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February 7, 2020 in Moscow,
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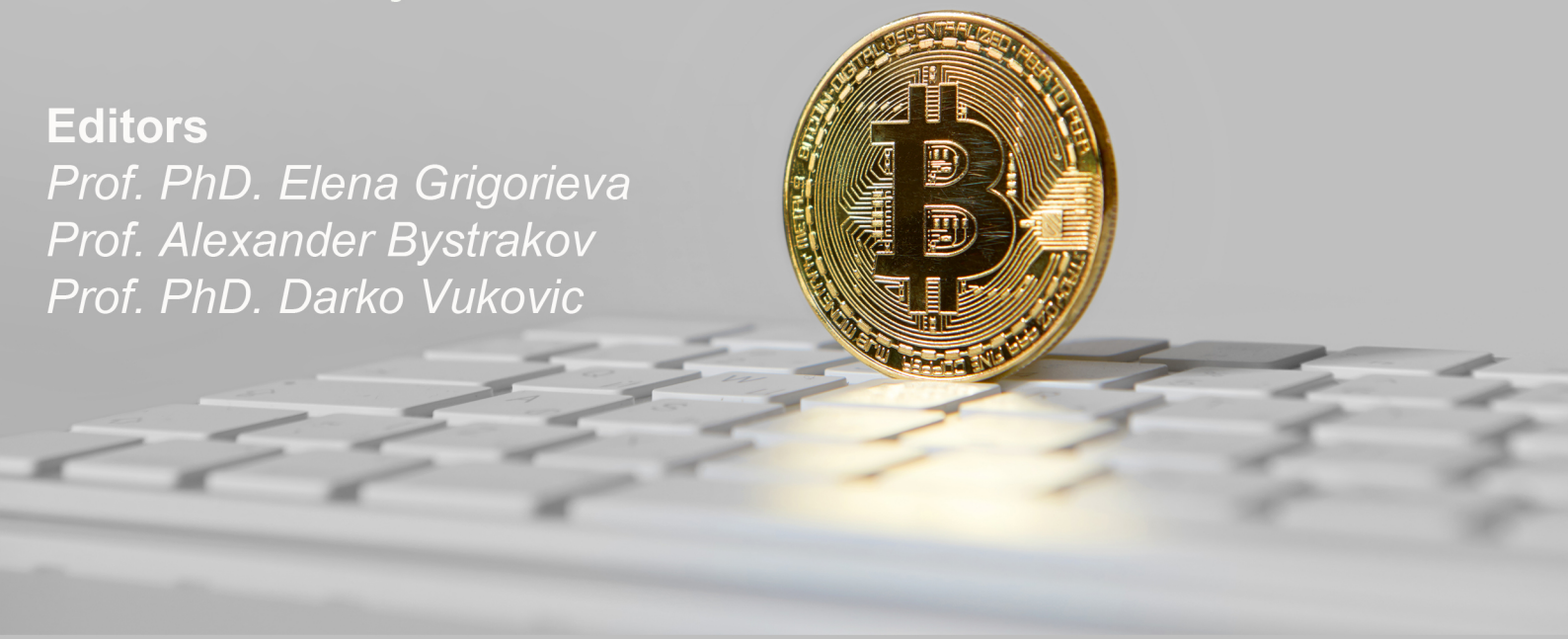
Miklukho-Maklaya St., 6, Russia



Editors
Prof. PhD. Elena Grigorieva
Prof. Alexander Bystrakov
Prof. PhD. Darko Vukovic

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Dear colleagues,

The international scientific and practical conference "DIGITAL FINANCE 2020" is the successor of the annual international round table "Financial technologies in the digital economy: problems and prospects of development in the world and Russia", which was held at the faculty of Economics for two consecutive years (2018, 2019).

Traditionally, the event was organized by the Department "Finance and credit" Faculty of Economics, RUDN. The event was co-organized by the Financial University under the Government of the Russian Federation, the Faculty of Business and information technology of the University "Turan-Astana" and National University of Science and Technology MISIS.

This book addresses the processes of digitalization in various areas of Finance. We presented selected papers from the conference where we discussed a lot of important questions and points of three main sections issues:

- *"Institutions and markets in the digital environment",*
- *"Corporate and public finance and control in the digital environment",*
- *"Financial innovations, engineering, monetary systems and financial regulatory policies".*

Editors:

Elena Grigorieva
Alexander Bystrakov
Darko Vukovic

International Scientific and Practical Conference: Digital Finance 2020 (DF2020)

Contents

Part I
DIGITALIZATION OF KEY SECTORS, BUSINESS PROCESSES AND SUSTAINABLE DEVELOPMENT

Digitalization of Key Sectors of Russia: The Main Problems and Ways to Overcome

Danilova O. V.[1], Belayeva I. Yu.[1], Rakov A.V.[1]

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Abstract

The aim of the study is to discuss the prospects for the transformation of property in the electric power industry, a key industry in the Russian economy. The lack of modern technologies does not allow optimizing the management of the energy system and improving the quality of energy supply. Switching the industry to intelligent systems is the only possible way to improve the quality and reliability of power supply and solve the financial and economic problems of the grid complex without increasing tariffs and additional burdens on consumers. Reliable functioning of the country's energy sector is largely determined by the volume and sources of financing digitalization programs. For these purposes, it is necessary to create an appropriate institutional environment and the formation of a special model of innovative development of infrastructure industries. In the course of the study, the authors came to the conclusion that the creation of new effective corporate structures in infrastructure sectors should occur with the participation of both state and private capital and be accompanied by the activation of transformational processes of property relations. Otherwise, the risks of private investment will be too great for the investment activity of domestic and foreign capital.

Keywords: corporate property, infrastructure industries, digitalization, intelligent power system, smart networks, Smart grids state support, tariff setting

1. Introduction

The fundamental restructuring of the economic relations that have occurred in recent decades in Russia has also affected property relations in the so-called "natural monopolies" – the electric power industry, railway, trunk and air transport, ports and utilities – which are the basis for the sustainable development of national economic systems. The rapid transformations taking place in the modern world are associated with the active spread of the Internet, information-computer and cloud technologies, the creation of digital platforms for stable communication channels, the spread of sensors, the use of artificial intelligence, robotics and machine learning [12]. A distinctive feature of the listed processes in the energy sector is the fact that the physical (power) and information and communication subsystems, in terms of the difficulty of ensuring the reliability of energy supply, the responsibility for the quality of energy resources supplied to consumers, become quite comparable [11]. The energy complex should ensure the reliability and availability of energy supply, reduce network losses, adapt to any energy sources and new market participants. The transition to digital energy involves a deeper level of interaction between sales organizations and consumers with new market actors (micro-generation, prosumers (active consumers), aggregators, drives, etc.). Parameters such as the ability to provide load management services (the so-called price-dependent consumption in retail electricity markets) are considered. The solution of these large-scale tasks requires significant financial investments and is possible based on the effective use of the property of the most important infrastructure sectors of the Russian economy.

2. Methodology

In the Russian economy, corporate relations began to form relatively recently. The Russian model of corporate property was the result of importing the institution of corporate property. Significant transformations of recent years are associated with an increase in the efficiency of corporate property management, which occurred mainly due to the exclusion of individual economic agents from production chains, lowering market barriers, building optimal logistics, expanding sales markets, and increasing transparency in the process of formation of market prices. Ways to implement the economic interests of

participants in corporate relations are characterized by inconsistent functioning, a high level of unevenness and conflict.

The processes of transfer to private ownership (in various forms) of several state functions of natural monopolies are quite controversial, with significant risks for the institutions of the state, business, and society [8]. Organizational measures to centralize the management and finance of infrastructure sectors have not solved the main problem – the formation of effective mechanisms for investing in new construction and financing of modernization programs for existing facilities [2].

Methodological approaches to the study of the category of property were formed in the process of evolution of theoretical ideas about the content, functions, laws of development and the role of property in the development of society. Modern theoretical ideas about property are traditionally developed in the framework of two scientific areas.

Neoinstitutionalism – a fundamental theory of property rights proves that property is not only the resources themselves, but also property rights. Issues regarding the efficient use of property should be addressed through a legal approach.

Neo-Marxism – combines scientific ideas that explore the category of property from the perspective of relations. The main idea is to state axiomatic provisions on the social significance of property relations.

A review of modern methodological approaches suggests that the main trend in the study of property is a combination of neo-Marxist and neo-institutional approaches. The concrete rational institutional analysis of property is organically combined with the social and political orientation of Marxist theory.

Systemic transformations of property should be carried out not only based on subjective programmatic transformations, but also considering socio-political parameters, understanding the ongoing global macroeconomic changes [5].

3. Results

An analysis of the world practice of transferring natural monopoly objects to the management of private companies indicates that in most cases only the ownership and use rights of these objects were transferred to private business, that is, the functions of management, economic management, investment and operation [9]. The basic rights to dispose of these facilities remained with the state. At the same time, the state strengthened control and regulatory functions, reserved tariff regulation and pricing of products and services of enterprises of natural monopolies.

The Russian state, abandoning its many economic functions, reducing the burden on the budget, transferred most of the risks of functioning of naturally monopolistic sectors to private business structures. Compensation was the high degree of administrative and economic freedom to dispose of the transferred objects and the right to receive super-profits under the condition of the efficient operation of the transferred enterprises. It should be recognized that the relationship between the state and “private natural monopolies” in property relations has developed in recent decades, contradictory and inconsistent. The attraction of private capital in infrastructure sectors in various forms – joint-stock, contract, concession, leasing, and others – has led to a general increase in risks and instability for the state, business, and society.

The problems of decentralization and the growth of independence of state monopolies were supplemented by the specifics of Russian state entities: the constituent entities of the Russian Federation have different statuses, rights, and obligations with respect to the federal centre. And all this even though the rules for the functioning of infrastructure companies, tariff policies, quality of service, safety and environmental standards should be uniform (at least coincide in the main characteristics) throughout the country. The long-term, over the decades, obsolescence of infrastructure assets and the lack of new construction in the most important sectors of the national economy has created a situation where further progressive development of the country is impossible without significant financial investments, and low innovative activity in this industry is a factor affecting the country's energy security.

According to certain parameters, the average technical level of installed equipment in distribution electric networks corresponds to equipment that was operated in Western countries 25-30 years ago.

Almost 50% of distribution electric networks have worked out their normative period, and 75% – twice as much. The total depreciation of distribution electric networks reached 70%, of main electric networks – about 50%, and this is significantly higher than similar indicators in other countries with a similar territory, where the depreciation rate is 27-44%. Only the dismantling of morally and physically obsolete equipment of thermal power plants in the amount of 22.7 million kW will amount to more than 15% of the total installed capacity. According to preliminary estimates, the volume of annually commissioned capacity since 20022 should be 4 GW per year.

The relevance of the “digitalization” of the electric power industry in Russia is associated with the need for technical development and deep modernization of infrastructure sectors [1]. The positive effect of the growth of digital technologies when they penetrate all sectors of the economy is not in doubt.

Under the “digitalization” in the law developed by the Ministry of Energy and adopted “On Amending Certain Legislative Acts of the Russian Federation in Connection with the Development of Electric Energy (Power) Metering Systems in the Russian Federation”, it is exclusively about the development of intelligent metering systems for energy flows, accounting for distributed automation systems, control systems for the operational state of equipment and the quality of energy supply, the creation of digital models for optimal management of the energy system.

The lack of modern technologies does not allow optimizing the management of the energy system and improving the quality of energy supply. The situation is complicated by the fact that the modernization of generating capacities, the commissioning and reconstruction of transformer power and power lines are not accompanied by comparable volumes of output of old inefficient capacities. First, this applies to thermal power plants. Thermal power plants play a significant role in the structure of electricity generation in Russia, due to two reasons: relatively cheap hydrocarbon reserves and climatic conditions. Over the past ten years, with a total input volume exceeding 45 GW, 13 GW has been decommissioned. The main reason is the possibility that power plants receive special payments for capacity, provided that the generation is classified as forced. As a result, the average age of thermal generation in Russia is 32 years, with a tendency to further growth: about 30% of the capacities have been operating for over 45 years. The characteristics of the age composition of electric power equipment are presented in Figure 1.

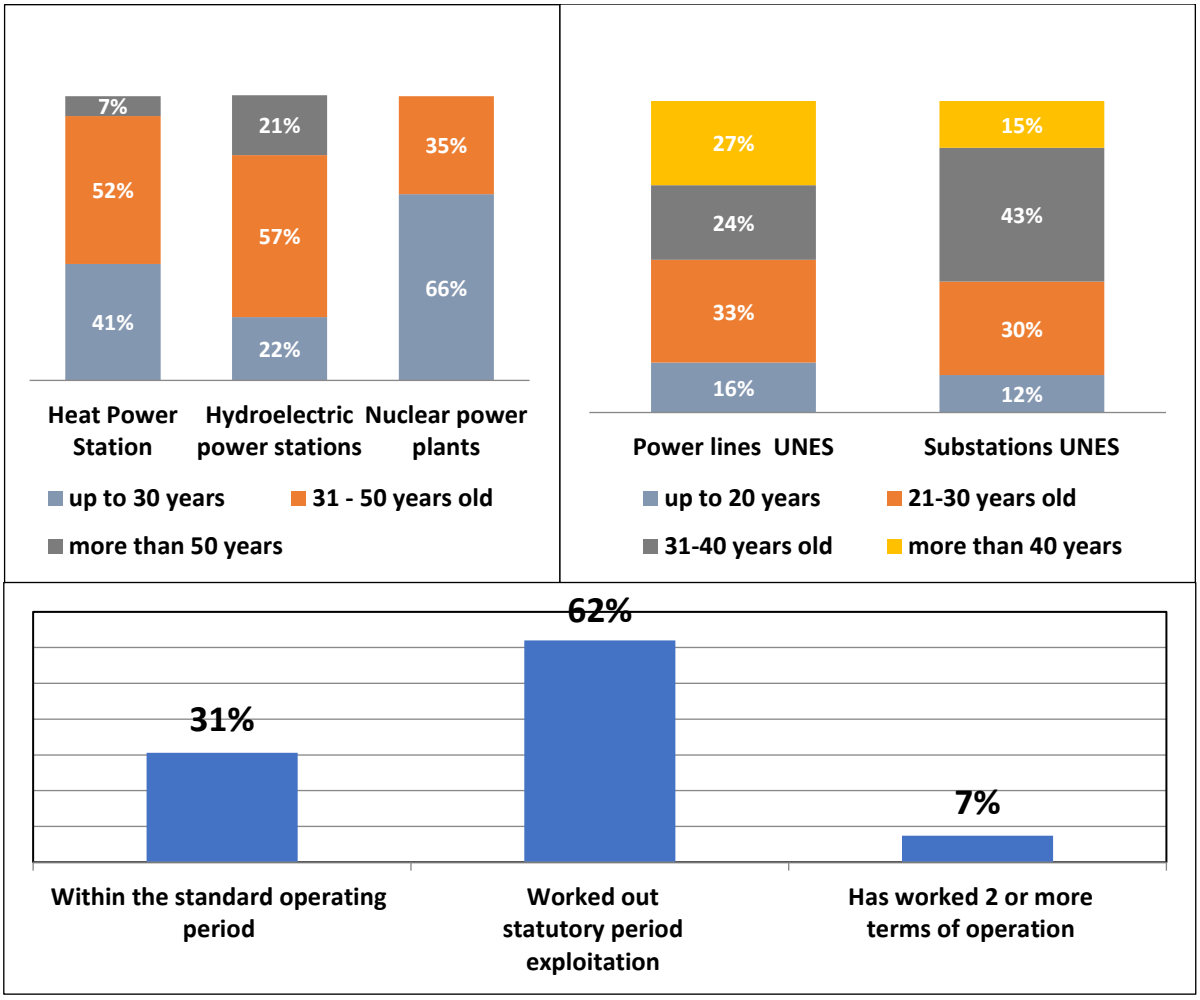

Fig. 1. Characteristic of the age state of the main equipment

The program for modernization of the electric power industry in Russia with a perspective until 2035 provides for:

1. Development and expansion of the use of innovative technologies of the Unified Electric Grid: a national, backbone network, the main networks of the integrated power systems, regional

distribution networks and networks with distributed generation. These measures will ensure a balance of power and electricity at the national level, the reliability of the power supply system and equal access to producers and consumers of electricity.

2. Formation of a highly efficient system of holistic optimal management of the development and functioning of the country's electric power complex (The energy strategy of Russia 2035).

Volumes of financing the activities of the Program for the modernization of the electric power industry of Russia for the period up to 2030 are presented in Figure 2.

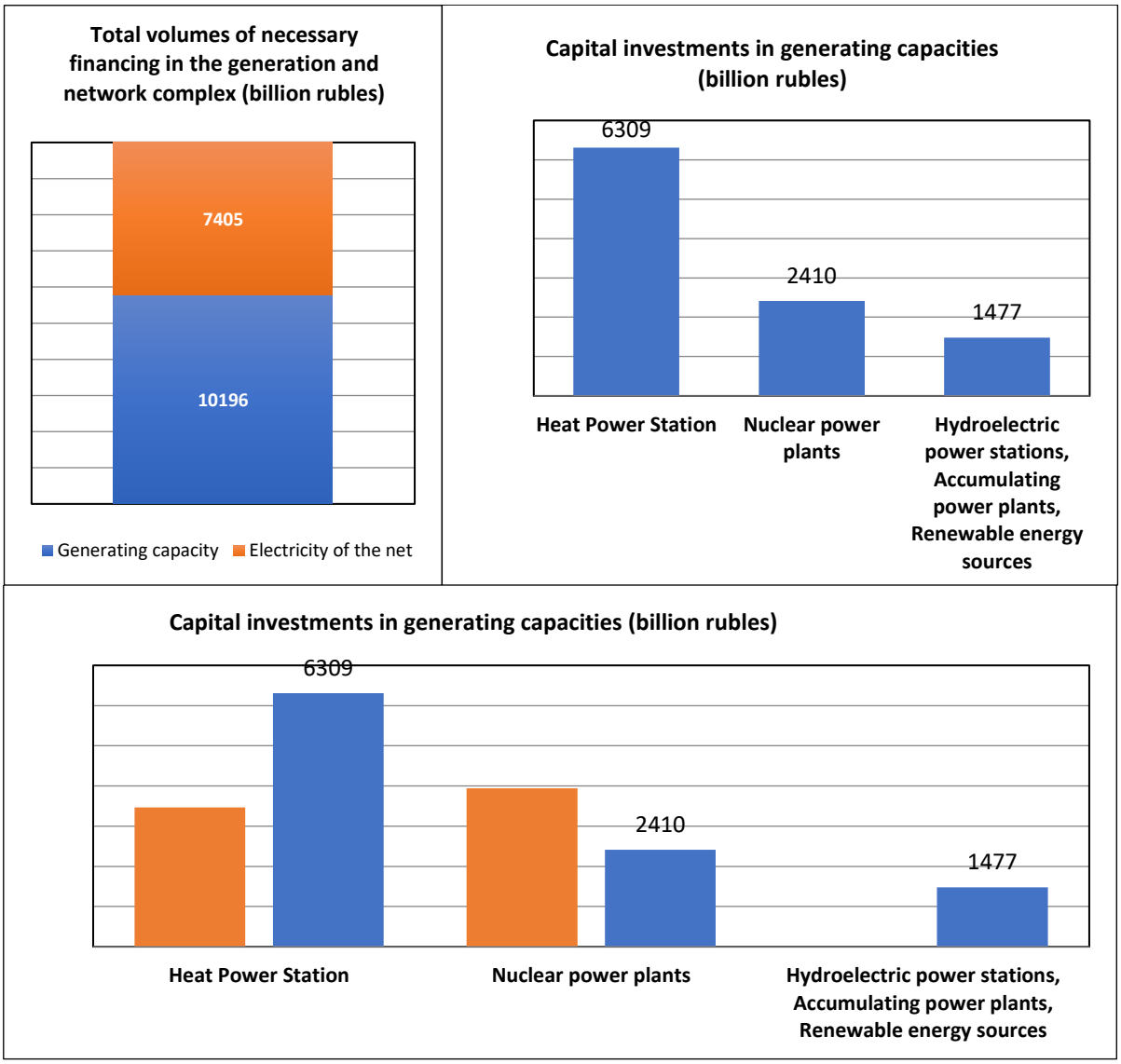

Fig. 2. Volumes of financing the activities of the Program for the modernization of the electric power industry of Russia for the period until 2030 (in 2010 prices)

The energy complex, in turn, must ensure the reliability and availability of energy supply, reduce network losses, adapt to any energy sources and new market participants. From the point of view of electricity consumers, the introduction of innovative technologies is necessary for the formation of new markets, within which there will be opportunities to quickly adjust their needs.

The solution of these problems is possible on the basis of creating a reliable and complete system of accounting for energy resources consumed, which allows you to objectively determine the volume of mutual obligations to pay for delivered energy resources, draw up a reliable balance of their production and consumption, and ensure the transparency of natural monopolies [3].

Starting July 1, 2020, Russian consumers will switch to the use of intelligent electricity metering systems, and this will be only the first stage in the implementation of the concept of digital networks.

Intelligent metering, not being a “self-sufficient” technology and functioning outside the “smart power system”, does not provide additional advantages compared to the usual transfer of metering device indicators. The same applies to the practice of “point” implementation of individual controls.

The main problems of the Russian energy sector remain:

1. *Cross-subsidization* and reduction of the network component in the final price for electricity, since a significant network component causes a steady increase in tariffs, a factor hampering the development of the entire national economy. On average, for the country, for consumers, the share of the network component in the price of electricity reaches 50%. This is significantly higher than world practice [10]. In the regions of the country, due to the network component in wholesale market prices, the cost of electricity for consumers rises from 1.5 to 3 times, which clearly indicates the extremely low efficiency of the entire electric industry. The uncontrolled growth in the number of territorial grid companies that receive, regardless of the volume of services rendered, a component of the “boiler” tariff based on the provision of the necessary gross revenue, also contributed to an increase in electricity tariffs.
2. *Reserve capacities* – currently the total maximum power of consumers with a maximum power of at least 670 kW connected to the electric grids of distribution subsidiaries of PJSC ROSSETI is 87 GW and is used by consumers at about 44%. Inefficient use of capacities occurs against the background of a chronic lack of investments in the electric grid complex, and significant physical and technological deterioration of electric networks.
3. *The “last mile” mechanism* – as a form of hidden industry tax when large consumers connected directly to the networks of the Federal Network Company (high voltage networks) additionally pay the costs of territorial network organizations (lower voltage networks), the services of which are not actually used [3].

The organization of intelligent accounting is a high-tech, but also extremely expensive project. The introduction of an intelligent energy system throughout the country requires careful calculations of economic and technological efficiency, a comprehensive analysis of costs and benefits.

The introduction of intelligent energy management technologies (smart energy system), ultimately, is designed to solve the following problems:

- Integration of centralized and distribution generation, including generating facilities of consumers upon reaching a certain necessary share in the energy balance. In this case we are talking about renewable energy sources. The most common are solar and wind generation, which have a low production stability. The rapid development of renewable energy sources began in the first decade of the 21st century. Large-scale programs for the development and state support of renewable energy in Western countries have led to the fact that the cost of electricity at these facilities has decreased by 70-80%. In the coming years in the world, the aggregate commissioning of renewable energy facilities should exceed the commissioning of centralized generation facilities. For objective reasons, the share of generation in renewable energy sources in Russia does not exceed 0.3% of the total generating capacity of the UES. According to the Energy Strategy of Russia for the period until 2035, it is planned to introduce 8.5 GW of generating facilities for renewable energy sources in Russia by 2035, of which 5.5 GW should be commissioned already in 2024 [7].
- Equalization of peak demand for power in the power system (reduction of power consumption peaks and rise/levelling of dips) to reduce the total demand for generating capacity and the corresponding network infrastructure, and reduce network losses due to peak load. The effect in the system is ensured by feedback, including through the interface of accounting systems as part of the intellectual infrastructure. Consumers are given a signal to reduce consumption or transfer the load to their own energy sources, that is, to small generation or to energy storage devices. The effect has a “deferred nature” because it is based on a future significant increase in electricity consumption due to the abandonment of hydrocarbon consumption and the transition to electric transport, electric heating, electric stoves [4].

