out a request about the state of scientific and technological progress and innovative activity in these branches and the prospects for the development of these branches. This request descended along the hierarchy of management to lower levels, that is, to specific managers and specialists "on the ground" - at enterprises and in research units.

Managers and field specialists, in this case, acted like experts. They formed information about the state of scientific and technological progress and innovation at their enterprise and the branch.

Further, this data was transferred up the management hierarchy, to higher levels. In this case, their partial generalization could occur. From government bodies, the data collected in this way was transmitted to the developers of the CF STP in response to their request.

At the end of the work, the developers of the CF STP performed the final systematization and adjustment of the collected data, bringing them into a specific format.

Proposals on the structure and content of the CF STP for 2021-2025 and the period until 2040 (hereinafter CF 2025) were developed at the Belarusian Institute of System Analysis and Information Support for the Scientific and Technical Sphere in 2018. The methodology was based on the global experience of foresight research, which was adapted considering the characteristics of the functioning of the economy of the Republic of Belarus. An impact on the methodology of the CF STP was exerted by the experience of foresight in the scientific and technological development of Russia 2030 (Hochberg, et al., 2016).

The purpose of CF 2025 was to obtain scientifically-based ideas about possible alternatives for scientific, technological, and innovative development of the Republic of Belarus in the medium term (5 years) and the long term in the context of world scientific and technological development.

The prediction was carried out in the context of the selected promising areas of scientific and technological development, and for each of the areas - in the context of sectors of the economy of the Republic of Belarus.

The initial list of promising areas of scientific and technological development was formed by experts based on global trends and the provisions of the Strategy "Science and Technology: 2018-2040" (Strategy, 2017). It included such areas as information and communication technologies; robotization and mechatronics; the energy of the future; space systems, unmanned technical systems; nano industry; bio-industry; additive technology; compositional and “smart” materials; ecology and environmental management.

Each of the promising areas was considered in the context of 14 major sectors of the economy, the development of which is largely determined by the main economic trends in the country: industry (except petrochemical), light and food; petrochemical industry; light industry; food industry; agriculture; transport and communications; architecture and construction; communication and informatization; power engineering; the science; education; healthcare; forestry; natural resources and environmental protection.

The intersection of the corresponding area of scientific and technological development and the corresponding sector of the economy was considered as a foresight area. Within each forecasting area, specific foresight objects stood out: promising innovative technologies, product groups, and goods.

The development of CF 2025 included the following steps:

- compiling a list of foresight objects.
- obtaining the values of the parameters of foresight objects.
- processing parameters of foresight objects.

To develop lists of forecasting objects the work of experts was organized based on the Delphi method. The Delphi method involves conducting questionnaires of experts (direct debates of experts are excluded) and making further multiple adjustments of the results based on familiarizing each expert with the opinions of other experts.

The work of experts was carried out as part of expert groups that were formed by sectors of the economy. The expert community for the research included more than 130 representatives of various organizations of the national educational institutions, research institutes, industrial enterprises, innovative companies, marketing organizations, government agencies.

As a result of 3 stages of Delphi, information was obtained on 302 technologies, goods and services, the appearance of which on the markets is expected in the period from 2021 to 2025, and 338 foresight objects, the appearance of which in the markets is expected in the period until 2040.

Based on the numerical analysis of a large amount of data for each technology, product, and service, the following groups of parameters were determined: global trends in publications and patents; global market capacity; the state of the infrastructure of the Republic of Belarus.

The first two groups of parameters characterized the demand for the foresight object for the foresight period. The third group of parameters characterized the feasibility of the foresight object in the conditions of the Republic of Belarus.

Trends in international and domestic publications and patents were obtained based on analysis of publication databases: Scopus, Web of Science; patent bases: Eurasian Patent Organization, European Patent Office, World Intellectual Property Organization, Rospatent, National Intellectual Property Center of the Republic of Belarus.

The capacity of the world market for each foresight object was determined based on marketing research and analysis of various sources including the database of the World Economic Outlook, the International Monetary Fund, data from the World Bank, OECD, WHO, the UN Department of Economic and Social Affairs and many others, depending from the specifics of industries.

The state of the infrastructure of the Republic of Belarus for each foresight object was evaluated by a combination of the following parameters:

- the state of production capacities (whether a forecasting object is currently being produced; if it is being produced, then at what enterprises; can a foresight object be produced at existing capacities).
- the number of research and development, experimental and technological works (R&D) registered in the State Register of R&D for 5 years, taking into account information about the degree of readiness of the foresight object (idea, concept; experimental model; prototype, pilot batch; small-scale production);
- the number of domestic scientific publications.
- the number of patents registered in patent databases and registers of the National Center for Intellectual Property.
- information about personnel potential.

Based on the obtained values of the parameters of foresight objects, the demand and feasibility indices were calculated. Based on the additive convolution of the normalized values of these parameters, the prospectivity index of each technology, product, and service was calculated.