The listed problems, undoubtedly, besides purely technical aspects, have deeper reasons [14]. And they are connected, inter alia, by the institutional ambiguity of resolving issues of property rights, the lack of a clear legislative distinction between these rights between business and the state. In a market economy, organizational and economic relations should be based solely on the rule of law. The deficit of legislative acts that uniquely regulate economic activity at state-owned facilities significantly reduces the efficiency of their use.

4. Conclusions

In a situation where neither the state nor business is able to independently solve the problems of financing modernization and investing in the technological development of infrastructure sectors, the conceptual basis for solving the problem should be partnership (in various forms) between the state and the private sector. In this case, the state should be legally assigned the ownership of strategic infrastructure facilities. Rights to own and use these facilities are transferred to private companies. This provision confirms international experience. In the EU countries, national support programs for the development of intelligent networks are being implemented. In Germany, Great Britain, Denmark, France, Austria, Sweden, Slovenia, and Ireland, from 2011 to 2014, roadmaps and strategies for the implementation of intelligent networks were adopted, implying state support, including financial support.

When analysing the risks posed using artificial intelligence technologies, it is also necessary to note the problems of ensuring the cybersecurity of the power system associated with the possibility of hacking or deceiving artificial intelligence.

In solving these problems, creating an appropriate institutional environment, maintaining the consistency of infrastructure sectors, and gradually involving large businesses in solving national strategic problems, in our opinion, the state should play a decisive role.

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Platform-Based Business Models for the Public Transport Development

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Abstract

The development of modern forms of urban mobility is a response to the aggravated problems of living comfort in urban areas, associated with an extremely high load on all urban services in conditions of increasing not only passenger traffic, but also extremely rapid obsolescence of transport infrastructure, which is not coping with the efficient organisation of transport flows. The development of an integrated transport system based on the use of platform solutions for mobility provides not only the maximum availability and comfort of transport services, but also the formation of sustainable urban transport systems with minimal environmental impact. The analysis of the existing experience in applying modern business models for the development of public transport will determine priority areas for the further development of urban transport systems. The use of "smart" technologies for managing the city's transport system creates a qualitatively new environment based on the development of "human capital" and the spread of innovation. The intellectualisation of the work of transport systems in the city is a complex system of interconnected innovations: technological, organisational and economic (various forms of cooperation between the government, government, private business and public organisations), new financial models (public-private partnerships, paid services, financing from economic results, new and including digital services), etc.

Keywords: Urban Mobility, Sharing Economy, Mobility as a Service, Platform Business Models

1. Introduction

The digital transformation associated with the implementation of the most effective innovations based on information and communication technologies is the basis for the development of a modern economy.

Data-driven innovations, new business models, and digital applications are changing what is happening in science, governments, cities, and in all sectors of the economy. One of the key drivers of such changes is the increasing mobility of the population, requiring new forms, new mechanisms and approaches to its management. As a result of the combination of growing mobility, the expansion of the needs of the population and the widespread adoption of information and communication technologies, a complex self-organizing system of intellectual urban mobility is formed, which is ready for the fastest adaptation in extremely dynamic urban space development conditions. [8]

According to experts of the American consulting company Arthur D. Little, trends in modern urban mobility are determined by: user needs (growing demands for convenience, speed, and predictability; changing expectations for personalization and sustainability, new laws, and regulations), technological "(re-)evolution (the ability to process Big Data to extract integrated personalized information, "digitalization" of vertical structures and everyday activities, technology as a fundamental element of business), and expansion of the transport mobility ecosystem (expansion of the mobility ecosystem beyond the traditional vertical structures, the value chain of mobility attracts the interest of participants from other sectors, the active participation of federal and local authorities in enhancing security). [13]

According to Lukas Neckermann (managing director of the Neckermann Strategic Advisors consulting company, UK), smart mobility is a new and revolutionary way of thinking in the use of vehicles, including not only a wide range of modes of transport, but also new models of owning it (including sharing). According to Neckermann, the smart mobility of the future is "three zeros" mobility: zero emissions, zero accidents and zero property. [3] Rethinking technological approaches to the organization of urban mobility requires the introduction of new business models that allow transforming not only the urban transport system, but also the entire urban logistics as a whole most efficiently and painlessly for the urban environment. The basis of the new economic culture is the sharing economy, or

the joint collaborative consumption, which allows you to directly connect key economic agents and distribute products and services between them without intermediaries. Collaborative consumption suggests that it is more convenient to pay for temporary access to benefits than to own them. In such conditions of changing approaches and priorities, the issue of introducing new generation institutions and mechanisms that determine the features of modern economic development (such as digital platforms) [3] becomes important.

2. Methodology

The research of urban mobility development based on platform solutions (integrated smart mobility) is built considering the requirements for the development of the Mobility as a Service system:

1. Development of a functional public transport system that offers several types of transport, including but not limited to public transport (trains, buses), non-motorized transportation (bicycles, scooters), car sharing and private personal transport.
2. The presence on the market of competitive suppliers of platform solutions that unite all market participants and provide standardized data for users and the possibility of booking, planning and making payments at a single payment point for all purchases related to mobility.

The methodology of this study is based on a comparison and analysis of reports on the formation of modern forms of urban mobility of the largest consulting companies in the world: the Boston Consulting Group, McKinsey & Company, Deloitte and a number of others. In addition, the analysis considered data from financial and non-financial reports of companies that provide urban mobility services based on platform solutions, as well as strategic planning documents for municipalities that have the most successful practice of implementing integrated urban mobility. All this made it possible to consider the mandatory requirements for the reliability of the data and the correctness of the findings, such as relevance, high reputation status of information sources; professional involvement in the studied problem, representativeness of the study.

3. Results

The platform as a business model is a model for providing, through a technology platform, direct interaction and transactions between entities using new methods and forms of interaction, value creation and pricing. [4] Currently, integrated mobility platforms are being introduced in many countries of the world, but most successfully – in the cities of North America (69 cities of the USA and Canada, Germany, Austria). But while in Stuttgart about 70% of the population use integrated mobility platforms, in Vienna – about 10%.

The total cost in all countries of the world for the implementation of solutions for the development of urban mobility in 2018, according to IDC, amounted to about $ 1.63 trillion. using platform solutions. [14] By 2022, such costs should exceed $ 1.8 trillion, with the expected Compound annual growth rate (CAGR) during the forecast period (2017-2022) at the level of 2.8%.

By the year 2023, more than 2.3 billion trips annual will be made on vehicles participating in various Mobility-as-a-Service programs (in 2018, only 17.6 million), with these growth rates remaining thereafter.

In other words, users will prefer such transport solutions to private.

MaaS technology integrates combining transportation services (buses, taxis, railways, and subways) and offers attractive on-demand services. One MaaS user can save 90 hours a year on the trips, comparing time spent using a private car. Therefore, by 2023, all MaaS users will save more than 500 million hours. [9]

In 2017, in the framework of the project “INTEND-Intentify future transport research needs” (Horizon 2020 research and innovation program, funded by the European Union), experts determined that the technical and economic basis for the development of transport systems of the future will be the seamlessness (multimodality and inter-modality) of transport systems. [10]

The multimodality of urban mobility exists in four aspects: information integration, service integration, tariff integration and physical integration. All cities (including London, Paris, Hong Kong and Seoul) that have achieved smart card tariff integration have shown a significant increase in the number of public transport passengers. Digital transport payments are most actively used in cities of Northern Europe, USA, Germany, and Singapore.

Thus, the Deutsche Bahn payment system (e-ticketing using QR-code) has been installed on phones more than 60 million times with more than 1.3 million daily paid trips, and the EZ-Link Card system (NFC technology allows customers to check transaction history and balances, top-up the ez-link purse etc), with the help of which every day paid about 3 million trips. installed on 600 thousand smartphones in Singapore. [5]

In accordance with good practices around the world there are four levels of business models of urban mobility based on the integration of software platforms, public and private companies, state and municipal authorities and consumers. (Table 1)

Table 1. Technical and economic features of the organisation of integrated urban mobility at different levels

Level	Technical features of the organization	Pricing Features
Level 1: planning	Coordination of various transport modes and route personalization.	Cost-free solution
Level 2: planning and selling tickets	Collecting mobility offers from different operators, reselling operator tickets to individual passengers	Calculation of income based on commission for each trip, or based on potential benefits
Level 3: planning, ticketing, and pricing.	Ability to purchase transport tickets for selected modes of transport in integrated mobility packages	"All Inclusive" solution
Level 4: fully integrated	Ability to plan trips, purchase and sale of tickets, the use of various tools to stimulate consumers to choose a specific mobility option	Selection of different pricing options for both the passenger and the transport company

Source: compiled by the authors based on the reference [15]

Companies operating in a system of fully integrated mobility will be able to independently control and plan not only directions and volume of investments, but also create a flow of subsidies that will stimulate passengers not only to use MaaS applications, but to apply them individually (for example, if possible plan trips off-peak hours at a reduced price). This way, the interests of different levels of public authorities meet the needs of private market players. [16]

The choice, made by the company relating to the concept of an integrated mobility platform is connected with six main criteria: the expected role in the Integrated Smart Mobility (ISM**)**, the planned business model, the field of activity, the sources of income/customers, the mechanisms for introducing the product to the market, the organizational model. [15]

The largest distribution in each of the market segments of ISM (Carsharing, Ride-hailing, Carpoling, Kichsharing) are several types of business models.

So, the most popular Carsharing model is the Station-based model, which is implemented by more than 140 operators in 51 countries and more than 1.3 thousand cities (this format of car rental, when the client picks up the car in a certain place and returns it there, is followed by Zipcar).

The most familiar model to the Russian market is Free-floating (short-term car rental with the option to park the car anywhere in the rental completion area), it is implemented by almost 80 operators in 160 cities in 36 countries of the world. User surveys conducted by Movmi confirm that despite significant initial investments, a low entry barrier (pay-as-you-go model) and ease of on-demand service are the main reasons for this business model to grow further. [2]

The peer-to-peer model (the owner of a private car is registered in applications, and the company acts simply as an intermediary, taking its percentage), despite the fact that it is used by only 25 operators in 19 countries, is represented in more than 2 thousand cities. The complexity of using this model is associated with insurance restrictions on car use.

In the segment of mobile services like an ordering a taxi, Uber's business model has become the most famous. Uber, one of the fastest growing and most controversial Silicon Valley start-ups. Although the basic Uber business model is quite effective in terms of revenue, the costs of its implementation are also extremely high.

Uber's operating losses in 2016 amounted to more than $ 3 billion. In 2017, they increased by 35% to $ 4.1 billion and fell to $ 3 billion in 2018, and continue to be significant, despite Uber's maturity, low driver salaries, IPO and other factors. The company's high costs are related to its corporate strategy areas: the constant expansion of the geography of its activities (start-up costs, lobbying and competition in new markets), commodification of travel sharing in local markets, less favourable conditions for drivers (drivers have a monthly outflow of about 13%, in connection with which marketing and advertising expenses for registering new drivers on the platform), expenses for attracting passengers are growing. [6]

4. Conclusion

The current stage of development of urban transport systems is characterized by a change of business models in transport services, the broad development of the economy of collaborative consumption, closed-loop economies, the digitalization of traditional public transport services based on mobile applications, the development of mobility as a service (application of a combination of services), and also with an increasing role public transport as the basis for managing city life. [12]

The set of tools and measures for the smart mobility development should cover all types of transport throughout the city agglomeration, including public and private, passenger and freight, motorized and non-motorized, as well as moving and parking.

At the same time, the border between public and individual transport is being erased in the transport system of modern cities: forms of public transport with the possibility of personal use (for example, carsharing) or individual transport with the possibility of collaborative use (carpooling) are developing. [1]

There is a gradual change in economic priorities: from the creation of added value directly in the process of providing transport services to the possibility of its creation in all related industries. In the future it could be based on the use of data and information obtained during the development of all forms of modern integrated smart mobility. It requires a review not only of the technological, infrastructural, but also of the financial, economic, and legal aspects of the development of urban mobility.

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The Development of Corporate Social Responsibility in Russian Business

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Abstract

Based on international experience, the article considers the development of concepts of sustainable development goals and corporate social responsibility in Russian business. The leading Russian business takes an active part in the formation of new approaches to resource and risk management in the context of sustainable development. Based on an analysis of Russian and international studies on this topic over the past 5 years, qualitative changes that have occurred in this area are demonstrated.

A number of features of the implementation of sustainable development goals by Russian business are highlighted. The conclusion is made about significant progress and concrete changes over the last decade of Russian business in understanding the features of its involvement in sustainable development processes in various aspects.

Keywords: sustainable development, management, corporate social responsibility, Global Sustainable Development Goals

1. Introduction

In Russia, a national strategy is systematically formed combining objectives on the achievement of economic efficiency, social fairness, and ecological safety. Modern Russian business is actively involved in forming of new approaches to resources and risks management in the context of sustainable development. The business community as one of key subjects for social and economic development of the country plays an important role both in financial attraction and business-model change for more stable within the achievement of objectives relating to stable development on national level [1].

The topic of Russian sustainable development is gradually moving from the «abstract» conception, interesting large companies to the additional agenda for many market players – as N. Zayceva, head of the laboratory of stable development at Skolkovo Moscow School of Management marks. The number of economic sectors involved in the topic is expanding including for example banking sector, property, retail, and transport. First, the conception of stable development in Russia begins to form institutionally through the correspondent changes in legislative, consumer, educational, partner and communication spheres. Then, companies, earlier than others began to integrate stable techniques in Russia, now, can set new standards for corporate work. In total, such parameters lead to principal changes in competitive landscape and game rules at the market, leaving no opportunity to ignore practices of stable development without any damage to business [2]. There are vivid examples of involving small and medium sized business, social entrepreneurs, and citizens in stable development objective realization.

The development of responsible or “green” financing may be attributed as well to positive drivers for Russian business – targeted investment in projects with ecological element, providing on special terms.

In December 2018, “Resursosberezhenie KhMAD” posted first in Russia green bonds at MOEX.

Funds from bonds placement will go to project implementation in waste management.

In general, recent tendencies, investigations also prove thereof in the sphere of stable development and corporate social responsibility, show that more and more Russian companies pay attention to the issues of stable development and corporate social responsibility. The most important result was the fact that principles and key factors of stable development are included in strategic activity lines, top managers more often are attracted to control of SD issues and the correspondent departments are created being responsible for this sphere.

As A. Ivlev fairly notes – EY managing partner in Russia: “In most part of Russian companies the trend of transfer is formed from the implementation of any specific corporate social responsibility projects focusing on charity and support of regional infrastructure of presence to the organized process directly correlating with such mission and business strategy” [3].

The leading Russian business takes an active part in the formation of new approaches to resources and risks management in the context of stable development. The issue of long-term aims linking with Global Sustainable Development Goals can most consistently appear when the contribution in stable development becomes one of key push factors on which basis such company may build its business strategy.

Over the past decade and a half big Russian companies actively implements the best practices in the sphere of stable development and corporate social responsibility both on corporate management level and on business-model level. The most important role in promoting sustainable development conception in Russia plays 20-30 companies-leaders [4, 7], which extend policy of responsible behaviour on suppliers and partners.

Modern investigations show that the accounting of social and environmental company activity aspects, its management quality (ESG-factors), stimulate its stability and financial efficiency in long-term outlook and increase its competitiveness at world markets. Thus, the dynamics of share index «Responsibility and openness» and «Sustainable development vector», built on the basis of the correspondent RSPP indexes significantly correlates with MOEX Index, the main indicator of Russian stock market. Funds of many companies-leaders of sustainable development are also stock market leaders on liquidity and capitalization.

2. Materials and Methods

In the context of sustainable development concept significant changes have taken place for the last fifteen years. Moreover, investigations of the last five years indicate serious qualitative changes.

Investigation method and methodology is built on analysis of five main works, two main of which are attributed to Russian Union of Industrialists and Entrepreneurs (RSPP) and include the investigation of reports relating to more than 60 companies and survey of 200 companies-members of RSPP PwC investigation (analysis of companies reports), KPMG and Effie Russia joint investigation, dedicated to the investigation of communications state in the sphere of SDG among companies-finalists of Effie Awards Russia and «Stable Development. Role of Russia» [1].

Let's consider five main issues relating to SDG integration and realization by the representatives of major Russian companies which were investigated in earlier mentioned works on objectives of stable development: SDG priority, issues of corporate management, SDG integration in business-model, resources of information on SDG, business expectations and barriers for its realization.

3. Results

The analysis of these investigations shows that any conclusions of foreign studies are generally true and for Russian business. In addition, it's necessary to note some peculiarities of sustainable development objectives realization by Russian business.

In general, Russian unions and associations (RSPP, TPP, AMP, UN GC etc.) of Russian business play the most important part in progress of sustainable development theme.

Key Russian business association, promoting interests of business societies both in Russia and at international level is RSPP. RSPP includes thousands of big Russian companies, representatives of industrial, scientific, financial and commercial organizations in all regions of Russia. Such association leads constant practical work: performs conferences on actual economic issues with participation of representatives of Russian and international business societies as well as heads of federal authorities.

RSPP keeps an electronic library of corporate practices, national register of non-financial reports, issues reference on regular basis concerning the best Russian corporate practices in the sphere of sustainable development and prepares indexes «Responsibility and openness» and sustainable development vector» based on materials of non-financial reporting of the main Russian companies.

The results of RSPP investigation allows making a conclusion on that the big Russian companies began to account sustainable development objectives when developing its strategies. Considering the fact that Russian companies still begin to integrate SDG in its activity, monitoring technologies of SDG achievement have insufficiently developed yet on corporate level. As Russian and foreign experience shows such companies potentially are more successful over the long run, more stable and efficient.

More than half (68.4%) of respondents to the company survey, RSSPP members, state that their companies have specific indicators, key performance indicators (KPI) in accordance with sustainable development objectives, 84.6% of them named employee training and education as the main KPI of organization. Health safety and environmental protection takes the second place on the number of references with 80.8%, then, employee health – 53.8%, international environmental safety – 46.2% and labor potential strengthening stays on the same level – 46.2%.

At the same time, some Russian companies' non-financial reporting analysis results prepared by FBK Grant Tornton experts show that in the most part of Russian companies the development of measuring KPI has not been completed yet in the sphere of sustainable development.

A very representative part of Russian companies has sustainable development issues, SDG, either in plan to implementation or being in the process of implementation in business model of organization.

So, for example, it's half of companies (50%), respondent within the investigation Sustainable Development. Role of Russia in mid-term plans or has already begun to implement a strategy, linked with SDG. 45% of respondents are planning or implementing such strategy of sustainable development, 42%, KPI of top management relating to the corporate sustainable development objectives and officially approved strategy of sustainable development.

A more complete picture on SDG reflection in business-practice (business-models) allows analysing results represented in investigation «Sustainable development. Role of Russia. In terminology used by 58% of companies there is «strategies of sustainable development» term. Slightly less than half of respondents (47%) stated that the company has a corporate policy/strategy on corporate social responsibility linked with SDG. 40% companies have framed and measurable objectives in the sphere of sustainable development. The same number of respondents marks the presence of officially approved strategy of sustainable development (separately or in combine with general business strategy). 38% of companies have coordinated SDG and KPI with other strategic objectives of company.

International companies are characterized by higher level of sustainable development issue integration in strategic documents and its business model. For example, the presence of any strategy, linked with SDG, is marked in 85% Russian departments of international companies and only in 8% of Russian companies. Most part of international company divisions (92%) and only each third Russian company (31%) have policy/strategy on corporate, social responsibility, linked with SDG [6].

The results of all Russian investigations show approximately similar results of SDG distribution on the level of priority for Russian companies. So, SDG, linked with the sustainable social and economic development as a whole is more significant for Russian business than SDG linked with the different aspects of equality and social equality and SDG of environmental thematic. SDG distribution on the level of priority in non-financial reports of Russian companies correlates with the results of foreign investigations.

For example, according to SDG data SGM Agencies and UN GC PwC are under focus of Russian companies priority attention, according to RSPP investigation data, SGM Agencies and UN GC PwC have SDG, concerning stable growth (SDG 8), sound academic background (SDG 4), well-being for all (SDG 3), rational patterns of consumption and manufacture (SDG 12), solid infrastructure, stable industrialization and implementation of innovations (SDG 9), strengthening of means for sustainable development achievement (SDG 17).

As key future SDG, which are not marked by companies as relevant, but are assessed by them as potential within its business-processes, are stated SDG relating to support of rational models of consumption and manufacture (23%); stability of cities and towns (19%); access support to energy sources (19%); stable industrialization and implementation of innovations (16%); stimulation of stable growth (16%).

As PwC investigation results show Russian business and population priorities and expectations from SDG introduction do not completely coincide. So according to the survey results performed with the participation of PwC in various countries, the population primarily is interested in SDG realization connected with food supply, poverty combating, health, and well-being.

As the results of KPMG and Effie Russia joint investigation show in determining the priorities of SDG implementation Russian business should also focus on a gradually forming audience of responsible consumers and have a consistent strategy of stable practices implementation and correspondent communication strategy for products and services and business as a whole [5]. Nearly 90% of Russian companies' representatives, surveyed within such investigation, think that SDG integration in communication strategies of companies helps business development.

The main resources of SDG information, in accordance with Stable Development, Role of Russia Survey, are events on stable development of corporate social responsibility (83%), RSPP events and resources as well as other Russian business-associations (56%) for company managers. About half of the respondents also mentioned the following channels as important informational ones: internal communicational channels, UN events and resources, different industrial events, media sources, including internet resources.

In the past two decades the main communicational sites in the sphere of sustainable development and corporate social responsibility in Russia were RSPP, Association of Managers in Russia and in the last ten years United Nations Global Compact National Network as well. This is particularly evidenced by the results of Stable Investigation, Role of Russia and "Assessment of informational resources in the

sphere of stable development" online survey, performed by the Center of Sustainable Business Development, SKOLKOVO Moscow School of Management in 2018. The particularity of dialogue development of different stakeholders in the sphere of SD for the last five years has become an active non-commercial organizations involvement to dialogue, in which business sees key partners [1].

4. Discussions

Based on the results of checked surveys we may note a significant progress of Russian business for the last ten years within the meaning of particularities of its involvement in sustainable development processes in different aspects – thematic, structure and management, finance and investment ones.

We may note some changes of corporate management system in Russia at the present stage, which indicate a significant increase of large business leaders' interest to the definition of strategic nature of sustainable development topic and issues.

We should note that for the last ten years sustainable development term definition itself in Russian companies are significantly transformed. If ten years ago, under sustainable development of company they understand only issues of corporate social responsibility and charity, then now the term interpretation of sustainable development of company is significantly expanded that led to the increase of division quantity dealing with the relevant issues.

Significant efforts and joint actions directed for detailing of this understanding are necessary and transfer from priority discussions to the implementation of methodical to its achievement, to business strategy and business model transformation for SDG achievement as well as change of specific practical results first of all based on business development in the global economy.

An important condition for building the efficient system of corporate management in any specific company is decomposition of sustainable development objectives from development and approval of SD strategy, business-strategy up to the efficient management of business-processes and corporate management systems in accordance with international standards.

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Modelling the of Attractiveness of Russian Cities from the Position of Population, Business and Tourism

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Abstract

The purpose of the study is to analyse the attractiveness of large Russian cities for residents, entrepreneurs, and tourism, as well as the factors that determine it. To achieve this goal, methods of comparative analysis, grouping, classification, correlation, and regression analysis of the parameters of socio-economic development of cities of the country with a population of over 100 thousand people were applied. The results of the study showed that among the factors affecting the attractiveness of cities for residents, the population, housing, crime, the level of salary and the availability of doctors were identified. Assessing attractiveness from the perspective of doing business involves considering production volumes, retail turnover and the number of city residents. Factors of tourist attractiveness are the characteristics of collective accommodation facilities and the number of relevant requests on the Internet. The developed set of econometric models can be further used as the core of the corresponding software tools, which should also include functional blocks aimed at solving problems. The findings suggest that the proposed models of the attractiveness of cities for residents, entrepreneurs and tourism complement each other and make it possible to implement an integrated approach to solving this problem.

Keywords: cities of Russia; attractiveness; population; business; tourism; investments; migration; econometric modelling; regression equations

1. Introduction

In a message to the Federal Assembly of the Russian Federation of February 20, 2019, V.V. Putin especially drew attention to certain aspects of the state's internal economic and social development, noting, among other things, the importance of «the integrated development of our cities and towns».

Taking into account the multidimensional nature of the problem under consideration, we emphasize that managing the effective functioning of Russian cities (including in the field of budgeting) from the perspective of increasing their attractiveness for various economic agents requires analysis and consideration of not only the current and retrospective state of the main parameters, but also the formation of a distinct scientific sound image of their further development. At the same time, given the limited budgetary resources of the state, the solution to the issue of financing certain areas takes on additional significance. In other words, the issues of forming forecasts and plans for the socio-economic development of territorial systems are being updated. One of the tools for studying the prospects for urban development is the use of formalized methods. The development of both domestic and world science [1] in the field of managing complex socio-economic systems [2] confirms the necessity and validity of using methods of economic and mathematical modelling.

2. Methodology

Of the currently available methods for modelling the socio-economic development of territorial systems, the most common is econometric modelling, based on a probabilistic-statistical analysis of the relationships of various parameters in previous periods of observation. This method allows you to identify quantitative relationships of the studied indicators and influencing factors, including in the field of public finance. The most widely used econometric models, expressed as systems of regression equations, reflecting the dependence of some quantities on exogenous variables under the conditions specified by the model, and lag variables [3].

Given the significant differentiation of Russian cities by the degree of socio-economic development, it is difficult to determine a single parameter that could fully describe the attractiveness of the city from

the point of view of such excellent economic agents as residents, tourists and entrepreneurs. It should be emphasized that each of them is of great importance for the formation of the budget system both at the municipal and state levels. When conducting the study, assessing the attractiveness of cities for the *population (residents)* implied an analysis of changes in a number of indicators, for example, the number of inhabitants of a settlement [4], the level of wages, crime, the provision of housing [5], and the availability of doctors. The magnitude of migration growth is considered as an integral parameter. As part of assessing the attractiveness of the country's cities for *entrepreneurs*, the volume of shipment of goods of own production and the provision of services on their own [6], retail turnover [7], the level of employment, the presence and degree of depreciation of fixed assets [8], and the population were taken into account. The volume of investments in fixed assets is determined as an integral parameter [9].

Assessing the attractiveness of the cities of the Russian Federation from the standpoint of the formation of *tourist flows*, it is necessary to consider a set of indicators, including the number of people placed in collective accommodation facilities, the number of places in collective accommodation facilities, the average number of employees of collective accommodation facilities.

The analysed indicators differ in dimension, which makes direct comparison impossible [10]. In addition, absolute financial performance may not be comparable for several other reasons. As part of the development of econometric models, the reporting statistical indicators of the socio-economic development of cities of the Russian Federation for the period from 2008 to 2017 were reviewed, posted on the portal of the Federal State Statistics Service, in statistical data collections and other open sources of information.

3. Results

Based on the above and a set of other prerequisites, a set of regression models was formed that interconnected the main indicators of the attractiveness of cities of the Russian Federation for residents, entrepreneurs, and tourists with previously defined factors.

Correlation-regression analysis of the parameters of the attractiveness of cities for residents made it possible to formulate the equation:

$$M_i = 0{,}032 + 1{,}029 * P_i - 0{,}011 * A_i + 0{,}003 * W_i - 0{,}004 * C_i + 0{,}008 * D_i \text{ ,} \quad (1)$$

where M_i – migration increase (decrease) in the population; P_i – number of citizens; A_i – housing provision; W_i – average monthly nominal accrued salary; C_i – crime level; D_i – medical supply.

The quality of this equation [11] can be inferred from the value of the determination coefficient equal to 0,91. In addition, the normalized coefficient of determination is at a comparable level. The standard error is a little over 0,03. Analysis of variance also confirms the above results. The calculated value of the Fisher test (264,93) significantly exceeds the threshold value.

It should be noted the negative values of the coefficients of the equation for two factors – «crime rate» and «housing provision». So, if in relation to the first indicator this is quite logical (the criminal situation does not contribute to increasing the attractiveness of the settlement), then with respect to the second parameter this dependence may seem ambiguous. It should be borne in mind that the area of residential premises per person decreases steadily when moving from considering less infrastructurally developed settlements to more developed ones [12], for example, from rural to urban areas and from small towns to large ones [13]. In this case, the presented results are quite reasonable. That is, a lower level of housing provision is interconnected with a higher standard of living in other respects. In general, the formed function very accurately reflects the real situation. It should be noted that the difference between the calculated and actual values indicates either the underutilization of the possibilities of attracting the population by cities, or the unaccounted factors of the attractiveness of the territory.

Modelling the level of attractiveness of various territories for entrepreneurs is based on determining the parameters of a function that describes the influence of a combination of previously defined factors on the volume of investments in fixed assets. During the study, the formula was used to calculate the level of employment of the population (2).

$$E_i = \frac{EO_i}{WA_i} \text{ ,} \quad (2)$$

where E_i – employment; EO_i – the average annual number of employees of organizations; *WA* – working age population.

The study of the influence of fixed assets is based not only on their cost, but also on the degree of depreciation. The corresponding parameter was evaluated:

$$F_i = AF_i * (1 - WF_i), \quad (3)$$

where F_i – depreciation of fixed assets; AF_i – the availability of fixed assets of organizations; WF_i – depreciation of fixed assets, units.

As with the parameters characterizing the attractiveness of the country's cities for residents, in this case the indicators were normalized, which had to be done due to the difference in their dimensions.

The performed correlation and regression analysis allowed us to obtain the corresponding equation:

$$I_i = 0{,}0002 + 0{,}182 * S_i + 0{,}00084 * E_i + 0{,}36 * R_i + 0{,}151 * P_i + 0{,}307 * F_i, \quad (4)$$

where I – value of investments in fixed assets; S_i – volume of shipped goods of own production, work and services performed by own forces by type of activity; R_i – retail turnover; P_i – population.

The coefficient of determination was 0,98. In this case, the standard error is 0,01. The performed analysis of variance confirms the above results (the calculated value of the Fisher coefficient was 1436,02).

A significant gap in the considered indicator of leading cities (primarily Moscow) from most other cities in Russia was revealed, which largely correlates with the level of their resource and financial base.

It should be borne in mind that the formation of the budgets of cities of federal significance has several significant differences associated with the fact that these cities are separate subjects of the federation. That is, there is a certain imbalance in the financing of urban development projects at the municipal and state levels. The constructed graphs of actual and calculated values are almost identical.

Assessing the attractiveness of cities from the point of view of tourists is based on assessing the impact of various indicators, including the number of requests on the Internet, the number of people placed in collective accommodation facilities (CAF), the number of places in the CAF, and the number of CAF employees. At the same time, if in relation to residents and entrepreneurs, attractiveness is directly determined by the characteristics of the locality itself, then in the tourism sector the situation may be formed somewhat differently. The presence of natural, historical and other attractions in close proximity to the city makes this settlement a peculiar place for tourists to stay (an intermediate point or «place to spend the night»), and not an independent object of visit [14]. At the same time, in some cases, the opposite situation takes place – formally being in one of the cities, tourists visit nearby territories as part of short excursions. In this regard, when assessing and forecasting the attractiveness of the country's cities for tourists, it is necessary to focus both on the values of indicators related to the territory under consideration and take into account the dynamics of the main parameters of the development of the region as a whole. Especially in those regions where tourism is a significant line of budget revenues.

The performed correlation and regression analysis allowed us to form the equation:

$$T_j = -38{,}0 - 6{,}41 * A_j + 0{,}154 * St_j, \quad (5)$$

where T_j – number of persons accommodated in collective accommodation facilities in the *j-th* region; A_j – the number of seats in the CAF in the *j-th* region, thousand units; St_j – number of CAF workers in the *j-th* region.

A high level of the coefficient of determination (0,83) indicates the quality of this equation. The normalized coefficient of determination is 0,91. The standard error is a little over 562,0. The estimated value of the Fisher test (179,5) significantly exceeds the threshold tabular value.

The generated equation reflects the processes taking place at the level of the constituent entities of the Russian Federation. Calculation of estimates for individual settlements and determination of their attractiveness for tourists require a conditional distribution of the presented observations between cities located on the territory of the *j-th* subject of the country. The most reasonable, in our opinion, to carry out the specified distribution in proportion to the number of inhabitants of the cities under analysis according to the formula (6):

$$T_i = T_j * \frac{P_i^j}{\sum_{i=1}^{n} P_i^j}, \quad (6)$$

where T_i – the number of persons stationed in the CAF in the *i-th* city on the territory of the *j-th* subject of the federation; P_i – the number of inhabitants of the *i-th* city located on the territory of the *j-th* subject of the federation; n – the number of cities from the analysed ones located on the territory of the *j-th* subject of the federation.

An additional study identified five groups of cities. Each group is characterized by a specific ratio between the number of people placed in the CAF and the number of Internet requests devoted to the sights in this village (a criterion for the attractiveness of the territory for tourists). To take into account this specificity, five regression equations were formed.

For the first group, an equation of the following form was developed:

$$SP_i = 161{,}1 + 5{,}86 * T_i, \quad (7)$$

where SPi – the number of online queries about attractions in the *i-th* city.

The second group:

$$SP_i = 1577{,}6 + 18{,}36 * T_i, \quad (8)$$

The third group:

$$SP_i = -286{,}0 + 45{,}24 * T_i, \quad (9)$$

The fourth group:

$$SP_i = 106{,}04 + 56{,}64 * T_i. \quad (10)$$

The fifth group:

$$SP_i = 1234{,}3 + 70{,}8 * T_i. \quad (11)$$

The quality of the generated equations is confirmed by the assessment of the parameters of regression statistics and analysis of variance (table 1).

Table 1. Regression statistics and analysis of variance

Regression statistics	Group				
	1	2	3	4	5
Multiple R	0,962	0,981	0,987	0,999	0,973
R-squared	0,925	0,963	0,974	0,999	0,947
Normalized R-squared	0,924	0,962	0,972	0,999	0,936
Standard error	1580,2	2470,5	1756,9	760,9	993,5
Observations	110	31	12	5	7
Fisher test (F)	1334,4	759,2	378,5	3992,6	88,5

Source: compiled by the authors

In all cases, the coefficient of determination exceeds 0,92, and the value of the Fisher criterion significantly exceeds the threshold values. Other indicators are indicative of the quality of these equations.

The developed set of econometric models for predicting the attractiveness of the country's territories for the population, tourists and entrepreneurs can be used as the core of the corresponding software tools for monitoring and predicting the level of attractiveness of cities, which could be used, including in the field of public finance management. In this case, the direct organization of work to achieve certain goals using the tools in question requires the development of a set of functional blocks aimed at solving problems.

Based on the characteristics of the parameters used and the specifics of municipal statistics, the frequency of updating information is one year. The information collection procedure carried out as part of the «Information Collection System» block is based on the centralization of geographically fragmented statistical information on the main parameters of the socio-economic development of settlements with a population of at least 100 thousand people [15]. At the same time, justification of the methodology for collecting information, the development of a request form and the provision of the necessary powers to the decision-maker.

To interact with the model complex, it is proposed to develop an interface for data input and output.

The basic requirements for this interface can be defined maximum simplicity and familiarity to the user. The scenario formation unit provides the procedure for selecting an alternative to changing the socio-economic parameters of the development of Russian cities. The need for this unit is due to the instability of the economic situation and the variability of forecasting. The database includes the initial statistical and calculated (derived) parameters. The forecasting unit provides the function of generating a forecast of changes in the attractiveness of Russian cities in the event of a change in key factors in accordance with scenarios for the development of the situation [16]. To form a forecast, a list of parameters is determined, and a forecast period is selected. Then, the values of factors are fed to the input of the presented economic-mathematical model. The predicted parameter values generated because of the simulation are sent to the data analysis unit. The data analysis unit makes it possible to assess the dynamics of changes in parameters, make a comparative assessment and include tools for conducting research on the socio-economic development of the region based on existing and derived parameters [17]. One of the results of the implemented studies is the rating of cities in the country in terms of attractiveness for residents, entrepreneurs, and tourism. The visualization block of the results makes it possible to display the results of modelling and analysis of information in graphical form, which allows to increase the efficiency of users.

The developed complex of functional blocks for monitoring and forecasting the level of attractiveness of cities for residents, tourists and entrepreneurs allows organizing work with the proposed model as the core of such tools.

4. Conclusion

Assessing the large cities of the Russian Federation from the point of view of their attractiveness for the population, tourists and entrepreneurs is a difficult task associated with the need to consider various factors [18]. In addition, the level of attractiveness can only be calculated in relation to a specific economic entity [19]. The presented economic and mathematical models can be applied by state authorities to solve the problems of the integrated territorial development of Russia [20]. Including those defined by the decree of the President of Russia «On National Goals and Strategic Tasks of the Development of the Russian Federation for the Period until 2024», goals in the field of ensuring the gradual natural growth of the country's population, incomes of citizens, poverty reduction, development of the public finance management system and increasing the pace of technological Development needs coordination with the development parameters of Russian cities. Obviously, the implementation of the goals defined in the message of V.V. Putin to the Federal Assembly of the Russian Federation of 02.20.2019, on the one hand, will contribute to the growth of their attractiveness for various economic entities, and on the other hand, it itself needs an appropriate scientific and methodological toolkit, an element which the proposed model complex can make.

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Digital Payment Technologies: Impact on the Development of e-Commerce and the Network Sector of the Economy

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Abstract

The article presents an analysis of the impact of digital payment technologies on the development of e-Commerce and the network sector of the economy. Using economic and mathematical modelling tools, the authors found that the number of active payment cards has the greatest impact on the change in the volume of non-cash payments. The aim of the scientific paper is to analyse the impact of digital payment technologies on the development of e-Commerce and network sector of the economy. The study was made with the help of statistical data for the period from 2012 to 2018 from National Bank of the Republic of Kazakhstan, Committee on statistics of Ministry of national economics of the Republic of Kazakhstan, analytical reports, and studies. Using the method of comparative and dynamic analysis, system-structural and cause-and-effect analysis, as well as analysis and forecasting based on a multi-factor correlation and regression model the authors found out that the number of active payment cards currently has the greatest impact on the change in the volume of non-cash payments. The analysis of the obtained regression coefficients shows that if the number of used payment cards increases by an average of 1 million units per month, the volume of non-cash payments will increase by 0.271 trillion tenge; an increase in the number of transactions made on non-cash payments by 1 million units will result in an increase in the volume of non-cash payments by 0.008 trillion tenge.

Keywords: payment system, digital technologies, payments, e-Commerce, network sector of the economy

1. Introduction

Nowadays digital trading is replacing traditional one. Digital Commerce grows into the real economy and becomes the most effective mechanism for redistributing and streamlining the market. While global digital Commerce accounted for 5.4% of the total retail volume in 2012, this figure rose to 9.1% in 2018.

At the same time, trade via traditional channels obviously dominates, while all major retail networks are being transformed based on digital models.

It should be noted that countries such as the United States and China have leading positions in terms of trade partners and trade turnover. They also have more than half of the global market share and digital Commerce. At the same time, the EAEU countries account for less than 1% of global purchases.

For example, in Russia in 2018, the increase in sales through digital trade channels was 22%, purchases through foreign online stores increased by 23% [1, p. 16].

The development of e-Commerce represents a huge potential for economic growth. First, it makes possible to increase the turnover of goods without limits. Secondly, it provides access to the market of any country. Third, it ensures the development of transit potential. In Kazakhstan, e-Commerce has grown by an average of 26% over the past five years, while the average annual growth has accelerated to 30% since 2015. In gross value, the volume of transactions in 2018 reached 259.5 billion tenge, including the volume of retail – 144.6 billion tenge, wholesale – 114.9 billion tenge. E-Commerce accounted for 1.4% of total retail sales. According to the forecasts of the Ministry of national economy in the Republic of Kazakhstan, the volume of e-retail trade will grow up to 2 trillion tenge in the next five years. Kazakhstan's market is represented by more than 1,700 independent online stores and about 20 electronic trading platforms, where more than 1 million small and medium-sized businesses function.

The total number of buyers of electronic goods and services is about 2.3 million people. The structure of the e-Commerce market consists of 68% of goods and 32% of services. Construction materials, household appliances, cosmetics, clothing, and shoes are in high demand. Among the services are the sale of air and railway tickets, payment for cultural events and utilities. E-Commerce to use modern information technologies, and the Internet is becoming an important strategic direction for the development of trade operations. For Kazakhstan, its development is especially important during the period of membership in the World Trade Organization, the Eurasian Economic Union and the "Belt and

Road" initiative. In this regard, the Government adopted the state program "Digital Kazakhstan", which defines the following target indicators: the share of e-Commerce in the total volume of retail trade in 2019-1.7%, in 2020-2%, in 2022-2.6%; growth in the number of online orders in retail trade (by 2016) in 2019-95%, in 2020-144%, in 2022-281%; the growth of cashless payments by means of digital technologies (by 2019) in 2020 and 18% in 2022-35%.

One of the key factors determining the development of e-Commerce is the accessibility of the population to information and communication technologies and the Internet. At the end of 2018, the share of Internet users was 81.3%. The key event of the year was the beginning of construction of fiber-optic communication lines of JSC "Kazakhtelecom" under the project aimed at providing broadband access to rural settlements. Within two years, it is planned to build more than 15 thousand km of fiber-optic communication lines and connect almost 2.5 thousand state institutions in 828 localities to main channels. According to the assessment of the International Telecommunication Union on the development of information and communication technologies, Kazakhstan occupies the 52nd position out of 176 countries. The state of online trading is inextricably linked to the development of non-cash payment tools. According to the National Bank, there are 30.1 million payment cards in circulation in September the 1st, 2019, which are held by 26.6 million people (compared to the same date in 2018, there is an increase of 39.6% and 49.5%, respectively). The most common are debit cards, their share is 78.6%, and the share of credit cards is 18.0%. The volume of transactions using payment cards in August 2019 amounted to 2.7 trillion tenge, an increase of 49.3% compared to 2018. The number of transactions also increased by 84.4% and reached 130.4 million attempts [2].

As of 2019, the online trading market of Kazakhstan was estimated at the level of 287 billion tenge, the total growth for the year was 23.2%. The share of online trading from the total trade volume was only 2.9%, which indicates a significant growth potential. The forecast for the overall global growth of the online trading market is 11% per year. At the same time, the potential of Kazakhstan is quite high, given the level of Internet penetration in Kazakhstan. According to World Bank, World Cellular Information Service, 76.4% of the population in Kazakhstan was represented by Internet users in 2017.

In this rating, Kazakhstan was in second place after the UK (94.8% of users), even ahead of the US (76.2%), Poland (76%) and Russia (76%). Adding to the positive picture, the growth in the number of connections via smartphones in the Republic at the end of 2018 was 18.2 million, and by 2022 it will reach 25.6 million users. By this period, smartphones should take up 82% of the total number of mobile connections.

As for the non-cash payments market, Kazakhstan has leading position in the world in terms of the growth rate of card payments – from 2013 to 2018, the weighted average growth is 20.5% per year.

According to the National Bank of Kazakhstan, the share of non-cash payments increased on average more than twice in absolute numbers, both in terms of the number and amounts in 2018 and 2019.

The analysis of the influence of the number of active payment cards and the number of transactions made on non-cash payments on the volume of non-cash payments in the Republic of Kazakhstan is of great interest.

2. Methodology

Theoretical and methodological base of research were represented by the works of Kazakhstani and foreign scientists-economists in the field digital payment technologies, normative-legal acts of the Republic of Kazakhstan in the sphere of development of payment system, the State program «Digital Kazakhstan». In the process of research, general scientific methods were used: the method of comparative and dynamic analysis, system-structural and cause-and-effect analysis, SWOT analysis of the system of state regulation of financial system, as well as analysis and forecasting based on a multi-factor correlation and regression model.

The study was made with the help of statistical data for the period from 2012 to 2018 from National Bank of the Republic of Kazakhstan, Committee on statistics of Ministry of national economics of the Republic of Kazakhstan, analytical reports and studies.

3. Results

We construct a regression model by adopting the following notation:

y – Volume of non-cash payments (trillions of tenge);

x_1 – Number of payment cards used on average per month (million units);

x_2 – Number of transactions made on non-cash payments (million units).

To estimate the parameters of the regression equation, we used the statistical data of these indicators for the period from 2012 to 2018. As a result of the data approximation, the following simple linear regression equation was obtained:

$$y = -1{,}266 + 0{,}271x_1 + 0{,}008x_2, \quad R^2 = 0{,}976 \qquad (1)$$
$$(-1{,}089) \quad (2{,}429) \quad (4{,}557)$$

The correlation coefficient is $R = 0{,}988$, which indicates the presence a close relationship between of resultant attribute and factorial attribute.

The coefficient of determination is $R^2 = 0{,}976$, i.e. 97,6% of the variation of the dependent variable is explained by the obtained model.

In addition, it was determined that the observed value of the F-statistic is $F_{act.} = 81{,}398$. The critical value of the F-statistic with $k_1 = m = 1$, $k_2 = n - m - 1 = 4$ degrees of freedom (where *n* is the number of observations, *m* is the number of factors) and at a significance level of 0,05 is $F_{crit.}(0{,}05; 1; 4) = 6{,}944$. Compare the observed and critical values. Since $F_{act.} > F_{crit.}$ ($81{,}398 > 6{,}944$) therefore, we can conclude that the regression equation is statistically significant and reliable.

The significance of the parameters of the obtained regression equation was checked using Student's *t*-statistics. In the regression model, t-statistics for the corresponding coefficients are indicated in parentheses. Comparing the absolute values of the observed values of t-statistics with the critical value $t_{crit.} = 2{,}160$ (at the significance level of $\alpha = 0{,}1$ and the number of degrees of freedom $k = n - m - 1 = 4$), we can conclude that the regression coefficients are significant and intercept is not significant.

The analysis of the obtained regression coefficients shows that:

- if the number of used payment cards increases by an average of 1 million units per month, the volume of non-cash payments will increase by 0.271 trillion tenge.
- an increase in the number of transactions made on non-cash payments by 1 million units will result in an increase in the volume of non-cash payments by 0.008 trillion tenge.

One of the indicators with which you can evaluate the measure of the response of one variable to a change in another is the coefficient of elasticity.

In our case, it will show the ability of the volume of non-cash payments to change depending on the change in the number of active payment cards and the number of transactions made on non-cash payments.