The values of this index were used in compiling corresponding ratings, according to the foresight as a whole and for each of the economic sectors (Zianchuk, et al., 2018).

4 PLANNING THE ECONOMIC DEVELOPMENT OF BELARUS BASED ON TECHNOLOGICAL FORECASTING

CF 2025 is used as the basis for the selection of strategic priorities for the development of the Republic of Belarus.

In the course of analysis and evaluation of the areas of scientific and technological progress, on one hand, the shortcomings of certain previously formulated areas of scientific and technological progress were revealed, and the other hand, the need of many traditional areas of scientific and technological progress in new tools and technologies are revealed.

Based on the results of the development of CF 2025 new priority areas of scientific, scientific-technical, and innovative activity in the Republic of Belarus have been formulated, balanced in terms of prospects (based on the analysis of the rating of technologies, goods and forecast services).

1. information and communication, aerospace, and interdisciplinary technologies.
2. energy, ecology, and environmental management.
3. innovative materials.
4. bioengineering, chemical, and medical technologies.
5. agro-industrial and food technologies.
6. mechanical engineering, photonics, micro-, opto- and microwave electronics.

A comprehensive forecast of scientific and technological progress along with forecasts of socio-economic development serves as the basis for determining the priority system of scientific, technological, and innovative activities of the Republic of Belarus. The foresight results are used in the development of the National Strategy for Sustainable Development of the Republic of

Belarus and other documents for planning economic development.

The developed foresight provides a scenario approach to managing economic growth. Prospects for the development of innovative technologies, product groups, and products are presented in three options for the development of the country's economy: pessimistic, balanced, and optimistic. Based on the number of resources available for each scenario, it is possible to determine which technologies, product groups and innovative products are subject to priority investment, and to which level (Shumilin, et al., 2019).

Based on the foresight, it is possible to form some significant large-scale projects (in the field of healthcare, robotics, etc.) focused on the production of goods in the Republic of Belarus that correspond to world trends in scientific and technological development, taking into account the prospects of the sales market (Zianchuk, et al., 2019).

The implementation of such “projects of the future” will promote the development of technologies, creating goods and services with significant competitive advantages in existing markets, and creating the potential for forming new market niches for domestic products.

5 CONCLUSIONS

One of the most important tasks for the Republic of Belarus on the path of innovative development is the activation of consistent scientific, scientific-technical, and innovative activities in all areas of the economy. The results of these activities should be expressed in the development of new technologies, the creation of new industries, and the strengthening of the country's position in world markets. CF 2025 is one of the most important components of solving this problem.

During the development of CF 2025, systematic work was carried out related to the identification of the most promising innovative technologies, product groups, goods, or services for Belarus.

When developing CF 2025, the following papers were considered: The Concept of National Security of the Republic of Belarus, the National Strategy for Sustainable Social and Economic Development of the Republic of Belarus, and the Strategy “Science and Technology: 2018-2040”.

When developing the foresight, the following were used: industry sector plans and development strategies of interested government bodies and organizations subordinate to the Government of the Republic of Belarus; exchange of experience results and expert consulting support of leading international foresight structures; forecast of scientific and technological development of Russia: 2030; American Leading Production Strategy (USA); the main trends of 2019 according to the Massachusetts Institute of Technology; the publication of the National Intelligence Council (USA) "Global Trends 2030: Alternative Worlds"; the main trends in the development of new technologies according to Gartner; reviews of the innovative development of various countries prepared by the United Nations Economic Commission for Europe.

The developed CF 2025 could become the basis of the national system of technological foresight of the Republic of Belarus, which is currently at the initial stage of formation.

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Review MEST- M…

PART A:

SECTION I

Name and surname of the reviewer	
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PART B: *Reviewer only*

SECTION II: Comments of manuscript

General comment	
Introduction	
Methodology	
Results	
Discussion	
Findings	

SECTION II (continue) (Click on the box next to the appropriate answer and check in one of the categories, or delete unnecessary in the event that you are unable to check the desired box)

Bibliography / References	**Literature is relevant** **Citation is in accordance with the requirements**	**Yes** ☐ **Yes** ☐	**No** ☐ **No** ☐
Figures	**Figures are appropriate**	**Yes** ☐	**No** ☐
Tables:	**Tables are appropriate**	**Yes** ☐	**No** ☐

SECTION III

Please rate it from one of: *(1 = Excellent) (2 = Good) (3 = Correct) (4 = Poor)*

Originality	
Scientific contribution	
Technical quality of the article	
Clarity of presentation	
Depth of study	

SECTION IV – Recommendations for publication:
(Please select one of the options with an *X*)

Accept the article "as it is"	
The work requires minor repairs	
The work requires small-scale changes	
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The work is good but it is not for publishing in the MEST Journal. It could be published in another journal, for example (make the proposal)	
Work has to be rejected because (please specify the particular reason)	

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This part of the review is confidential and will be available only to editors of the MEST Journal. If you have any special comment to the editors, you can enter it here.

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