We have obtained the following values of mean population of elasticity coefficient:

$$E_{yx_1} = 0{,}976\%, \quad E_{yx_2} = 0{,}640\%.$$

An analysis of the obtained elasticity coefficients shows:

1) if the number of active payment cards increases by 1% from the average level, the volume of non-cash payments increases by 0.976% from its average level with the same number of transactions made on non-cash payments.
2) if the number of transactions made on non-cash payments increases by 1% from the average level, the volume of non-cash payments increases by 0.640% from its average level with the same number of active payment cards.

4. Conclusion

Thus, we can conclude that the number of active payment cards currently has the greatest impact on the change in the volume of non-cash payments.

According to the review of the results of oversight of payment systems and development of the payment services market for 2018, conducted by the National Bank of Kazakhstan, as of January 1, 2019, there were 23.4 million payment cards in circulation; the number of their holders was 19.0 million.

Thus, at the beginning of 2019, one adult citizen of Kazakhstan is at least a holder of two payment cards and uses one of them for a month.

These data indicate that in the future, increasing the volume of non-cash payments due to an increase in the number of plastic cards will be difficult, and the need to issue new cards will decrease.

Therefore, participants in the payment services market in Kazakhstan need to pay attention to the conditions for conducting transactions on non-cash payments.

According to experts Of the Association “Digital Kazakhstan”, the e-Commerce market in Kazakhstan may reach 928 billion tenge in 2022. That is, according to conservative estimates based on global average growth, the increase will be 6%.

This is more than 1% of Kazakhstan’s GDP. Today, members of the “Digital Kazakhstan” Association account for about 60% of the e-Commerce market and about 70% of electronic payments. The market is particularly important for the economy of Kazakhstan, and it depends on us whether we will achieve the announced results by 2022 [3].

It should be recognized that according to world experts, the global e-commerce market will amount to 2.8 trillion dollars by 2023. Already, the B2B and B2C segments are beginning to go online actively, and this trend will increase in the future. The global share of e-Commerce in retail turnover in 2018 reached 11.6%. In China, this share was 23.7%, in the EU-14.8%, in the US-10.8%, in South Korea-7.2%. At the same time, in the next five years, the world will see an increase in e-Commerce by $ 1 trillion, so the growth of e-Commerce will proportionally reduce the share of traditional trade.

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The Role of Digital Marketing in the Modern World

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Abstract

The article is devoted to the development of digital marketing, what evolutionary transformations occur during the advent of digitalisation in marketing activities. Interactive marketing is interconnected with Internet marketing, where such technical techniques have been formed that contribute to the target audience offline. At the end of the 20th century, business development belonged to websites and banners, many organizations still use it. But most organizations use the new features of interactive networks to attract customers to them. As a result, due to the Internet, entrepreneurship has formed several areas for the development of electronic commerce, branding, and marketing. Many companies independently create special channels for branding or implement advertising in online games. Most organizations have started their online blogs. Undoubtedly, marketers will not stop promoting online channels and will develop this direction. Marketers always “keep abreast”, trying to follow the latest trends in the market. But in a rapidly changing world, marketers must constantly test the latest market tools. Brand management often needs new directions, opportunities, actions, experiencing roughness in its work. The most important means of interactive marketing is the Internet and equipment that provides access to the digital market, as tools for obtaining data, establishing contacts and self-realization of an individual. An equally important role is played by local networks, which are a productive information complex, where people interact, play, exchange useful information. The main tool of digital marketing is mobile on-line terminals. If the early development of the brand came through SMS messages, then today they use branded applications or organize WOW calls. The goal of this research is to observe the role of digital marketing in the modern world. The recent economic circumstances in our country, the accelerated technology market, social and political conditions, the informatization of society, and the growth of business information have required the continuous improvement of digital marketing management methods.

Keywords: digital marketing, branding, online content

1. Introduction

The article is devoted to the development of digital marketing, what evolutionary transformations occur during the advent of digitalization in marketing activities. Interactive marketing is interconnected with Internet marketing, where some techniques are formed to contribute to the target audience offline.

2. Methodology

This research was carried out using the following methods: empirical (study of publications on digital marketing, research on various approaches to studying this issue), theoretical (cognition, synthesis, description).

The theoretical aspect of studying the marketing of the company: the formation of the latest goods and services, manufacturing, financial side, implementation helps to achieve strategic and operational goals, focusing on market requirements, working closely with customers and business partners. Modern methods of applying digital technologies have contributed to the emergence of digital marketing, constantly developing, and expanding the field of implementation, which involves the synthesis of several areas of activity. The number of digital devices is growing all the time, learning the latest computers, mobile devices, smartphones, tablets, digital message boards, interactive screens, gaming applications, home theatres and music centres, navigation systems, etc. The methodology of the practical orientation of the problem under consideration concerns chipization, which affects the operation of a huge number of different equipment. The study of the works of many authors on this issue comes down to digital ICT, which involves network technologies, digital TV, mobile communications, navigation, multimedia, which can generate income.

3. Results

Digital marketing is recognized as the use of all kinds of interactive networks for the development of branded goods, for example, television, radio, Internet, social networks, etc [1].

It is a mistake to think that digital marketing is an evolutionary development of Internet marketing. In digital marketing, mobile marketing and exhibition stands using LED technology and spectacular presentation materials have been successfully applied. In fact, it is a complex subject that applies peculiar forms of branding marketing. Nowadays, interactive marketing often uses standard advertising, the basic purpose of which is many subscribers, for example, QR codes in advertisements and media [2].

To date, digital TV has completely embraced the world, integrating Internet applications, for example, using a TV, you can go to your own Instagram page, watch a video, or keep abreast of the latest news.

Digital screens and POS-terminals are widely used. This interactive media slowly but surely substitutes on traditional advertising signs, facilitating direct communication with the client and attracting his attention with a message or using POS terminals to facilitate the final purchase. Tablet computers and other means, special applications help the client acquire new knowledge, participate in various games, watch new films, go to the global network and so on. Most people use a modern telephone as part of their personal lives, where they are around the clock and consume information [6].

The new principles of interactive marketing have affected various aspects of the commercial area the sale of consumer products. According to R. Tobaccoual, Vivaki's strategic director, "Digital tools are like hydrochloric acid burning through everything".

Successful businessmen are making efforts to adapt to promising interactive tools, focusing their business on the innovative way with the advent of various technologies. Recently, the technology of attracting new customers has changed a lot. Today, the introduction of interactive storage media into the business has evolved the trends of advertising media and marketing policy in general; all kinds of applications of social networks, high-speed Internet and the latest types of online and offline information processing has transformed the interactions of companies and their consumers. However, most marketing directors do not quite realize the role of digital marketing and apply it, but no one can imagine the market competition without it [3].

Customer orientation has been used for a long time in the entrepreneurial strategy of organizations; however, it is use as a new marketing policy strategy has become likely due to the spread of interactive media (including social networks). Focusing on the market, the main stumbling block is not products or advertising, but new ways of managerial decisions in the field of attracting the final consumer [4].

The expanded use of interactive marketing requires the highest degree of integration process of different departments of the organization, the skills to combine various content reserves, information, production, and industrial reserves, and constantly improve the organization of implementation and online content. This ability is required to monitor customer behaviour and correlate with the organization's policy, which should promote sales development in traditional supermarkets and online [7].

For example, Nike Inc. spends a lot of money on digital media, so on the company's website offer various programs and services, such as training programs for the use of digital gaming machines (Kinect from Microsoft), the new Fuel band, wrist-based devices for tracking and analysis of customer movement per day [5].

Clients have access to a huge number of links on Facebook and Instagram, photos that are posted by other clients on the Nike website [8]. The target audience of the company is all the time in correspondence, call up to receive advice on a product of the company. During the formation of the strategy for using interactive media, the company sharply reduced the cost of advertising in paid media, which provides the company with the potential to expand and deepen its own brand in the market space.

The Booz & Company conducted a survey of companies operating in the market to present the whole picture of the role of digital marketing in their field [10].

The classification of firms was carried out according to four criteria [9]:

1) Leading companies – there are few of them, but the developing part of companies such as Nike, Burberry, 3M, Apple, LL Bean, and Coca-Cola, actively developing their business with the help of digital marketing, forming the latest trends and applying in their business.
2) The second category of companies only studies, develops sophisticated types of segmentation of market funds based on in-depth studies of customer behaviour. However, they don't turn these ideas into the real life of entrepreneurial activity.
3) Firms – pioneers who have formed a strong presence in interactive mass media, in the latest types of electronic business, creating their own Internet platforms. However, for the most part, the practical role is not seen.

4) Firms that have begun to apply digital marketing actively [11].

According to of the use of the Profiler programs, programmers concluded that they did not see the possibility of monopolization in the market space, the leading companies that use interactive marketing invest significant development finance. Companies are focused on the formation of effective relations between the company and the client, especially in the field of content – solutions for active attracting customers to implement their own software products.

The rapid development of broadband Internet affects corporate policy [13]. Thanks to Internet technologies, a huge amount of data is available to consumers, it increases the level of demandingness when comparing customers at least 2-3 years ago. The practical use of marketing databases for the convenience of product alerts for a client segment is currently lagging behind digitalization, which uses the latest innovations in artificial intelligence, thereby attracting more new customers and retaining regular customers.

During the customization, a peculiar phenomenon appeared, the so-called individual marketing with the participation of consumer developments and digital services. For example, the company Garden.com (focused on products “Everything for the garden”) allows consumers to introduce projects of garden areas and garden plantings on their own website [12]. The consumer is given a chance to choose from over 20 thousand products and the opportunity to pre-see different designed landscape pictures using a personal computer with Internet access.

Digital marketing allows you to apply the latest approaches of competition for the client in the media, changing the principles and tools of marketing policy. For example, the use of digital individual media involves advertising brand steps by purchasing access rights and the ability to communicate with potential customers and require revision in commercial activities. In case when the media acquires the latest development, directions using digital technologies, then attracting more customers and active disseminating information is ensured, then marketing will acquire a new evolutionary development in the modern world. Marketing does not just add digitalization as part of the approaches but changes the whole scheme of the instrumental approach to achieve success in advertising development. A restructuring of the approach is required, focusing mainly on digital media [15].

After all, the basic principles of marketing are positioning and segmentation, which are unchanged, the use of digital networks involves the creation of new ways to increase speed to attract new consumers.

In the competition, the future client chooses the brands of companies that are ready to apply digital marketing quickly. Note that the various products of various companies against this background are lagging and invisible.

In modern conditions, the formation of marketing planning has become a futile action.

Intense competition between firms needs dynamic brand management. Marketers are required to quickly respond to market changes and attract customers to create the assortment policy of the company. Digital marketing tools are constantly being updated with information about the behaviour of potential consumers. But it is possible to mark a new stage in the development of marketing only in case when all marketing firms switch to digital operations.

The use of digital channels helps marketers maintain a continuous dialogue with each consumer.

This collaboration, which uses the data obtained in the process of previous dialogs with the consumer, provides a high level of marketing activity.

In addition, marketers constantly apply online feedback about the preferences of future customers, which increases profitability and optimizes the communication of departments within any company.

Digital marketing does not imply clear algorithms. Likewise, digital marketing is full of ways to achieve profitability. A marketer forms a business plan on corporate content, in turn, other employees of various departments use game schemes and display videos. In this case, there is no single rational development of digital marketing, but within this framework, certain principles must be adhered to [14].

Information technology has caused to customer passivity. Using the latest technology, customers participate, choose, and indifferently observe seller companies. Clients actively use the opportunities of the Internet, create blogs, exchange opinions. Often, customers even go one step further when applying modern IT related to digital marketing. They widely use digital content, comparing, criticizing, expressing opinions about a product, and even participating in advertising events on company content. The use of IT is not only the choice of modern technical tools. In addition, modern information media have a high-throughput capability that provides customers with the expectation of what they want. Marketers are required to build a model of behaviour towards a client who seeks to participate in market policy.

In addition, the role of an intermediary company fades into the background, as the seller company and the client virtually communicate directly. During complication and development of the digital market, a need arises for highly qualified information intermediary services, which has several reasons [8]:

- an exponentially growing number of methods requires special databases and mastery of competency skills, often in assessing the quality and consumer competitiveness of certain products, supplier trust, forecasting demand for innovative products and analysing demand elasticity, etc.
- at the same time, it is convenient for seller companies to concentrate on the production of certain goods, customers need comprehensive solutions.
- often clients need both a consultant and a guarantor of the transaction.

4. Conclusion

With digital uncertainty, the last factor listed is the main factor. There is some algorithm for its implementation for this. For example, after the buyer pays, the payment goes directly to the seller. In addition, the data of an unscrupulous digital market participant is distributed by a broker.

In the virtual world, data reliability is available in a closed global network society:

- digital customers can access true data on product quality, sellers, price lists, services, etc. thanks to a real-time reputation system and reduced search costs on the Internet.
- electronic suppliers have reliable data on the volume and structure of demand, competitors, consumer inquiries, opinions on products that are available in the global network.

So, the creation of a market mechanism in the global network has shown that the market has its reserves. The transition of the market to the global network is generating new factors in the development and changes most sales algorithms, which allows us to argue about a digital market that is different from the traditional market.

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Identification of Business Processes in the Context of Forming a Sustainable Development Strategy for an Industrial Organization

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Abstract

In economic literature business process is represented systemically as an input (the entered resources), in a black box business processes and different resources and an exit are represented by result of activity. At the same time, we do not share the point of view of researchers who represent a business process model of the enterprise as set of the components entering a concept external and internal environment.

Their author's two-way classification is developed for identification of business processes in article: on uniqueness – routine and unique (changing, non-standard); on it is degree the effect which had by business process on competitive advantages of the organization: business processes of direct action and business processes of indirect action. Routine business processes cannot pass into group unique (changing, non-standard) business processes. At the same time unique business processes demands change, in case of change of a stage of development of life cycle of the industrial organization.

Therefore, it is necessary to develop a matrix of business processes of the enterprise for each stage of life cycle of the industrial organization, which contains the following data: a stage of life cycle of the industrial organization, routine business processes, unique (changing, non-standard) business processes.

This matrix is based on the Pareto principle and the principle of the lever and the strengthening feedback.

Keywords: business processes, Pareto, organization, strategy

1. Introduction

A complex and dynamic external environment requires enterprises to constantly improve their management systems and support systems. In this case, various management options are possible.

Recently, the process approach has been widely used to create an effective enterprise management system; many enterprises around the world are moving from a functional organization of production to technological.

It is relevant to study the problems of development and improvement of business processes of an industrial organization, since it requires a constant search for new methods and tools that can create and maintain business processes of an industrial organization in a constant effective state. Improving business processes also allows you to increase the competitiveness of the enterprise and make it more sustainable in the event of a crisis. The main indicators of the economic efficiency of management as a whole are the profit and competitiveness of the industrial organization, however, the effectiveness of business processes can also be assessed as a significant factor affecting the management of the enterprise as a whole.

The classification of business processes in an enterprise is important for several reasons: A good understanding by management of which processes occur in the enterprise and why they are required is necessary. It will be necessary to align all business processes in a flexible system so that they do not duplicate each other, and at the same time there are no aspects of the enterprise that are not covered by any business processes. In general, all business processes of the company are aimed at, firstly, producing values for customers (goods, services), and secondly, supporting their own activities, optimizing, and developing. Knowing exactly what business processes are and what types they are divided into, can help to figure out whether their system is properly built in the enterprise and if there are any flaws.

2. Methodology

Analysis and generalization of economic literature, publications in periodicals devoted to the conceptual provisions for the functioning of business processes in the context of socio-economic systems, which helped to consider existing systems for identifying business processes and ranking processes by the degree of influence on the goal – sustainable development of the entire enterprise.

Justified classification makes it easier and more complete to identify the processes under study. That is why classification underlies the structure of most practical control systems, since the assembly and description of the relationships of individual components requires a clear understanding of the nature of these components, their properties and type. But in order to lay this structure as a skeleton for the possibility of realizing more global goals, it will take validity of the types of interconnections of individual classes and levels of business processes, which was the result of a system analysis of the problem, [1].

As a basis, the method of constructing a classification structure of business processes of an enterprise by analysing their role and place in the overall process model of this enterprise is used.

Creating a hierarchical structure of processes by dividing the results by degree of importance to achieve the goals of the enterprise. The hierarchical structure becomes a result-oriented system, the achievement of which is confirmed by modelling and comparing the results with existing systems.

3. Results

In economics literature, a business process is systematically represented as an input (input resource); in a black box business processes, various resources and output are represented because of an activity. However, we do not share a point of view of researchers who represent an enterprise's business process model as a set of components included in the concept of external and internal environment.

Such global ideas about a business process are more likely to relate to a business system concept, so there is an unnecessary complication of a business process which distracts from the essence of a process. From this perspective on the idea of a business process, there are difficulties with business processes' identification, while by identifying a business process we assume the formation of business processes' functions, which define their boundaries, the departments' organizational responsibility for performing functions and the interaction of business processes themselves (organization of interfaces).

Therefore an effective intrinsic classification of business processes is highly important. The literature presents many different characteristics of business processes' classification according to: linkages with external environment, a dependence on subject area, stages of a product's production cycle, a nature of added value, a level of detail, a number of technological stages of production (services),a pattern of results, value, a method of knowledge transfer, complexity, a participation in value creation. Ambiguity in the approaches to business processes' classification is manifested in the fact that the same feature has a different classification in various economists' research. At the same time without a clear classification of business processes, it is impossible to develop an effective system for managing them in an industrial organization. In this article the classification of business processes is multiple and consists of already-known classifications.

We assume the following essential characteristics according to:

1. H. Binner [2, p. 28] – management processes, operational processes and supporting processes.
2. The value – primary and secondary processes.

As the author's classifications of business processes, it is supposed to use 2 more classifications according to:

1. The uniqueness – routine and unique (changing, non-standard);
2. The degree of action that a business process has on competitive advantages of an organization: direct business processes and indirect business processes.

The first author's classification of business processes is discussed in more detail below. By routine business processes we mean a set of operations that execution order is clearly identified with the technology or relevant rules or instructions and does not require changes due to the change of organization's life cycle. These business processes are debugged once at an enterprise and further they are constantly carried out according to a pre-optimal algorithm. If mass routine business processes can be identified, then first they should be debugged and to do this the well-known Pareto principle, which has proved its effectiveness, must be applied. Routine business processes cannot change to group unique (changing and non-standard) business processes. At the same time, unique (changing, non-standard) business processes require changes in case of changing the stage of organization's life cycle.

However, this group of business processes can be divided into two more groups:

- Business processes which must change at all stages of industrial organization's life cycle.

- Business processes which must change at separate stages of industrial organization's life cycle.

Therefore, it is necessary to develop an enterprise business process matrix for each stage of industrial organization's life cycle, which contains the following data: the stage of industrial organization's life cycle, routine business processes and unique (changing, non-standard business processes).

There are some regularities in effective development of industrial organization's business processes in terms of the presented classification of business processes:

1. Constant increase of routine business processes when transiting to another stage of industrial organization's life cycle.
2. Standardization and application of a consolidated tool for routine business processes' implementation in various functional units.
3. Optimization of primarily mass routine business processes of an industrial organization.

Moreover, the correct identification of business processes is essential in the algorithm. Replacing unique (changing, non-standard) business processes with routine ones will inevitably lead an enterprise to collapse, as well as not reduction of unique (changing, non-standard) business processes and their change to routine business processes will also lead to the organization's decline [3].

As a justification for the need to adopt such a classification, business process management systems based on their other types are discussed below.

In terms of research on the mechanism or business process management system of an industrial organization, scientists mainly provide diagrams of these processes. Business process management system is mainly presented in the form of a schematic presentation of an enterprise management system (Figure 1 by Zhuravleva I.O.) [4, p. 14], without taking into account the specificity of business processes' functioning at an enterprise and it comes down to a business process' analysis according to the types based on the chosen by the author feature. The analysis is carried out mainly in three standard positions: the purpose of the process, the functional content and the costs for business process maintaining.

Other authors believe that a business process management system is a business system that includes four elements: a supplier, an enterprise, a consumer, and the results of an enterprise's business processes. At the same time the authors (for example, Parinov S.V.) [5, pp. 55-58] present schematically and in detail the results of an enterprise's business processes, which include the following elements: input, production preparation processes, production processes and output. These elements are in fact the same as described above in the "Business process in an enterprise management system" scheme.

From our point of view in this understanding of the system there is no such element as management.

Many authors in their studies cite several models that describe a business process management system in one way or another. For example, they propose the following models: an enterprise business process model, a business process content management model for business processes and enterprises, the formation of an enterprise business process management system, a model for the formation of an organizational structure of a system by enterprise's processes. The disadvantages of this approach are:

1. The lack of a clear distinction between the concepts of "business process model" and "business process management system".
2. The lack of a consolidated tool for managing business processes; only some separate elements are described in the studies, e.g., system formation.
3. The presence of an institutional management structure of a business process without a management system itself is inefficient.

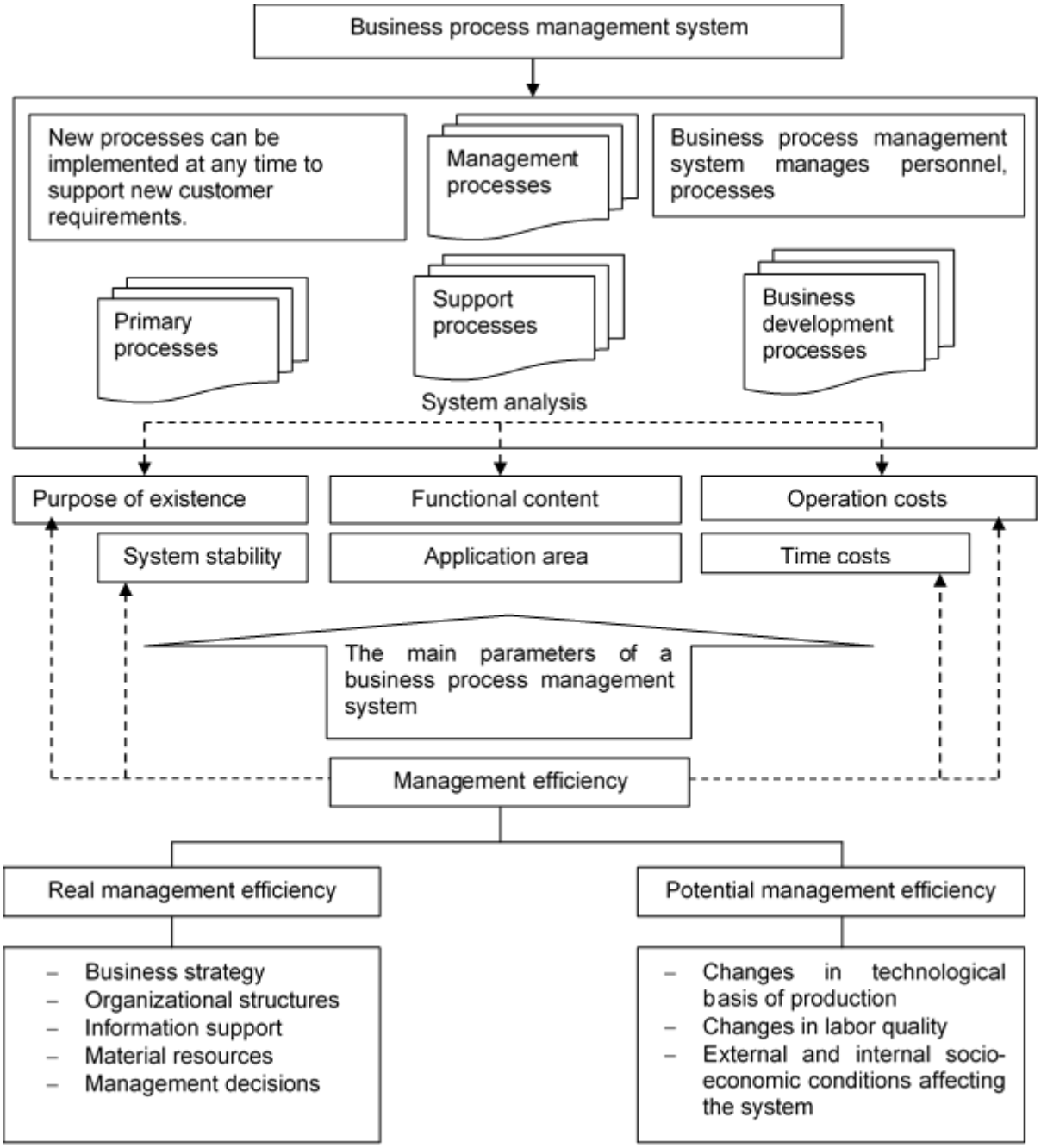

Fig. 1. The scheme of business process management when implementing the principles of a system approach in an industrial organization [4, p. 14]

A number of authors present a business process management system in the form of a methodology that consists of stages, which can be called a management system design, but this is unlikely to replace the first system [6]. By the stages of a business process management system design organization, documentation, resources, analysis, design, implementation and management are meant. It is unlikely that this can be considered systemic even for the first stage, i.e., the formation of a business process management system. Therefore, the mechanism of formation of the business process management system should include some items from the list above such as analysis, design, documentation, implementation and remaining discussed and debated stages.

Other authors of business process management system modelling conceptually use the above methodology complementing it with their stages and tools [7].So, Tretyakova E.A. [8] supplemented the methodology with the following stages: determining strategy, determining key success factors, evaluating the effectiveness of a business process model, audit of business process management system (Figure 2). This scheme of business processes system modelling is the most complete and systemic one.

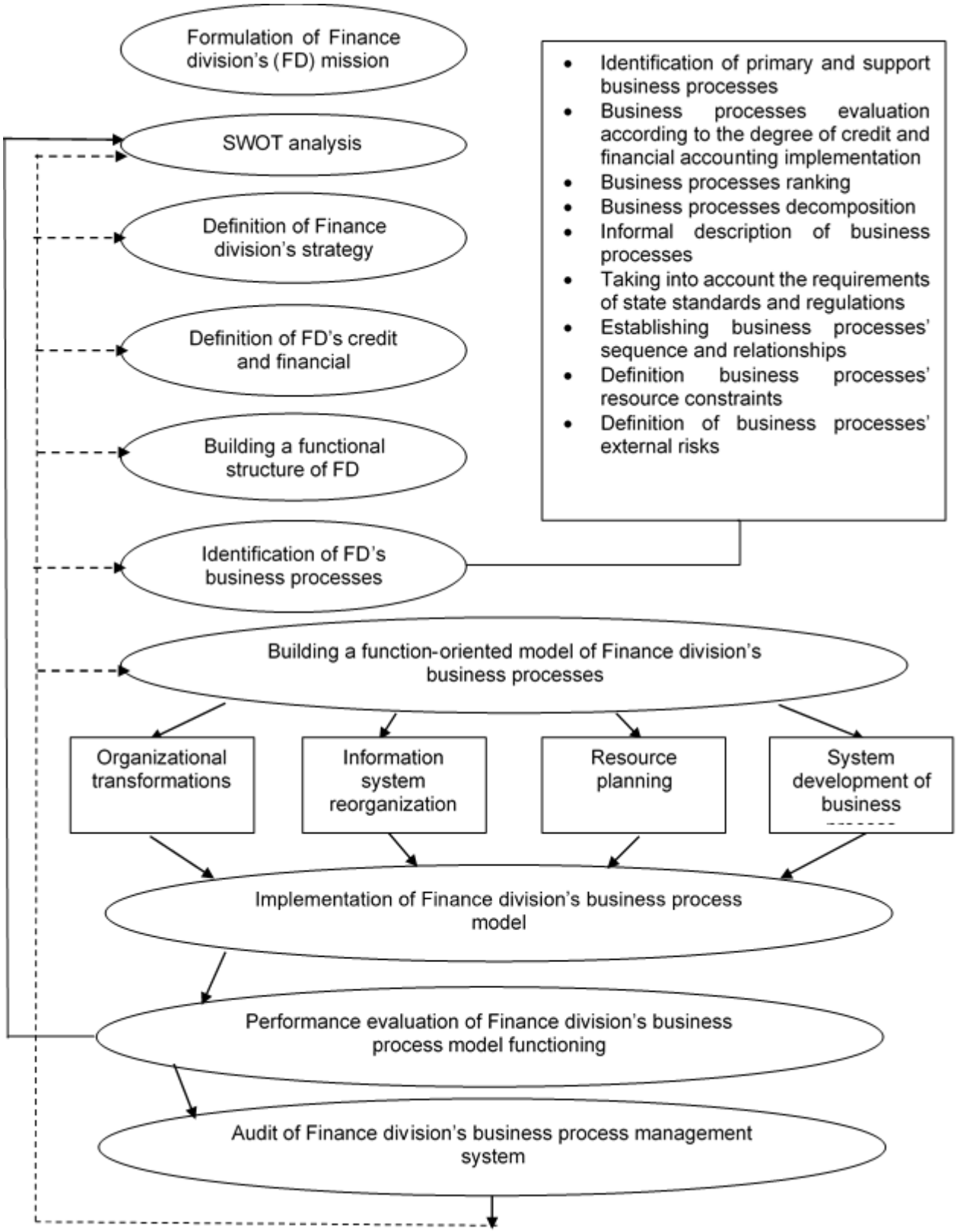

Fig. 2. The Scheme of conceptual system modelling of an industrial organization's business processes [8, p. 22]

Zhuravleva I.O. also offers a project model for developing effective business processes. It is partially based on the same stages of designing a business process management system, but in abridged form.

It includes strategic goals, the analysis of existing business process model, efficient business processes modelling and effective implementation of business process models. The model also includes

an assessment of new business processes' effectiveness. In addition, the author notes that it is necessary to use both a systematic approach and 5 types of resources: human, information technology, time, financial and technological.

The project model for developing effective business processes of Zhuravleva I.O. is enlarged and it includes the following stages:

1. The strategic goals system.
2. The analysis of existing business processes model "as they are";
3. The effective business processes modelling "as they will";
4. An assessment of new business processes' effectiveness.

According to the analysis carried out in the article, there is no clear, universal, and effective system for managing business processes and the system to form it [9]. By management process, the author means the sequence of managers' actions aimed at coordinating the joint activities of people to achieve organization's goals. Therefore presenting the result of administrative process' implementation as the result of the functioning of the various elements of element management system (in this case business process management system), it is easy to reveal that it strongly depends on the human factor, which significantly complicates the problem of information disclosure and its content [10].

So, the following concept for managing industrial organization's business processes is proposed in the article; it includes three levels of hierarchy:

1. Strategic planning of business processes development of an industrial organization.
2. Creation of a business process management system for an industrial organization and (the formation of a system and its constant improvement) and, based on the strategic plan of a road map, the development of a system and some separate individual business processes. At the same time in the general business process management system of an industrial enterprise, an element of their development must be laid in the event of a change in internal and external factors.
3. Creation of maps describing specific business processes of an industrial organization and a matrix of business processes (according to one or two features).

The components of business process management process were discussed above. The institutional component is considered below; it also consists of three levels. The first level is subsystem values and goals of an industrial organization in this case there are top management and functional units [11, 15].

At this stage it is necessary to rank business processes in order of importance and identify business processes that have an impact on competitiveness. It is also necessary to clarify that from the standpoint of the impact on an industrial organization's competitiveness, business processes can be direct and indirect actions. From the perspective of systems thinking and using leverage (it is necessary to find a suitable combination of actions so in this case system is capable of changing suddenly) the most effective business processes are of direct action. Business processes of direct action according to the standpoint of systems thinking is the optimal point of the principle of leverage application, which allows quickly and effectively improving an industrial organization' competitiveness and improving its competitive advantages. Thus, we get a significant result with the least efforts; it is a manifestation of the principle of leverage. The development of direct-action business processes also allows obtaining reinforcing feedback, which implies that a change in a system state is a signal for an increase of the starting changes, i.e., a system will allow providing a greater change in the same direction. [12, 13]

Business processes of indirect action do not affect competitive advantages effectively, so their debugging and development must be carried out in the second place.

At the second level is a structural subsystem, which includes the head of business process management and managers of specific business processes and is responsible for business processes' implementation and interaction between departments. This is the system on which the previous level is based. The composition of structural subsystem is a specific set of existing activities and external environment of an industrial organization [14].

The final third level is a self-development subsystem, which includes a business process team and teams and business process development groups. This system allows developing creative potential of staff, which is implemented in the creation of temporary creative teams of formal and informal nature for continuous changes of industrial organization business processes.

The hierarchies of a business process management system and the levels of institutional component must be coordinated (Table 1).

Table 1. The coordination of hierarchies of a business process management system and the levels of institutional component

Levels	**Hierarchy levels of business process management concept**	**Institutional levels**
The first level	Strategic planning of business processes development	Subsystem of industrial organization's values and goals
The second level	Business process management system	Structural subsystem
The third level	Creation of maps describing specific business processes of an industrial organization and a matrix of business processes	Self-development subsystem

For the first level, the initial platform for forming the concept of strategic planning of business processes development must be a business process classification matrix that is universal and can be used not only for an industrial organization but also for all commercial organizations.

Table 2. The priority matrix of an industrial organization's business processes development to increase its competitive advantages

	Routine business processes	**Unique business processes**
Direct business processes	The first level	The third level
Indirect business processes	The second level	The fourth level

Therefore, the first level requires a form that debugs the routine business processes of direct action, the second level requires a form that debugs routine business processes of indirect action, the third level requires a form that debugs unique business processes of direct action and the fourth level requires a form that debugs unique business processes of indirect action. The complexity of identifying business processes lies in the fact that there are crosscutting business processes and mixed business processes that are difficult to attribute to any level. Therefore, these types of processes must be considered in detail and it is necessary to determine their contribution to increasing the competitive advantages of an industrial organization. However, we will not consider these issues in the article, because the scope of this work does not allow observing them.

This matrix is based on the Pareto principle, the principle of leverage and the principle of feedback strengthening.

4. Conclusion

1. Thus, all business processes of an industrial organization can be classified according to two criteria:
   - The uniqueness – routine and unique (changing, non-standard);
   - The degree of action that a business process has on competitive advantages of an organization: direct business processes and indirect business processes.
2. The concept of managing business processes of an industrial organization includes three levels of hierarchy: strategic planning of business processes development of an industrial organization; the creation of a business process management system for an industrial organization and (the formation of a system and its constant improvement) and, based on the strategic plan of a road map, the development of a system and some separate individual business processes; the creation of maps describing specific business processes of an industrial organization and a matrix of business processes (according to one or two features).
3. The priority matrix for business processes development of an industrial organization to increase its competitive advantages consists of four levels: the first level is routine business processes of direct action, the second level is routine business processes of indirect action, the third level is unique business processes of direct action and the fourth level - unique business processes of indirect action.

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Part II
DIGITALIZATION IN THE FINANCE SECTOR

Methodological Approaches to Assessing the Level of Digitalisation of the Financial Market

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Abstract

There are several threats and opportunities in the context of digitalisation of the economy as a whole and as a financial market. Mega regulators need to consider these conditions to increase the competitive position of national financial markets. Evaluation and ranking are a well-proven management tool for making strategic decisions. In this regard, it is necessary to form a methodological basis for forming an assessment of the digitalisation level of the financial market.

Based on the comparative approach the authors compared the most famous world indices, those are presenting the digitalisation level of the economy and society. The authors proposed an approach to forming a methodology for assessing the digitalisation level of the financial market. At the same time, the view of the Basel Committee on Banking Supervision on the significant impact of fin-tech & big-tech on the risks of the financial market was considered there. Although, the authors examined the materials of the G20 Global Partnership for Financial Inclusion (GPFI), Alliance for Financial Inclusion (AFI), the World Bank and considered the Financial Inclusion Indicators developed by the Bank of Russia.

The author's approach consists of three integrated groups of indicators included in the Final Index of the digitalisation level on the financial market: "Digital infrastructure of the financial market", "Customer loyalty related to financial products and services within digital form", "Level of the financial market risk".

Keywords: digitalisation of the financial market, indexes for assessing the digitalisation of the economy and society

1. Introduction

The financial market is going forward in the implementation of digital solutions in all its segments: investment, banking, and insurance. The usage of technologies such as biometrics, blockchain, online services in the field of transfers and transactions allows financial market institutions to create new business models that are fundamentally different from the traditional one. [1] The new institutional participants are occurring as the companies that create technological solutions in finance. It is forcing a radical review of the strategies and tactics of licensed financial market players. The partnership of traditional financial institutions and fintech companies can greatly enhance the effect of the digitalisation of financial services, which is reflected in all indicators of the financial market and enhances the competitiveness of the national financial market.

Nowadays Russia is implementing the Digital Economy Program and many departmental programs that provide control over the process of digitalisation of the economic segments. In particular, the program of the main directions in the financial market development of the Russian Federation for the period 2019-2020 is being implemented. [2] It outlines the main directions of development of fintech as an integral part of the financial market, as well as the Strategy for increasing financial inclusion in the Russian Federation for the period 2018-2020 [3].

During the implementation of programs, it is necessary to implement required measures for assessing the achievement of target. Additionally, the development of the comprehensive methodological approach is required to assess the level of the financial market digitalisation, including diverse affecting indicators.

2. Methodology

The high speed of the financial market digitalisation, the scale and complexity of management and control processes create the need to consider the digital factor. The digitalisation process is the stage following the informatisation process, which has long been an integral part of economic development.

In international practice, there are several methods for assessing the economic digitalisation [IDI, DESI, DEI, WDCI, NRI, E-Intensity, GCI] [5, 6, 7, 8, 9, 10], each of those is based on the index method usage and basically has a different conceptual approach to form the initial indicators. The comparative approach was used by authors to identify the similarities and differences in indices formation within a range of methods.

The position explained in the reports of the Basel Committee on Banking Supervision (BCBS) on the impact of the technological innovations development on increasing the risk level of financial activities and on new opportunities that open up under these conditions was considered there. [4]

3. Results

The development of methodological approaches to assessing the digitalisation level of the economy as a whole can be noticed considering the indicators used in international practice, those are reflecting the need for ranking national economies, assessing their competitiveness and the potential for further development in this direction. Such approaches are based on the index method and usually include several sub-indexes (groups of indicators) that reflect certain aspects of the problem being studied.

Firstly, it should be concerned, that ICT Development Index (IDI) is used to monitor and compare level of development in information and communication technology including Internet usage. [5]. This index has existed since 2007, and is currently improving its methodology, since in the last three years there have been quite serious changes in technology. The ranking of countries according to this index was last formed in 2017. Russia took 45th place in this ranking, decreased its position compared to 2016 (from 43rd place). The first three places were taken by Iceland, the Republic of Korea and Switzerland.

The next index is the Digital Economy and Society Index (DESI) [6]. It began to be calculated in 2014 and was used to assess the level and degree of influence of digitalisation processes in the EU countries.

However, in 2015 the methodology was improved in order to compare countries within the European Union with other countries. This index is called I-DESI (The International Digital Economy and Society Index) [7].

This approach is qualified to monitor the achievement of ongoing digitalisation programs in the European Union, and on its basis, quantitative and qualitative indicators are evaluated. The evaluation is applicated to characterise the development level of digitalisation processes and compare with other countries that are actively introducing digital technologies in all areas of the economy. According to the results of calculating this index, Russia ranks 36th out of 45 countries. The structure of this index contains five sections:

- Connectivity (Broadband market developments in the EU)
- Human Capital (Digital Inclusion and Skills)
- Use of Internet Services by citizens (services incl. financial, social networks, online education, consulting etc.)
- Integration of Digital Technology by businesses (adopting digital technologies by e-commerce, small and medium business to enhance efficiency, reduce costs and better engagement between company and their customers/partners)
- Digital Public Services (the digitisation of public services, focusing on eGovernment and eHealth)

The methodology for calculating the Digital Evolution Index (DEI), was first implemented in 2014, and is based on four drivers:

- Supply Conditions (level of infrastructure development, incl. bandwidth, servers, security, and accessibility of digital content)
- Demand Conditions (level of customer demand for “digital consumption” of all types of digital services, incl. financial)
- Institutional Environment (level of political stability, governance quality, investment inflows, competitiveness, and digital ecosystem)
- Innovation and Change (level of user adoption new tech and services, advertising, ecosystem attractiveness, venture capital availability)

The methodology divides the countries participating in the ranking into four groups: Stand Out (leading) countries, Stall Out countries (the growth rate of digitalisation is slowing down), Break Out countries (with the potential to develop strong digital economies) and Watch Out countries that face significant challenge on the way to digitalisation. According to the ranking in 2017, Russia entered the group of Break Out countries. This means that the achievements in the field of digitalisation are not so high but making gains and growth in the innovation space could make it possible to move to a higher group in a short time.

Another ranking reflecting the degree of digitalization of the economy, but with a focus on competitiveness, is the World Digital Competitiveness Index (WDCI).

The calculation includes thirty statistical and twenty expert indicators that form three large groups of factors:

1. Knowledge: The capacity to understand and learn new technologies. It considers training, education, research, and the concentration of their results.
2. Technology: The competence to develop new digital innovations. It indicates the development of the regulatory framework, laws that stimulate innovation, investment in innovation, support for entrepreneurship, venture financing, speed and availability of high technologies incl. broadband communications and Internet.
3. Future readiness: The preparedness for the coming developments.

It includes such indicators as the use of online services and digital innovation within and including portable computers (tablets, smartphones), the use of Big Data by the business, the degree of availability and use of innovations, the integration of all processes with information technologies.

At the end of 2018, Russia was on the 40th place in the WDCI ranking. Among first ones there are USA, Singapore, Sweden, Denmark and Switzerland.

Experts from the World Bank, the World Economic Forum and the INSEAD International Business School also have their own vision for evaluating the digitalisation of the world's economies. The Networked Readiness Index (NRI) methodology has been calculated since 2002, consists of four pillars and shows the degree and role of ICT in the development of the economy and society. Sixty indicators total form the following groups of pillars (each of these pillars is divided into three sub-pillars that constitute the second level):

- Technology: Access, Content, Future Technologies
- People: Individuals, Businesses, Governments
- Governance: Trust, Regulation, Inclusion
- Impact: Economy, Quality of Life, SDG Contribution

In this rating, as of 2016, Russia ranks 41st. In the leading position are Singapore, Finland, Sweden, Norway, and the USA.

Another authoritative measure in the methodology for assessing the level of economic digitalisation is the BCG e-Intensity Index. This index was developed in 2008 and consisted of three components, each of those accounts certain part of total index weighting:

- Enablement (50%) measures various aspects of digital infrastructure deployment,
- Engagement (25%) measures how active institutional and private users are,
- Expenditure (25%) measures the spending on online retail and advertising.

Infrastructure development, online spending, and user activity. Based on the final calculations, five groups of countries are formed with accordance to their level of digitalisation.

It is necessary to mention one more index, the methodology of which was developed by Huawei – the Global Connectivity Index (GCI). The annual calculation has been started in 2014 and reflects the degree of development of digital technologies of the countries participating in the ranking [8]. The 40 indicators can be analysed both vertically with accordance to the pillars (Supply, Demand, Experience and Potential) and horizontally in connection with each of core technologies (Broadband, Cloud, IoT and AI). According to the report in 2019, Russia was on 41st place. Leaders of the ranking are USA, Switzerland, Sweden, Singapore, Denmark [9].

The analysis showed that at present there is a developed apparatus for assessing the degree of digitalisation of the economy and society, and the assessment methodologies have many common opinions, expressed in a set of indicators and a weight of values. However, there are differences in the set of indicators, which is mainly due to the purpose of rating and target users. As result affected final values and the conclusions drawn. Table 1 shows a comparison of the conceptual approaches of existing methodologies in terms of the inclusion and significance of certain indicators in the calculations.

Table 1. Comparative analysis of conceptual approaches to the formation of the methodology of economies digitalisation indexes

Conceptual factors of influence on the final indicator	**IDI**	**I-DESI**	**DEI**	**WDCI**	**NRI**	**E-Intensity**	**GCI**
Industry digitalisation	-	-	-	-	-	-	-
Service digitalisation	-	+	+	-	-	-	-
Share of high-tech products/activities in the economy	-	-	-	+	-	-	-

State interest (effectiveness of state policy in the field of digitalisation)	-	+	-	+	+	+	+
Knowledge/education development in the field of digitalisation	+	+	-	+	-	-	-
Institutional development	-	-	+	+	+	-	+
Digital environment security	-	-	+	+	-	-	-
Influence of price factors on the digitalisation	-	+	-	-	+	+	-
High-tech import/export	-	-	-	+	-	-	-
Innovative activity in the economy	-	-	+	+	+	-	+
International cooperation	-	-	-	-	-	-	-
Impact of digitalization on society	-	-	+	+	+	-	-

Source: compiled by the authors based on the references [5, 6, 7, 8, 9, 10]

Comparative analysis revealed that in all methods there is no evaluation of Industry digitalisation and International cooperation. The degree of Service digitalisation is considered only in two indexes: I-DESI and DEI.

It should also be noted that the degree of the financial market digitalisation has not been mentioned in the framework of the considered valuation approaches.

The authors opined that the assessment of the digitalisation level is closely related to the concept of "financial inclusion". In July 2015, the Bank of Russia shared a definition of the concept of "financial inclusion" on its official website. This definition represents financial inclusion in a broader sense and, in addition to physical access ("proximity to infrastructure"), includes such components as the affordability of financial services, mental and assortment availability. In the framework of the concept of "financial inclusion", such aspects as marginal utility of financial services and their security are also affected.

In 2015, the Bank of Russia developed financial inclusion indicators and a financial inclusion assessment system in accordance with the recommendations of the G20 Global Partnership on Financial Accessibility, the World Bank financial accessibility alliance.

The report of The Global Findex Database [10] emphasises that, among other factors, digital technologies also affect the level of financial availability. The main source providing inclusion is access to the Internet using various devices. Globally, about a quarter of the total volume of available financial services is provided through digital sources.

As part of the Strategy for increasing financial inclusion in the Russian Federation for the period 2018-2020, the Bank of Russia has identified key targets to measure the effectiveness of its implementation [3]. Within these indicators, the digitalisation factor is considered.

So, the Physical Accessibility Index (PAI, russ. IFD) considers electronic access points provided by financial institutions. The indicators are calculated: "The share of the adult population that is able to transfer money instantly using a mobile phone or using satellite communication (by accessing a bank account or without it)", "The indicator of financial education" and "The share of the adult population that satisfied with providing and functioning of services by financial organisations".

So, currently there is no consolidated integrated approach to assessing the financial market digitalisation. In addition, no methodology considers the impact of fin-tech & big-tech on digitalisation of the financial market.

4. Conclusion

The Basel Committee on Banking Supervision conducted a study on the impact of the development of fin-tech & big-tech on the financial market in terms of threats and opportunities for banking institutions [11].

The BCBS believes that before banks went through the stages of technological and electronic innovation. However, the current situation is complicated by the high rate of introduction of digital innovations by specialised companies that do not have barriers to entry in the market, in contrast to specialised financial institutions.

During the analysis to formulate forecasts for the future development of the banking industry, the BCBS focuses on increasing the risks associated with new technologies and business innovations. In this regard, the authors consider it necessary to pay attention on the risk level when forming a new approach to assessing the level of the financial market digitalisation.

Table 2. Approach to the formation of indicators for assessing the financial market digitalisation

The enlarged group included in the final index	**Conceptual factors influencing the final indicator**
Digital Financial Market Infrastructure	- The weighted number of financial institutions (in each segment of the financial market) that use a digital business model; - The level of financial institutions attracting fin-tech companies to support business processes (outsourcing); - The level of Internet accessibility of financial products and services consumers and the speed of the Internet. - The weighted number of special applications and programs that ensure the purchase/provision of financial products and services.
Loyalty of consumers of financial products and services to digital sources as a service provider	- The structure of non-cash payments carried out using various digital tools (cards, applications, crypto, etc.); - The level of receipt of financial products and servants in digital format; - The level of financial education of financial market participants; - The degree of satisfaction with the work of financial institutions in digital form.
The degree of the financial market risk	- The average response time of supervisors to claims from participants on the financial market; - The share of reporting provided through digital sources; - Possibility of online monitoring and compliance with the requirements of the mega-regulator (authorised commissions and/or agencies); - Availability of requirements of the mega-regulator (authorised commissions and/or agencies) to the level of protection when using digital services; - The presence of regulatory measures regarding fin-tech & big-tech companies operating in the financial market.

Source: compiled by the authors

The author's approach to the formation of a methodology for assessing the level of the financial market digitalisation could be considered in table 2.

This approach is based on the examined indexes for assessing the digitalisation of the economy and society, assessing the financial inclusion of the G20, the Alliance for Financial Inclusion, the World Bank, and the BCBS reports. In the authors' opinion, the former three-component approach can be expanded and detailed in the form of further research with the identification of possible correlations and mutual exclusions.

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Methods of State Financial Control in the Context of Digitalization of the Financial Sector: New Opportunities and Prospects

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Abstract

Development of financial technologies modernizes the traditional directions of rendering financial services in which innovative products and services for end users appear. Now in the financial market of the Russian Federation a number of a tendency, the forming prerequisite for stimulation and development of financial technologies among which increase in penetration of financial services due to their digitalization is observed. The purpose of this article is to explore new methods of state financial control in the context of global digitalization of financial services provision. The research used scientific methods of knowledge of economic phenomena and processes: dialectical approach to the study of economic systems, analysis, synthesis, complexity, method of expert assessments and other popular scientific methods. The article considers modern trends of fintech development. The main directions of fintech development in Russia are highlighted. Methods of state financial control in conditions of digitalization of the financial sector are proposed. The conclusion is drawn that fintech development in the Russian Federation modernizes the traditional directions of providing financial services in which innovative products and services for end users appear. Stimulation of fintech introduction in Russia must be carried out by means of creation of state financial control.

Keywords: state financial control, fitch, globalization of economy, digital technologies

1. Introduction

In the global market, traditional payment services are replaced by electronic payment systems, which in real time allow to carry out the necessary financial services quickly and conveniently with appropriate savings for service funds and a reliable system of protection. Currently, more international payment systems are emerging in the Internet, which have their own clearing houses based on other technology platforms and do not need to attract existing cash circulation systems. These circumstances require improvement of the methods of state financial control in the context of digitalization of the financial sector.

The solution to the problem of state financial control in the context of the implementation of Fintech in Russia may be the regulatory sandbox, a mechanism for piloting new financial technologies requiring changes in legal regulation. The regulatory sandbox was launched by the Bank of Russia in April 2018 and is aimed at expanding the range of financial services and increasing the competitiveness of the Russian financial market. The list of priority financial technologies for piloting on the regulatory site includes Big Data and Machine Learning technologies, mobile technologies, artificial intelligence, biometric technologies, distributed registry technologies, open interfaces, crowdfunding, cryptographic technologies, Initial coin offering (ICO), robo-ivising [2].

2. Methodology

The present work, using methods of analysis, logical generalization, scientific abstraction, as well as system-structural analysis, examined modern trends and directions of fintech development in Russia, as well as improvement of methods of state financial control in conditions of digitalization of the financial sector. While writing the article used the provisions of classical theory, the provisions of the main concepts of the theory of digital economy.

As a methodological basis, the study is based on a set of complementary popular scientific methods of analysis (interpretation, abstraction, dialectical, logical, comparative, etc.). The article uses such research methods as modelling, generalization, as well as graphical, calculation-design methods of analysis. Methods of systemic as well as specific historical analysis are important in the work.

3. Results

The volume of global investments in fintech companies in the fourth quarter of 2017 amounted to $8.7 billion [12], although the processes themselves have more than a century of history (Table 1). In view of fintech as a result of the interaction between technology and the financial sector, one of the first such companies were the Atlantic Telegraph Company, which in 1866 laid a cable across the ocean.

This made it possible to reduce the period of financial settlements between America and Europe by several orders of magnitude (from months to days, even hours) and save a lot of time and money on transactions. In the contemporary history by the vanguard fintech call Barclays bank which in 1967 installed the first ATM (ATM) in London. He helped financial institutions save cashier time, thus reducing costs.

By estimates of the largest American bank Cit i, the further growth of FinTech – start-ups will lead to the fact that by 2025 30% of bank employees of a world banking system will lose the jobs. New digital financial technologies will replace bank branches and the way banks communicate with customers. For example, in China, 96% of sales in e-commerce systems occur without the participation of banks [7].

Fintech, on the one hand, can be real threat for development or even existence of the banking sector if to consider that they along with new technology solutions want to become leaders in its highly profitable segments, and with another – a new stage of development if banks overcome traditional conservatism and will cooperate, forming the new progressive relations with FinTech.

The term “fintech” refers to new applications, processes, products, and business models in the financial services industry that may consist of one or more complementary financial services provided over the Internet.

Table 1. Evolution of development of FinTech

Period	1866-1967	1967-2008	2008-present	
Era	FinTech 1.0	FinTech 2.0	FinTech 3.0	FinTech 3.5
Geography	Global/the developed countries	Global/the developed countries	The developed countries	Emerging/Developing
Key elements	Infrastructure/ computerization	Traditional/Internet	Mobile devices/Start-ups/New participants	
Changes	Communication	Digitalization	2008 financial crisis/smart phones	Advantages of mobility
Examples	Transatlantic cable (1866), telex (1966)	First ATM (1967), SWIFT (1973), Online-banking (1983-1985) Internet (1999)	Introduction iPhone (2007), BitCoin (2009)	MyBank, WeBank (2015) Chinese Online Banks without physical branches

Source: [11]

In the research work on evolution of financial D.V. Arner technologies, etc. claim that the origin of the term can be tracked by the beginning of the 1990th, referring to “Financial Services Technology Consortiums”, the project initiated by Citigroup for increasing efforts in the direction of technological cooperation [5]. However, the term “fintech” was already used in 1972. In a scientific article devoted to models of analysis and solution of daily banking problems, the Vice President of the bank Manufacturers Hanover Trust, A. Bettinger proposed the following definition: “Fintech is an acronym that stands for financial technologies that combine banking experience with modern methods of science and computer management” [6].

Prof. G. Schueffel proposed the following definition of the concept under study: “Fintech is a new financial industry that applies the latest technologies to improve financial performance” [10].

The definition of financial technologies can be divided into several groups, depending on the object with which the fintech is associated (Table 2).

Table 2. Approaches to the definition of fintech

Criterion	Author	Definition
Technology	A. Bettinger [6]	Fintech is an acronym that stands for financial technologies that combine banking experience with modern science and computer management methods
	I. Lončarski [8]	Evolution and application of technologies in finance that replace traditional business models in the market, opening new risky horizons
Sector, industry, industry	I. Micu [9]	A new financial industry sector that includes the full range of technologies used to organize trade, corporate business, and retail services to the end-user
	Wharton [13]	An area of economics that consists of companies that use technology to improve the efficiency of financial systems
Finance	P. Xie, C. Zou [15]	Third mode of financial activity other than direct financing through securities markets and indirect financing through commercial banks

The divergence of views of researchers confirms the impossibility of reaching consensus in the definition of Fintech by expert means. Given the diversity of the concept under study, according to the author, Fintech should be understood as a multi-vector, unique and comprehensive form of interaction of the latest technologies into the financial market, which is characterized by its quantitative and qualitative development at the expense of start-ups and improvement of efficiency of financial services provision. Fintech represents technologies that fundamentally change traditional financial services, including mobile payments, money transfers, loans, fundraising and asset management.

At present, there are a number of trends in the financial market of the Russian Federation, which form the prerequisites for the stimulation and development of financial technologies, including the increase in the penetration of financial services due to their digitalization [2, 4].

The development of financial technologies in the Russian Federation modernizes traditional directions of financial services provision, in which innovative products and services for end-users appear. This trend is most strongly observed in the following areas [2]:

- payments and transfers: online payment services, online transfer services, P2P exchange of currencies, B2B payment and transfer services, cloud cashiers and smart terminals, mass payment services.
- financing: P2P consumer lending, P2P business lending, crowdfunding.

As part of the implementation of the Digital Economy of the Russian Federation program [1], the Bank of Russia has been in operation since mid-2019. Stepped up the transfer of financial services to the digital environment. The basis of this process will be the introduction of a platform for remote identification of individuals in a single system of identification and authentication based on biometric data, which will increase the availability of financial products and services for the population, as well as increase competition in the financial market.

However, according to experts of the Bank of Russia, “in addition to the opportunities, the wide introduction of financial technologies carries potential risks for market participants and stability of the financial system, management of which may require non-standard methods. It is obvious that optimal measures to regulate this area should not stifle innovation, which will require a reasonable balance between consumer protection, personal data and market efficiency” [3].

The promotion of the implementation of fintech in Russia should be carried out through the creation of a favourable technological and regulatory environment.

In order to improve the effectiveness of regulators, the SupTech (Supervision technology) is used in world practice, which refers to the improvement of existing methods of supervision and regulation with the help of new technologies in order to provide effective ways of identifying and assessing risks, collecting and analysing data.

In the Russian financial market this trend is expressed in the improvement of mechanisms of interaction between the Bank of Russia and supervised organizations: development of the personal cabinet of the financial market participant, use of new formats of provision of supervisory information, as well as improvement of state control, the model of which is shown in Figure 1.

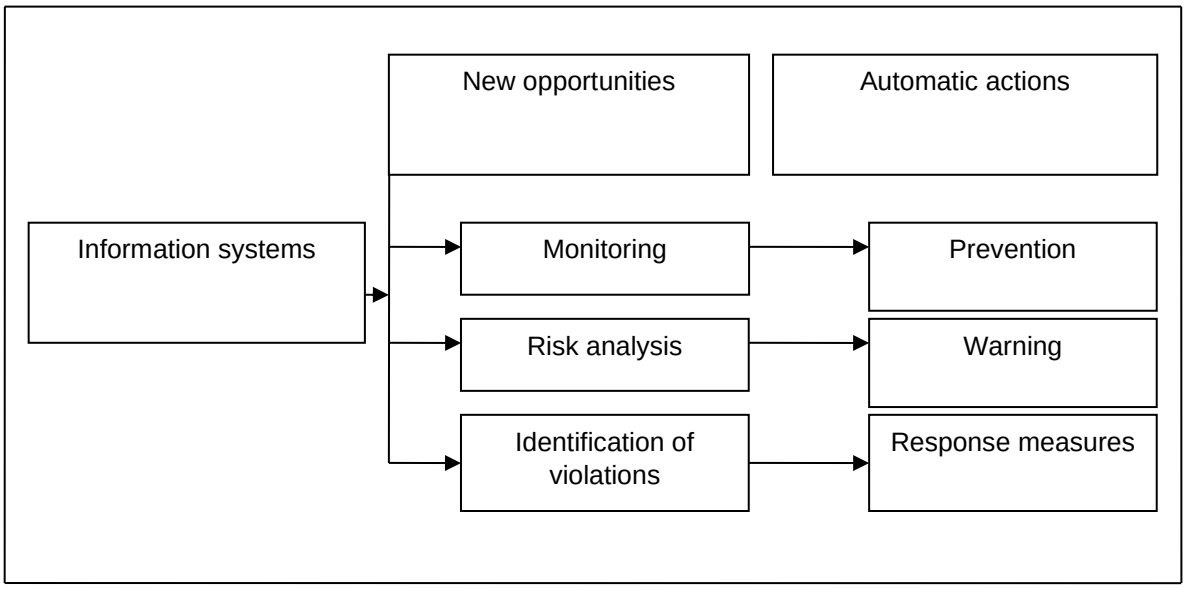

Fig. 1. Model of state control within the framework of digitalization of financial services
Source: author's own

The counter RegTech direction – Regulatory technology – involves financial institutions using Fintech to improve regulatory compliance and risk management, which allows financial organizations to implement internal control requirements faster and at less cost.

Within the framework of this direction on the Russian financial market it is planned to carry out analysis of promising RegTech applications and to prepare reviews, recommendations and requirements for the use of relevant solutions by financial market participants, as well as specialized companies.

4. Conclusions

Further development of state financial control in the context of the implementation of fintech should include:

- research of modern infrastructure of e-financial services systems in the context of its integration with other automated technologies (cloud technologies in customer service, T-outsourcing, multipayment systems, CRM, Money Exchange, corporate financial portals and promo-sites, ready solutions for financial self-service networks);
- research of modern banking systems promoting electronic financial services in the online environment (Internet banking; Internet payments and remittance systems; Payment smart cards and universal front office systems; Remote banking systems; Electronic payment instruments and electronic money in global financial markets) and the role of banks in the development of e-business, commerce or trade;
- study of issues related to information security of electronic financial services systems.

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Methodological Features of Digitalization of Development Banks (on the Example of VEB.RF)

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Abstract

The authors revealed the methodological features of digitalization of development banks (DB), using the example of VEB.RF. The main content of the activities of the DB (including its financial operations, its implementation of the project cycle) determines the need to separate the procedures for digitalization of the DB and its FinTech transformation. The importance of the work of the DB with new classes of projects related to the digitalization of the economy and FinTech transformation of financial organizations is emphasized. The authors believe that the experience of assessing the digitalization of the economy of individual countries using the digitalization indices can be used to assess the digitalization and FinTech transformation of the DB. According to the authors, the methodological features of digitalization of the DB (including VEB.RF) include: the separation of digitalization and FinTech transformation itself, the need to analyse all business processes implemented by the DB and their division into two groups, the emergence of new classes of projects related to practical the introduction of digitalization and FinTech transformation, the need to change or introduce new information systems in the DB, the usefulness of using digitalization indices to assess the current state of digitalization and FinTech transformation DB.

Keywords: FinTech, development banks, digitalization, digitalization indices, indicators

1. Introduction

Development banks (DB) finance various projects (primarily infrastructure ones) aimed at developing national economies (in cases where private financial institutions are not interested in such financing). Moreover, all DBs use the so-called. project cycle for managing financing and project implementation (Torres, & Zeidan, 2016).

In particular, DB (Musacchio, Lazzarini, Pedro Makhoul & Simmons, 2017) invest in commercially unpromising projects that significantly affect sustainable development (construction of roads and water supply systems in remote areas, investments in clean energy, etc.), direct lending or direct investment in equity, to stimulate both entrepreneurship and the development of private capital markets, – adaptation of credit analysis to the achievements of digital economics and others.

Digitalization of the economy is the fourth industrial revolution, which allows specialists to talk about the new digital economy or new digital economy (NDE) (Rose, 2016). UNCTAD (United Nations Conference for Trading and Development) connects NDE with a set of technologies that are implemented in practice using modern production equipment (including robots), involve complex automation, the use of new data sources (big data) and their analysis, cloud computing, elements of artificial intelligence (AI) (The “new” digital economy and development. UNCTAD, 2017).

Recently, the features of NDE include (Rose, 2016):

1) The massive emergence of new data sources (video cameras, factory sensors, gadgets, etc.). This allows you to accumulate large amounts of data, process them (big data analytics), develop new products and services.
2) The emergence of new business models associated with the use of modern technologies and relevant platforms (markets and competition in industries are changing).
3) The transition to the practical use of machine learning and AI elements in the production and sale of goods and services.

The Basel Committee on Banking Supervision (BCBS) (Basel Committee on Banking Supervision, 2017) considers it possible to use the following definition for FinTech (it is noted that there is no single, universally accepted definition): “technological financial innovations that can lead to the emergence of new business models, applications, processes or products and having a significant impact on the provision of financial services, financial markets and organizations”.

2. Methodology

As a research methodology, we used the generalized results of a quantitative and qualitative analysis of the main directions of the DB activity (implementation of the project cycle: development of a cooperation strategy between the DB and the country, identification, approval and implementation of the project, its completion and evaluation; raising funds by issuing and selling bonds), principles of digitalization of the economy of both developed and developing countries (including Russia), generalized experience in the development and use of digitalization indices (allow to take into account the current level of digitalization of the economy of a particular country and, as a result, compare different countries among themselves for this indicator). The principles of FinTech-transformation of financial organizations, using the complex processes of storage, processing, and transmission of information, were also used.

3. Results

The essence of the activities of the DB is related to the implementation of the so-called project cycle.

In this regard, to better understand the specifics of digitalization of the DB, a project cycle should be considered in more detail. Under the project cycle of the DB, we understand the set of stages from the development of a plan of cooperation between the DB and a specific country (region) to the completion and evaluation of the project (Official website of the Asian Development Bank).

As a rule, the following stages of the project cycle are used:

1. Development of a strategy for cooperation with a region (country) (SS). SS corresponds to the development plan of the regions (countries).
2. Project identification (preparation). DB often provides grants (technical support) for projects/programs to help stakeholders identify and prepare feasible projects. Identification is carried out to identify those people who may be affected positively or negatively by the project. DB typically employs consultants to conduct a feasibility study for the project.
3. Approval. Negotiations on a loan are held, a draft loan agreement and project documentation are submitted for consideration to all parties involved, including executive authorities.
4. Implementation. The project is implemented by the executing agency in accordance with the agreed schedule and procedures. Project consultants are recruited as needed. For example, preparatory work for a construction project may include recruiting consultants, preparing tender and project documentation, equipment procurement plans, and selecting contractors for construction
5. Completion and evaluation. After completion of the project, the DB prepares a completion report to document implementation experience (reports are prepared within 12-24 months after the completion of the project).

The main operations of the DB, primarily those carried out as part of the project cycle, its stages, the essence of enterprise digitalization (UNCTAD definition) allow the authors to propose the following working definition of enterprise digitalization (including DB): production and sale of industrial (non-financial) goods and services using automation, robots, new means of obtaining data and modern technologies such as big data analytics, elements of artificial intelligence, cloud technologies, etc.

This definition does not contradict the definition of UNCTAD and allows us to conclude that the most important component of digitalization is the collection, processing, and transmission of information.

Thus, when it comes to digitalization of the DB, it is necessary to implement the engineering of business processes of the DB, to highlight those areas of its activity that can and should be subjected to digital transformation.

In the process of the business of the DB, various financial operations are regularly performed (financing of projects, payments on loans, placement of bonds to obtain cash resources, etc.), then in this situation the digitalization of the DB will be associated with the implementation of the FinTech or FinTech transformation of the DB.

The Bank of Russia refers to modern financial technologies (Bank of Russia, 2017) big data analytics, AI, machine learning, robotics, mobile technologies, blockchain (Mogayr, 2017), biometrics and cloud technologies: these technologies allow, in the opinion of the central bank, to produce and sell banking services.

According to the authors, in relation to the banking sector, the following wording can be used as a working definition of FinTech: production and sale of banking services using modern data processing technologies (listed above), telecommunications, the Internet and wearable gadgets and devices.

As well as for enterprise digitalization (DB), the implementation of FinTech implies significant changes in the processes of collecting, processing, and transmitting financial information.

The definitions of enterprise digitalization (DB) formulated by the authors and the introduction of FinTech in the banking sector make it possible to distinguish between these processes: in one case, the production and sale object is an industrial product and service, and in the case of FinTech, a financial product and service.

The most important feature of DB digitalization is that digital transformation and FinTech transformation can and should be applied not only to the DB itself, but also to the projects that it selects and finances.

For example, when it comes to infrastructure projects (for example, the construction of an asphalt road), the DB will discuss with all participants a project implementation option that takes into account existing and future digitalization options (for example, the use of light sensors and other devices in the construction of an asphalt road that allow collecting additional data to optimize the functioning of the road).

A new class of projects is emerging that are causally related to digitalization and FinTech transformation: for example, the development of online banking. Or the supply of robots and the practical use of technology such as big data analytics in existing industrial production.

In this regard, DBs will have to use a new class of consultants: specialists in digitalization and FinTech transformations, i.e. specialized specialists in the field of information systems.

It can be expected that digitalization and FinTech transformation will increase the efficiency of the DB (Matveevskii, 2018).

The previously mentioned modern financial technologies, as well as fast payments, the use of new business models, and trading platforms on the Internet will enable the DB to implement projects aimed at providing banking services to low-income customers, cooperation between traditional banks, fintech companies, and mobile operators.

The strategy for further development of the DB should include the development of financial infrastructure in the country of presence, the promotion of digitalization of enterprises, and the FinTech transformation of financial organizations.

For the successful implementation of digitalization and FinTech-transformation projects of the DB, it is advisable to be able to evaluate these processes. In this regard, international experience in evaluating digitalization may be useful.

At present, several so-called digitalization indices: for example, the International Telecommunication Union prepared the ICT Development Index (International Telecommunication Union, 2019) and the Global Cybersecurity Index (International Telecommunication Union, 2018), and the United Nations Department of Economic and Social Development introduced the Electronic Development Index government (E-Government Development Index) (United Nations-Government Survey, 2018).

The International Digital Economy and Society Index (I-DESI), prepared for the European Commission (European Commission. Digital Economy and Society Index, 2019), allows evaluating the digitalization of both individual countries and their associations. The 2018 report (European Commission. Digital Economy and Society Index, 2018) presents the DESI International Index (I-DESI), which measures the effectiveness of both individual EU countries and the EU as a whole compared to 15 other countries: Australia, Brazil, Canada, China, Iceland, Israel, Japan, Korea. (Republic of), Mexico, New Zealand, Norway, Russia, Switzerland, Turkey, and the USA. I-DESI has the same structure as the existing DESI but differs significantly from DESI in terms of the set of indicators used, so these indices cannot be considered comparable.

The digitalization index presented by McKinsey in the Digital Russia: A New Reality report (Report “Digital Russia: a new reality”, 2017) is based on the use of data characterizing the costs of information technology (IT) per user. The index is calculated using 24 indicators and allows you to evaluate the level of digitalization for end consumers (Internet penetration, use of smartphones, social networks, electronic commerce), organizations (use of digital technologies, advertising on the Internet), the state (dissemination of information and telecommunication technologies (ICT), their use), the overall security of ICT and innovation (coverage, access quality, innovation, development of ICT companies). The fundamental feature of the index is that it does not imply the calculation of a single quantitative indicator but has three final qualitative values: a low level, an average level, and a high level of digitalization.

According to the authors, this approach to measuring (evaluating) digitalization is currently more preferable (correct): the inaccuracy of the initial data is smoothed out, its dynamics during the period of “measurements” of various indicators (their number varies for various digitalization indices ranging from several tens up to hundreds).

The digitalization indices used, the methodology of their construction can be used to assess the level of digitalization and FinTech transformation in the DB.

VEB.RF, the Russian development institute, operates on the basis of the federal law On the State Development Corporation VEB.RF (VEB.RF, 2019) and, in partnership with commercial banks, finances

projects aimed at developing infrastructure, industry, the social sphere, strengthening technological potential and improving the quality of life of people.

At the end of 2018, the supervisory board of the state development corporation approved the VEB.RF business model until 2024: priority projects for the DB will be projects (including the Digital Economy project) that will solve the problems presented in the Decree of the President of the Russian Federation of May 7, 2018 No. 204 “On National Goals and Strategic Tasks of the Development of the Russian Federation for the Period until 2024”.

The activities of VEB.RF should ensure until 2024: the issuance of loans to finance priority projects in the amount of up to 3 trillion. rubbles., Co-financing of the economy in the amount of 8-9 trillion. rubbles, it is supposed to pair national payment systems and digital platforms.

4. Conclusions

1. Digitalization of the DB is associated both with the digitalization of the economic processes that arise during the functioning of the DB, and with its FinTech transformation.
2. DB digitalization involves analysis of all business processes it implements and their division into two groups: economic processes and financial processes. For these groups, it is necessary to analyse the possibility of using modern technologies for obtaining and processing data, robotics, etc.
3. The most important feature of digitalization for the DB is that new classes of projects are currently emerging related to the practical implementation of digitalization and FinTech transformation, as well as the creation of a digitalization infrastructure.
4. Digitalization of the DB and their FinTech transformation involves changing or introducing new information systems, which determines the need for the use of appropriate specialists or companies.
5. Digitalization and FinTech transformation of DBs (including VEB.RF) are lengthy and costly processes, which determines the need for their evaluation. The experience of using digitalization indices to assess the level of digitalization in individual countries can be used in this case as well. According to the authors, it is advisable to use the McKinsey methodology.

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Methodology of Developing a Business Model of Russian Banks in the Conditions of Fintech

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Abstract

The paper proposes a methodology for developing a business model of Russian banks in FinTech.

The definition of FinTech and the basic scenarios of FinTech transformation of banks prepared by the Basel Committee on Banking Supervision (BCBS) are given. The authors specified FinTech's definition of banking. It was concluded that the FinTech transformation of Russian banks will be related to the transformation of their information systems. The authors analysed BCBS scenarios and summarized the development of FinTech in Russia. There is a high level of penetration of FinTech services in Russia, the creation of ecosystems by Russian banks (for example, Sberbank PJSC), which creates favourable conditions for the FinTech transformation of Russian banks. The analysis allowed the authors to prepare a methodology for choosing the FinTech transformation scenario for Russian banks. The methodology considers which entity manages relationships with customers and ultimately provides services and assumes risk, various types of interaction between Russian commercial banks and FinTech companies and BigTech companies, bank resources, and prospects for further development.

Keywords: FinTech, BigTech, business model, information systems, ecosystem, bank

1. Introduction

Basel Committee on Banking Supervision (BCBS) (Basel Committee on Banking Supervision, 2017) considers it appropriate to use the following working definition for FinTech: «technologically permissible financial innovations that may lead to the emergence of new business models, applications, processes or products associated with a significant impact on financial markets and institutions, and the provision of financial services».

According to the Bank of Russia (Bank of Russia, 2017), the most promising financial technologies are: Big Data and data analysis, artificial intelligence, machine learning, robotics, mobile technologies, blockchain, biometrics, cloud technologies.

The issues of the general interaction of traditional banks and FinTech companies are considered, in particular, in (Stephen, G., 2016), (Benedict, Drasch, Schweizer & Urbach, 2018), (Hill, 2018), (Lee & Shin, 2018). The problems of the evolution of bank business models in FinTech are constantly being studied: in (Simon, 2019) it is noted that the digitization of the banking industry makes new models of banking business possible and necessary. (Schmidt, Drews & Schirmer, 2018) emphasizes that competition and collaboration between traditional banks and new financial institutions will radically change the future ecosystem of the financial services business. Based on the analysis of business models of 286 international financial companies and banks, the authors prepared seven types of business models for cooperation between FinTech companies and banks. In (Priya, Ganesh & Premkumar, 2019). it is concluded that in general the business model of a financial organization consists of two fundamental elements: a value proposition ("What is offered and to whom") and an operating model ("How do we generate profit by providing an offer"). Financial innovations in this context are classified as innovations related to the process of production of products and changes in risks.

Interpretations of the concept of "business model of a bank" under FinTech conditions are given in (EBA report on the impact of FinTech on credit institutions 'business models, 2018).

In this case, the authors of the work understand the bank's business model as the choice of a digital transformation scenario for a traditional Russian bank under FinTech conditions.

2. Methodology

As a research methodology, we used a quantitative and qualitative analysis of the development of FinTech in the world and in Russia. The existing experience of adapting the Russian banking system to FinTech was used. The study was based on the BCBS scenario approach to digital transformation of credit organizations in FinTech terms: options for the interaction of traditional banks with FinTech, BigTech, telecommunications and IT companies. In banking business, the authors considered FinTech as a complex of processes for storing, processing and transmitting information related to the production and sale of banking services and based on the use of the Internet, telecommunications, big data analytics, artificial intelligence and specialized wearable devices.

As part of the scenario approach, the authors consider the recommendations of BCBS, a change in the system of relationships between credit organizations and customers, features of customer relationship management and highlight the following scenarios:

- modernization of existing banks (an example is the Sberbank of the Russian Federation – a traditional bank that provides almost all services in a remote format and uses blockchain technology in its activities);
- the emergence of new banks (Tinkoff Bank is a remote servicing bank. It uses blockchain, data and business process models, artificial intelligence, etc., when providing digital products and services, its share in the banking market by assets by 01.01.2020 according to the rating agency Expert RA is -0.638%, and the value of assets exceeds 555 billion rubbles (18th place in the ranking in terms of assets among Russian banks);
- A distributed bank (within the framework of this model, the activities of banks and FinTech companies merge – an example – LLC NPO Yandex. Money).
- Excluded bank – the bank provides its services through financial intermediaries.
- The use of digital technology without the participation of the bank.

3. Results

BCBS notes (Basel Committee on Banking Supervision, 2017) that two factors are especially important in assessing the impact of new technologies on the banking industry:

- The degree of implementation of basic technology in society,
- The degree and prevalence of technological know-how among the general population.

To assess the impact of the evolution of FinTech products and services on the banking industry, BCBS identifies five basic scenarios, while emphasizing that in practice combinations of these scenarios will be used.

In preparing the scripts, BCBS considered the following main circumstances:

1. Which entity manages customer relationships or the interface,
2. Which entity ultimately provides services and assumes the risk.

BCBS provides the following description of the basic scenarios (Basel Committee on Banking Supervision, 2017):

1. Modernization and digitization of existing traditional banks (“the best bank”). Existing banks digitize and modernize themselves to maintain relationships with customers and continue to produce and sell basic banking services (technologies are used that allow banks to change their current business models) – digital transformation.
2. New bank: replacing existing banks with applicant banks. Traditional banks will not be able to survive the competition in the new conditions and will be replaced by new, technology-oriented neo-banks or banks that will be established by BigTech (Basel Committee on Banking Supervision, 2017), providing a full range of banking services based on digital banking platforms.
3. Distributed bank: distribution of financial services among FinTech firms and banks. Financial services can be provided by distributed banks or other financial service providers, such as FinTech companies or BigTech. In this case, the digital interface of the client can belong to any of the players on the market. Many new enterprises appear that provide specialized services without trying to be universal or integrated retail banks, paying attention to the provision of specific (niche) services.
4. Excluded bank: existing traditional banks become commoditized service providers, and customer relations are owned by new intermediaries. Existing banks become financial service providers and cede direct customer relationships to other financial service providers such as FinTech and BigTech. FinTech and BigTech use client platforms to provide a variety of financial

services from different groups of suppliers. An excluded bank may or may not retain the balance sheet risk of transactions depending on a contractual relationship with FinTech or BigTech.

5. Without a bank as an intermediary: banks have become irrelevant, as customers interact directly with individual financial service providers using modern technologies. Banks are being squeezed out of customers financial transactions by more flexible platforms and technologies that ensure the satisfaction of end-user demand depending on their financial needs (borrowing, making payments, raising capital, etc.).

In this scenario, customers may be able to personally choose the services and the provider, rather than choose such services through an intermediary bank.

General characteristics of the development of FinTech in Russia, the interaction of Russian banks and FinTech companies at the end of 2018 presented in (Matveevskii, Berdyshev, Prokofiev & Ryabchenko, 2019).

The real results of the FinTech transformation of credit institutions can be found in the materials of the FinTech Association (FinTech Association, 2019).

In 2019, the penetration index of FinTech services in Russia amounted to 82%, which follows from the report of the audit and consulting company EY (Global FinTech Adoption Index 2019, 2019). In two years, the penetration of FinTech services in Russia grew by 39%.

EY do in the 2019 report the following key findings (Global FinTech Adoption Index 2019, 2019):

- FinTech companies have become sophisticated, global competitors,
- Many financial organizations banks and insurance companies, have formed their own proposals in the field of FinTech, which requires clarification of the definition of FinTech itself,
- The interaction between FinTech companies, traditional financial companies, and players outside the financial industry forms FinTech ecosystems that replace traditional bilateral partnerships.

In Russia, 99.5% of consumers know that there are FinTech services for transferring money and making payments. FinTech companies offer their services that are both personalized, affordable, transparent, reliable, and cost-effective.

When discussing the methodology for choosing business models by Russian banks under FinTech conditions, it should be borne in mind that there are companies on the Russian market that offer digital transformation services for Russian banks. For example, the Diasoft company (Diasoft, 2019), in the framework of the offer of digital transformation services, believes that it is necessary to achieve complete coordination of service channels, i.e. implement omni-channel in the bank (omni-channel).

The presented material allows us to draw the following conclusions:

1. The penetration rate of FinTech in Russia is extremely high (according to EY – 82%) and is rapidly increasing.
2. FinTech companies (primarily foreign ones) have become experienced and global competitors.
3. Many financial organizations banks and insurance companies, have formed their own proposals in the field of FinTech.
4. The interaction between FinTech companies, traditional financial companies, and players outside the financial industry forms FinTech ecosystems that replace traditional bilateral partnerships.
5. The largest Russian banks invest large amounts of money in their digital transformation, and in the Russian banking system, all scenarios of digital transformation of Russian banks (in the interpretation of BCBS) are implemented in practice, banking ecosystems are created (example: Sberbank PJSC).

According to the authors, FinTech in the banking sector can be defined as the production and sale of banking services using telecommunications, the Internet, mobile gadgets and devices, and technologies such as big data, artificial intelligence, etc.

In this regard, the authors propose to use the following methodology for developing a business model (in the above interpretation) of Russian banks in the context of FinTech development:

Stage 1. It should be borne in mind that any option for developing (changing) a business model of a Russian bank in the Internet will be a transformation (creation) of an information system (IP) (RBC, 2019) bank. Accordingly, it will be necessary to formulate requirements for IP, analyse the analytical model, implement the design and implementation of IP, conduct testing and implementation of IP, ensure its maintenance. It is important to evaluate the effectiveness of the obtained IP after a certain time. The complexity of the IP development process determines the advisability of using consultants who will represent the bank.

Stage 2. Assessment of the current state and development prospects of the Russian banking system, considering the development of FinTech. This stage should be carried out by specialists (consultants), its results should determine the current level of competition in the Russian banking services market,

current trends (in particular, the growth of license withdrawals and actual banking system nationalization), its dynamics due to the threat of “entry” to this market at least Russian BigTech companies. The results of this stage should be “compared” with current and prospective resources and the capabilities of the bank under study.

Stage 3. The choice for the implementation of one or more BCBS scenarios for the digital transformation of the bank. The methodology for selecting or developing a new (in FinTech) business model by a specific Russian bank is related to the selection of one or more BCBS scenarios for practical implementation. In this regard, it is necessary, at least briefly, to assess the prospects for the use by Russian banks of the scenarios prepared by BCBS.

Scenario 1. Modernization and digitization of existing traditional banks.

The scenario description allows us to conclude that the bank will spend huge financial resources and will be forced to choose the transformation option: do everything yourself (hire employees, wait, etc.) or use the services of system integrators, FinTech companies (outsourcing). It should be borne in mind that the digital transformation of the bank is a change in the existing methods of storage, processing, and transmission of information in the process of production and sale of banking services (products). In practice, this scenario can be implemented in a “pure” form only by large Russian banks (Sberbank, Gazprom bank, Alfa Bank are already operating under this scenario). At the same time, large banks are creating their own financial ecosystems (the largest one is owned by Sberbank PJSC). The creation of ecosystems increases the competitive position of a large bank if BigTech “enters” the banking market.

This scenario, theoretically, can be implemented to unite a group of Russian regional banks.

Scenario 2. Neo-Bank.

This scenario assumes the creation of a new generation bank from scratch: large initial expenses, in addition, customers of the old bank may be reluctant to switch to servicing a new bank. This scenario is suitable for large and medium-sized Russian banks. In this case, the risks of losing some of the customers of the “old” bank remain. An association of regional Russian banks may also use this scenario.

Scenario 3. Distributed Bank.

This scenario is especially convenient for small (in terms of capital) Russian banks: in fact, this is partial or full outsourcing of digital services and the use of modern financial technologies. In this case, the bank may become a “shell” financial company. But there is a great risk of the gradual pushing of such a bank by outsourcing companies and turning the bank into an excluded bank.

Scenario 4. Excluded bank.

In the excluded bank scenario, big data, cloud computing, AI, and other technologies are fully used in various configurations by interface platforms that provide innovative use of connectivity and data processing capabilities to improve the quality of customer service. Operators of such platforms have more opportunities to directly compete with banks for ownership of relations with customers. For a Russian bank, this is a forced choice: lack of resources, transition to wide outsourcing, mistakes in building relationships with partners. If a similar Russian bank manages to defend its position, then it will occupy a certain niche and will not degrade further to the state of exclusion from business.

Scenario 5. Without a bank as an intermediary.

In this scenario, customers may be able to personally choose the services and the provider, rather than choose such services through an intermediary bank. As for Russian banks, there is no information that a bank has reached this state: often, Russian banks are simply losing their licenses.

4. Conclusions

Foreign FinTech companies have turned into experienced and global competitors, and many financial organizations have formed their own proposals in the field of FinTech. FinTech ecosystems have emerged, based on interactions between FinTech companies, traditional financial institutions, and non-financial suppliers of goods and services.

Russia is characterized by a high penetration rate of FinTech (82%) and it is growing rapidly. Large Russian banks have already invested and continue to invest large amounts of money in their digital transformation, create their own ecosystems (Sberbank PJSC). The proposed methodology for developing a business model (as interpreted by the authors) of Russian banks under the conditions of FinTech development will allow banks to use resources more efficiently and increase the stability of the banking system as a whole.

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Financial Engineering to Optimize Hedging in Banks Based on Derivatives to Better Withstand Stress Conditions the Case of Banks in Syria

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Abstract

Banks have limited options to withstand shocks in stress conditions. Therefore, financial engineering has been addressed as a particularly important hedging practice when banks cannot concentrate more risks on their books, or when the costs of selling assets are too high. This study uses derivatives to better hedge the exposure of banks to credit risk in stress conditions considering the case study of banks in Syria in optimizing hedging practices based on credit default swaps (CDS). The aim of this study is to use financial engineering to provide banks with a hedging technique to better absorb shocks in times of stress conditions. This has been discussed and illustrated with visual model diagrams. The case study of banks in Syria considered in this study is not just the story of individual banks but a window into how to hedge the exposure of banks in stress conditions. The recommendations set out in this study provide banks with an optimized hedging practice which is not part of current financial engineering at banks in Syria. Moreover, a hedging arbitrage has been developed to address whether derivatives have a hedging comparative advantage in terms of return on capital.

Keywords: Stress Conditions, Hedging, Credit Risk, Derivatives, Credit Default Swaps (CDS), Financial Engineering, Banks in Syria

1. Introduction

Banks have limited options to withstand stress conditions [15]. Financial engineering presents an opportunity to banks to hedge their exposure in these conditions. However, significant existing and new challenges remain to be addressed. The emergence of new financial products increased the exposures.

Hedging can always be improved. Exposure to credit risk in stress conditions continues to be challenging. [17]. This study sought to answer the following question:

How to optimize hedging practices in banks to better withstand stress conditions?

As derivatives are quite common instruments used by banks [3], they received more attention in recent years. The use of derivatives in financial engineering continues to increase [1]. Therefore, the focus of this study is primarily on derivatives, and particularly on credit default swaps, to optimize banks' hedging practices to withstand stress conditions.

Hedging has been much debated recently. Fabozzi *et al*., (2006) [8] found that derivatives have become so important in risk management that a bank is at greater risk if it doesn't use derivatives in hedging. Greenspan (2004) [9] concluded that derivatives have enabled the largest banks in their credit-granting role to divest themselves of much credit risk by passing it to institutions with far less leverage".

Furthermore, Scott P. Mason (1995) found that hedging is one of the basic ways to manage risk in banks. Robert Shiller (2003) [12] proposed the developing of more innovative financial instruments such as more innovative derivatives to deal with risks [11]. Kenneth J. Arrow (1996) [10] points out that derivatives are remarkably like insurance. Sagi Akron (2019) [14] stresses the growth of hedging instruments in emerging markets revives the debate regarding optimal hedging strategies. Roxana Angela Calistru (2012) [13] found that users of credit derivatives for protective purposes were outnumbered by the speculative ones.

This study focuses on optimizing hedging in stress conditions. It argues that current hedging practices can be improved. The aim of the recommendations put forward in this study is to optimize hedging practices to accommodate the severity of stress conditions.

2. Methodology

In order to optimize hedging in stress conditions, this study considers the case study of banks in Syria in optimizing hedging practices based on credit default swaps $(CDS)_s$ believing that the case study of these banks represents an overview into some empirical evidences of stress conditions under which banks need to hedge their exposures and obtain a credit protection. The story of banks in Syria offers many interesting insights into how banks can hedge their exposures to accommodate the complexity of risk, the unpredictability of adverse events, and the severity of stress conditions. Accordingly, a hedging arbitrage has been developed to address whether derivatives (credit default swaps) have a hedging comparative advantage in terms of return on capital when hedging positions. This has been discussed and illustrated with visual model diagrams.

However, questions on hedging are profound and complex. They are difficult to answer without laying out some observations and analyses. Therefore, this study is structured as follows: Second section provides empirical evidences and results of how can banks use financial engineering to optimize hedging in stress conditions based on derivatives providing a hedging proposal, and explains how the technicalities of this proposal would work in banks in Syria in stress conditions. Third section provides the conclusions.

3. Empirical EVIDENCE and Results

Banks cannot concentrate all the risks on their own books. They need to make use of derivatives to spread the risks to other participants in the market or even to other banks that have the knowledge and the resources to take on the risks [4]. Derivatives involve the sale of contingent credit protection for predefined credit events of lending transactions. The protection buyer of a credit derivative hedges specific credit risk in return for periodic premium payments to the protection seller. However, as Credit Default Swaps are by far the largest sector of the derivatives market [7], banks can use CDSs in financial engineering to reduce their exposures (buyers of protection) or to take position in the market (sellers of protections). A Credit Default Swap is a financial contract whereby the underwriter on loans (a bank) attempts to eliminate possible loss arising from the risk of default on these loans. In other words, a Credit Default Swap is a contract where the seller provides credit protection against the default risk of a reference asset in exchange for a fee. Buyers of protection use Credit Default Swaps to reduce their exposures, while sellers of protection use Credit Default Swaps to generate risk-based revenues. Credit Default Swaps allow the transfer of credit risk from parties who want to shed credit risk (such as banks) to counterparties willing to take credit risk.

Banks can use Credit Default Swap in stress conditions to hedge the exposure to the risk of default on an asset portfolio such as a portfolio of loans [5]. Accordingly, a bank that is exposed to high credit risk can use financial engineering to shift some of that risk by buying protection in a credit default swap contract. More technically, the hedging proposal of this study to hedge the exposure of banks to credit risk would function as follows:

1) The protection buyer (a bank) pays a fee to the protection seller (an investor, insurance company or another bank),
2) In exchange, the protection buyer (a bank) has the right to receive a payment conditioned upon the occurrence of a credit event by the reference entity,
3) Should a credit event occur, the protection seller (investors) must make a payment and the contract terminates, and the protection buyer (a bank) pays out the accrued premium from the last payment date to time of credit event. After that payment, there are no further payments of the swap premium by the protection buyer to the protection seller,
4) If no credit event occurs by the maturity of the swap, both sides terminate the swap agreement and no further obligations are incurred, and the protection buyer (a bank) will make a quarterly swap premium payment over the life of the swap. The tenor, or length of time of a credit default swap, is typically three to five years.

There is no doubt that the earnings from the portfolio of loans depend basically on how much debt and capital back these loans. Therefore, without the hedging proposal of this study, the earnings from the portfolio can be calculated as follows:

$$E = Y - (C \times (100\% - R) \quad (1)$$

Where E is earnings, Y is the portfolio yield, C is the debt cost, and R is the capital ratio.

The earnings from the portfolio can be calculated as follows:

$$RoC = E/R \quad (2)$$

Where RoC is the return on capital.

The hedging proposal of this study implies that the buyer of protection (a bank) benefits from the decline of the risk weight. Accordingly, the capital charge declines, the debt cost increases, the new earnings decline (as the bank had to pay a credit protection premium) and the new return on capital increases. This is because:

$$\frac{\textbf{Portfolio Yield} - (\textbf{Debt Cost} \times (\textbf{100\%} - \textbf{Capital Ratio}))}{\textit{Capital Ratio before Hedging}} < \frac{\textbf{Portfolio Yield} - \textbf{Protection Premium} - (\textbf{Debt Cost} \times (\textbf{100\%} - \textbf{Capital Ratio}))}{\textit{Capital Ratio before Hedging}} \quad (3)$$

Therefore, to ensure that the hedging proposal can improve the return on capital based on Credit Default Swaps, the following arbitrage must be true:

$$C2 / C1 < 1 - \frac{P}{r-i} \quad (4)$$

where C1 is the capital before hedging, as a percentage of portfolio size, C2 is the capital after hedging with CDS, as a percentage of portfolio size, P is the protection premium on CDS as a percentage of notional hedged, r is the return on the portfolio, and i is the cost of bank's debt.

This hedging arbitrage can address whether derivatives have a hedging comparative advantage in terms of return on capital when hedging positions. However, the question of how the technicalities of this hedging proposal would work in banks in stress conditions will be discussed, examined, and illustrated in the case of banks in Syria.

The current ongoing crisis in Syria triggered a substantial market volatility and an increased exposure to higher and more risks, and there is the perennial potential for markets to become more volatile. With more than 450 branches, there are 11 private commercial banks in Syria, 3 private Islamic banks, and 6 State-owned banks. These banks have been battered by the storms of the ongoing crisis in Syria (SYP66.42bn of accumulated banking losses in 2016 and 26.36% of bank run in 2012). Though, financial engineering remains old-fashioned and out-of-date in these banks.

Banks in Syria have built up excessive position to exposure in recent years. Although assets these banks grew substantially in recent years (31.64% between 2015 and 2016), unfortunately, financial engineering is not yet a feature of banking in Syria meaning that the use of innovative instruments such as derivatives for hedging reasons is almost absent. Therefore, derivatives can be used as a sophisticated risk management practice to hedge the exposure to a concentrated lending business such as the one in banks in Syria as well as the exposure to the credit risk underlying this business.

Derivatives are most likely to be used when the costs of selling or securitizing loans are too high, they can be used in banks for hedging purposes allowing risks associated with the underlying assets to be transferred [16]. Derivatives would enable banks in Syria to break down risks into smaller elements that can be traded to align with the risk management objectives. They allow risks beyond the risk management capabilities to be transferred to counterparties willing to accept, and capable of, taking the risk.

As the average amount of bad debt in banks in Syria increased from 3% in 2010 to 41% in recent years resulting in many loans being written off [2], a bank in Syria concerned that one of its customers may not be able to repay a loan can use financial engineering to protect itself against loss by transferring the credit risk to another market participants while keeping the loan on its banking book. To clarify this, we assume a company in Syria wants to borrow from a bank. If the company has a history of bad credit, the bank can use derivatives to transfer the risk of default to other market participants. In other words, in exchange for an annual fee over the life of the loan, the third party pays the bank any remaining principal or interest on the loan in case of default. Meanwhile, the company receives the loan, the bank is covered in case of default, and the third party earns the annual fee. Everyone is happy. Figure 1 presents the hedging proposal of this study in a visual model diagram to illustrate how financial engineering works to hedge positions against the exposure of banks to credit risk via a Credit Default Swap Contract.

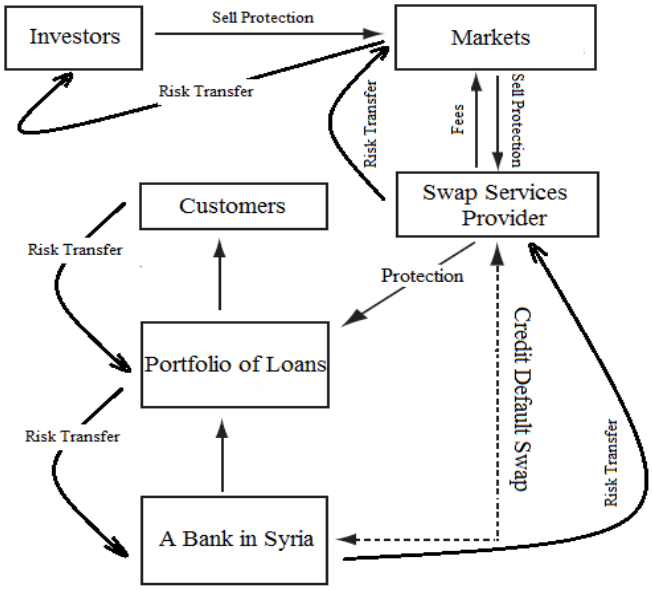

Fig. 1. A Hedging Proposal Against the Exposure of Banks to Credit Risk Via a Credit Default Swap Contract
Source: by the author

With such hedging proposal, banks in Syria can emerge from exceptionally tough market conditions with extraordinarily strong prospects for the future if risks were managed and positions were hedged as proposed to better withstand shocks arising from stress conditions. Table 1 illustrates the assets that can be hedged against the exposure to credit risk using the hedging proposal of this study in banks in Syria in 2016.

Table 1. Assets That Can Be Hedged Against the Exposure to Credit Risk in Banks in Syria in 2016 (SYP)

N	Bank	Deposits at other Banks	Loans	Total
1	ARBS	37,043,851,235	11,729,951,675	48,773,802,910
2	SHRQ	8,814,322,224	8,417,742,816	17,232,065,040
3	BBS	38,329,301,391	12,315,800,062	50,645,101,453
4	BBSF	137,227,167,197	34,628,020,853	171,855,188,050
5	BOJS	10,009,748,541	10,603,938,923	20,613,687,464
6	BSO	158,644,073,279	4,150,351,257	162,794,424,536
7	FSBS	59,436,594,626	19,423,457,814	78,860,052,440
8	IBTF	87,728,232,306	14,359,920,353	102,088,152,659
9	BASY	62,768,633,600	11,311,060,707	74,079,694,307
10	QNBS	62,159,337,008	2,777,946,421	64,937,283,429
11	SGB	30,284,118,302	9,478,974,683	39,763,092,985
Total		**692,445,379,709**	**139,197,165,564**	**831,642,545,273**

Source: by the author based on banks' financial reports of Syrian SEC Available on www.scfms.sy

Based on Table 1, the hedging proposal of this study would enable banks in Syria to hedge a position of SYP831bn, or 72.04% of total assets in banks in Syria, against the exposure to credit risk based on Credit Default Swaps. 48.17% of these assets are deposits, and 8.32% are loans.

4. Conclusion

Financial Engineering has been addressed as an especially important hedging practice to be in use by banks in stress conditions. Banks can use Credit Default Swap in these conditions to hedge positions against the exposure to the risk of default on an asset portfolio such as a portfolio of loans.

With the hedging proposal of this study, banks would be able to hedge their positions in stress conditions to the exposure to credit risk via Credit Default Swap. Moreover, a hedging arbitrage has

been developed to address the comparative advantage of derivatives in terms of return on capital when hedging positions.

The hedging proposal of this study has proven to be able to hedge 72.04% of total assets to the exposure to credit risk. These positions remain exposed to high credit risks during the current ongoing crisis in Syria due to the lack of a sophisticated hedging in banks in Syria.

Finally, shedding light on optimizing hedging to better withstand shocks in stress conditions opens new boxes of intriguing questions. How to hedge the exposure of banks to fluctuations in rates? What are the risks and disadvantages of using derivatives in hedging? We refer these to further research.

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Problems of Research of Digitalization of Crediting of the Population in Russia from the Point of View of the Theory of Non-Financial Economy

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Abstract

The purpose of the article is to identify the problems of research on the impact of digitalization of crediting of the population on the socio-economic development of Russia and suggest ways to solve them. The relevance of the study is since lending to the population is the leader of digitalization in the Russian economy, and there is practically no corresponding study in the country. The research is based on the provisions of the theory of non-financial Economy and the authors' earlier estimates of the role of digitalization in socio-economic development. The study justifies the scope of research of digitalization of retail lending, which is the impact on the socio-economic development of "financial" and alternative lending in their interdependence, the formation of a common approach to assessing the impact of digitalization on lending, including credit boom based on the interpretation of digitization as a less significant factor in the improvement of activity than its organization, and of the real sector of the economy – as the main driver of change in the field of Finance. The authors consider the temporal and spatial ways and channels of influence of digitizing of lending processes on its dynamics, and make proposals for organizing state statistical monitoring of the influence of digitizing of lending processes in credit organizations on the dynamics of lending to the population.

Keywords: digitalization of lending, non-financial lending, digitization of credit processes, digitization ex ante, digitization ex post, ways, and channels of influence

1. Introduction

Digitalization, or the transition to the use of "digital" ICT processes, is interpreted as a phenomenon that can radically change the face of society soon, with ambiguous socio-economic consequences.

Banking in Russia is one of the leaders in digitalization (retail trade is in 2nd place, communications are in 3rd place) [1], and within it is lending, which accounts for 90% of the FinTech market (2017) [2].

At the same time, the digitalization of lending to the population is proceeding at a faster pace. So, in Sberbank in 2019 artificial intelligence issued 100% of credit cards, 90% of consumer and 50% of mortgage loans, but only 35% of corporate loans [3]. This requires a priority study of the impact of digitalization of retail lending on the socio-economic development of Russia. But this research is largely absent (digitalization is not even highlighted as a factor in credit behaviour), which makes opening and determining ways to solve its problems extremely relevant.

2. Methodology

To determine the scope of the study of the impact of digitalization of retail lending on socio-economic development, as well as for the General assessment of its role in it, the provisions of the theory of non-financial economy and the results of the authors' research on the role of digitalization in socio-economic development are used.

The main provisions of the theory of non-financial Economy. All financial systems of money provision (credit, tax, insurance, pension, currency, etc.) have substitutes from the real sphere of economy. The latter, as more acceptable to customers, displace the former, often with the active support of the government [4; 5]. So, "normal" consumer credit is being replaced by "Islamic" (the sale of goods to the "borrower" by the Bank with deferred payment), a loan to buy equipment – by leasing equipment.

Finance (monetary relations in which the movement of money is not opposed to the counter movement of goods or rights to use them) arise from the imperfections of industrial and family life. The main factor of positive and negative changes in Finance and their overcoming is the real (non-financial) sphere of the economy. The negative impacts of Finance on socio-economic development are strong.

Its positive effects (both caused by state policy measures and spontaneous ones) are weak, effective only when they are in line with non-financial ways of solving the corresponding socio-economic problems, and, being isolated, can even bring harm [6; 7].

General assessment of the role of digitalization in socio-economic development. Expectations of the impact of digitalization on the kinds of activity and socio-economic development are overstated. The main factors of their progress are the improvement of the organization and the improvement and expansion of the use of basic technologies (directly satisfying the needs of people, including production needs). Digitalization has cultural barriers – some customers do not want to use "digitized" services, for example, calling a taxi through the control room [8]. Therefore, you should distinguish between digitization of processes and digitalization of them.

Information problems were clarified by studying the relevant sources, ways and channels of influence of digitization of lending processes on its dynamics – by generalizing the opinions of experts and interpreting decision-making as a multi-factor maturing and completed (after making a fundamental decision) process. Questions for the survey of credit behaviour of the population were formed based on data on the channels of influence of digitalization.

3. Results

Digitalization of lending to the population has an impact on social and economic development through lending to the population, strengthening both its weak positive effects and strong negative ones.

The scope of research is the impact on the socio-economic development not only of digitalization of "financial" lending (including non-Bank and informal, i.e., "friendly"), but also of "non-financial", forms of which are the supply of consumer goods and housing to "borrowers" by "creditors" with deferred payment (commodity credit) and their lease, and in their interdependence, including in certain segments (for example of the interdependence of mortgage lending and rental housing).

The private sector and the government should make even greater efforts to digitalize the above-mentioned forms of Islamic banking and leasing, both formal, when non-financial creditors are organizations, and informal, when they are other individuals. In the latter case, we are talking about creating and using appropriate "non-financial" crowdfunding platforms.

Particularly relevant is the study of the impact of digitalization of retail credit on the socio-economic problems associated with the boom in lending to the population, which began in the 2nd quarter of 2017 [9]. These are problems to be solved by the boom (the decline in real disposable income of population, low economic growth due to poor consumer spending, the stagnation of profitability of banking business [10]), and problems they created (growth of debt load of the population and the threat of the banking crisis and subsequent recession, growth of social tension due to increased debt burden on the poor). It is necessary to find out, for example, to what extent the digitalization of credit has contributed to the formation of an exorbitant credit burden on low-income borrowers.

The general assessment of the impact of digitalization on retail lending should consider the overestimation of the relevant expectations of the society, for example, the expectations for digitalization of consideration of credit applications and debt collection. With all the success of digitalization of these processes in Sberbank, the share of overdue debt in the Bank's loan portfolio according to the results of work for 9 months in 2019 was 2.21% [11], whereas before their digitalization, for example, according to the results of work for 9 months in 2016, it was at the level of 2.8% [12], i.e., not much higher.

Also, especially in assessing the future impact, the existence of cultural barriers to digitalization should be considered. About their presence the fact makes us to think that the share of online lending in the structure of delivery of loans of microfinance organizations (MFOs), which reached the level of about one-third, has stopped growing since the beginning of 2019 [13, p. 2; 14, p. 2; 15, p. 2]. In 2019, at a level of just over 60% the share of online lending in the structure of delivery of loans in the segment of Payday microloans has stabilized [15, p. 2]. It seems that the smaller and simpler the credit is, the lower the cultural barrier to digitalization is, and the larger and more complex it is, the higher it is. Hence, mortgage lending must-have the smallest penetration of digitalization.

A serious obstacle to studying the socio-economic consequences of digitalization of lending to the population is, first, the complexity of obtaining data on the transition to the use of certain digital technologies in credit organizations. Data transmitted to the media or published by credit organizations themselves is fragmented, and as for the digitization of "internal" processes, such as debt collection, it is incomplete and untimely. To solve this problem, it is necessary to introduce an appropriate state statistical observation with the publication of the collected data by the Bank of Russia.

Another obstacle is the lack of accurate data on the impact of digitization of credit processes in credit organizations on the dynamics of lending to their customers, as well as incomplete and fragmented data on the impact of digitization on other parameters of credit activity, such as the dynamics of overdue

debt, the number of employees. Banks and MFOs simply do not systematically study the impact of their online services on lending dynamics.

Ways of influence of digitization of credit processes on its dynamics. The 1st way is through reducing the time to get a loan [16] (search for a credit organization, filing a credit application, waiting for its consideration and registration of a loan). All things being equal, one-time digitization of lending processes will result in a short-term surge in the issuance of loans in the amount of loans whose issuance time has decreased, followed by a return of loans to the original level.

In the study of this effect of digitization on the credit boom, it is necessary to distinguish between the effect of digitization made before (*ex ante*) and after (*ex post*) the beginning of the boom. Ex ante digitization accelerates the onset and, in part, the passage of a boom, making its start less violent and its endless abrupt. Digitizing ex post increases the fast-moving part of the boom, making its completion even less abrupt. Due to the impossibility of full digitalization of credit, both types of digitization cannot ensure the accelerated passage of the entire boom, i.e., it will end as before the digitization.

The 2nd way of influence of digitization on dynamics of crediting – through increase in its volumes in connection with which the short-term surge of issue of credits considered above will be stronger, and the subsequent stabilization of issue will occur at the level of issue, higher, than before single digitization.

This effect of digitization on the credit boom will lead to an increase in the boom with the same distribution over time.

Channels of influence of digitization on the volume of lending – by increasing the number of borrowers for the account of the persons that: a) are willing to take a loan but do not have time for going to the office to apply for credit and to register it (thanks to digitization of relevant processes), b) are experiencing the “sports” interest in online lending, c) are ready to take the credit, but previously refused it by reason of the universality of its terms (by offering personalized credit products), d) transformed into attractive borrowers for credit organizations (in connection with the introduction of digital technologies, allowing to take into account more about the ability of customers to service loans, for example, to study their informal income), e) previously did not want to take a loan, but increased their self-esteem through online services (for example, assigning personal credit ratings).

The regulator could oblige credit organizations to investigate the impact of their digitization of the processes of lending to the population on its dynamics through the ways and channels discussed above, and transmit relevant information to it, which it could generalize and publish.

Deciding by the borrower to apply for a loan is a multi-factor process that ends under the influence of the last of its significant factors (favourable changes in lending conditions). Example: the desire to take a loan arose after the need for a certain thing appeared, but high interest rates did not allow to apply for it, increased when the interest became low, but the extended term of the standard loan did not suit, increased even more after receiving an individual offer from the Bank, but it was not realized due to lack of time to go to the office, and the final decision was formed after the Bank digitized the relevant processes.

When studying the effect of digitization on the volume of credit, it is important to distinguish the “replacement” effect from the “income” effect. Digitization is not a factor in the case when the online service was accessed after the final decision on lending was made, for example, the decision to purchase a credit card was formed, but the choice of a virtual card occurred after.

To study the impact of digitization on the volume of lending to the population, they can use the questions included in online loan applications: “Your decision to take a loan has matured solely as a result of: a) the opportunity to apply for a loan and/or issue it online, b) receiving a personalized offer from the Bank, c) increasing your self-esteem as a borrower after studying your status using online services (setting a scoring rating via the Internet, etc.)?”, “Is your decision to take out a loan through online services dictated solely by online curiosity or a desire to experience the corresponding sensations?”. The facts of the impact of digitization by increasing the attractiveness of borrowers for a credit organization are established by the credit organizations themselves.

Despite the presence of a number of ways and channels of influence on the lending dynamics, interpretation of digitalization as a less important factor in the improvement of activity than its organization, and the real sector – as the main driver of changes in Finance, allows us to pre-conclude that the digitalization cannot be a major factor of the boom of crediting of the population, in particular of modern Russian, which is confirmed by experts. Most of them point to a “real” factor as the reason for the boom, such as a reduction in consumption of the population due to the fall in real disposable income thanks to the events of 2014 [17]. The second factor is sometimes indicated as a decrease in interest rates on loans caused by a decrease in the key rate of the Bank of Russia, but digitalization as a factor of the boom is not indicated at all [18].

4. Conclusion

Proposals for organizing a systematic study of the impact of digitization of credit processes on lending to the population can be used to develop similar proposals for “non-financial” lending to the population.

These proposals can also be used to develop proposals for organizing a systematic study of the impact of digitization of relevant processes on financial and non-financial corporate lending, as well as on other financial processes and their substitutes from the real sphere of the economy.

The ideas and approaches to the study of digitalization contained in the article can be used to study the impact of digitalization on various elements of the country’s economy and the socio-economic development of the country under the influence of all its digitalization.

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Participative Budgeting in Smart Green City Context

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Abstract

Currently there are more than 7 billion people living on Earth and at least 1 million inhabitants globally live in cities. Modern cities start to use smart infrastructure and digitalization for sustainable development. The article is devoted to considering the smart technologies in city participative budgeting.

City budget and financial and economic policy are under trends of digitalization and citizen's participation. Such attitudes and their formation depend on many factors, both public subjective and urban objective. At the same time modern smart cities involve the technological solutions introduction that significantly changes the urban life, which forms new behavioural patterns of interaction between citizens and the urban environment. Participation, individual capacities, and coordination are key factors for improving the efficiency of the financial and economic system and efficiency of urban management.

Through these important aspects, it opens strategy perspectives in the fields of participative urban management and the implementation of digital governance. The paper investigates influence of digitalization in city budgeting and attracting citizens to city management.

Keywords: city, citizens, smart city, digitalization, participative urban budgeting

1. Introduction

In recent years researchers have shown significant interest in the sustainable and smart urban development problems, which is reflected in a formulations variety related to the modern cities development trends [1]: "smart cities", "sustainable cities", "green cities", "liveable cities", "digital cities", "intelligent cities", "knowledge cities", "resilient cities", "ecocities", "low carbon cities"… New terms appear as "Cities of Harmony".

Some authors [2] propose interpretation of "sustainable" and "smart cities" from the point of view of the smart city three main dimensions (technologies, organizations and people), paying attention to the infrastructure's integration, social learning, human capital gain and citizen involvement. This declaration indicates the improving the city's environmental friendliness goals, the living environment quality through the innovative technologies' introduction [3].

Given the connection between the smart city three main factors (technology, people, and institutions), the authors mean that the city will be smart when investments in human capital and IT-infrastructure ensure sustainable growth and improve the quality of life by focusing on people and creating a comfortable environment for life and development. The smart city concept is quite old, but in recent years it has entered a new dimension, using ICTs to build and integrate critical infrastructure and services for the city [4]. Initiatives to create a smart city have appeared recently as a model for addressing current urban problems in order to make life in cities better [5].

With the increasing population living in cities [6], modern cities are becoming the new knowledge economy, the innovation economy, and the creative economy centers [7]. The new economy drivers are people and people also are the modern cities main resource. Such a situation makes modern cities focus on people, and a city becomes "smart" when a harmoniously organized urban environment provides equal opportunities for all society members and creates favourable conditions for the human capital development [8]. It is noted [10] that the ecology problems and modern cities landscaping are relevant for many megalopolises in the world, which makes the green city values worthy for accepting as promising "smart city" goal. It should be noted that achieving the "green" city goals depend not only on the modern technological solutions application, but also heavily on the citizens. Thus, the success of municipal solid waste production reducing largely depends on the existence among the citizens the garbage separate collection practice and what is commonly called "environmentally friendly behaviour".

Therefore, this article discusses the smart behaviour practices formation among citizens in terms of environmental behaviour and respect for the environment. The presence or absence of such processes

is considered as a basis for understanding the implementing green city solutions prospects in terms of the city residents' willingness to support and use them.

2. Methodology

The study is based on the method of bibliographic analysis of materials on the study and analysis of smart cities and participating budgeting, available in the scientific literature, as well as data on educational programs from the official websites of universities.

In this approach, we adhere to the structure described in publication [5] with some changes in positioning green technologies terms. The smart city structure is a set of interacting projects that jointly ensure the achievement of their own local goals and common development city goals. The projects structure building logic is reflected in the structural-functional model. Each functional element of such a model characterizes the city function's group in relation to residents, business or government. As shown in Fig. 1, the smart city functional elements are grouped into four layers. The urban environment layer reflects the smart city projects implementation areas at the physical level. The "city development industry" layer reflects the urban economy sectors composition, which are the narrowly specialized solutions implementation areas. The most relevant for decisions in the field of urban landscaping and ecology at the industry level are areas such as greening urban infrastructure. The "city digital representation" layer provides the city data integration, urban environment and urban processes in a single logic. The need for this layer is considered in [13, 14]. The "smart city information services" layer provides an interface for the smart city solutions interaction for citizens.

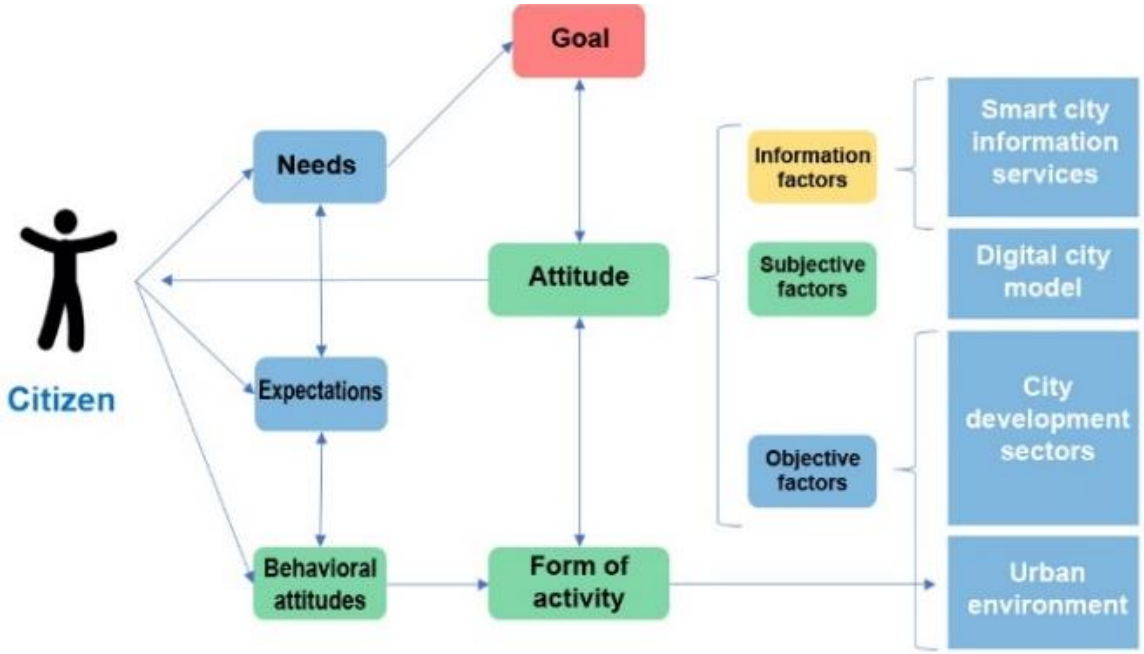

Fig. 1. Green decisions in the smart city structure

The city dweller interaction with the urban environment is determined by the purpose and interaction form and is characterized by the ability of the urban environment to meet the expectations and the city dweller needs, thereby ensuring the interaction goal achievement. This ultimately translates into positive or negative effects.

Moreover, the urban environment ability to meet the expectations and city dweller needs depend on its objective and subjective characteristics. The urban environment objective characteristics are formed at the first- and second-layers level and reflect the environment physical ability to meet the city dweller needs. Subjective characteristics are formed at the level of the third layer and reflect the ergonomic and environment design qualities and its ability to ensure the city dweller positive emotional response formation. A special place is occupied by environmental information factors that form in the virtual space and determine the city dweller a priori ideas on the urban environment, which ultimately affects his perception.

Based on this model, it is obvious to assume the ecology and gardening technologies dominant role in the city subjective perception factor's formation and significant role in the objective perception factors formation for interaction individual forms such as recreation, sports [15]. The information factors role

formed by representing the city target image in digital space in the city dweller perception, himself in the city and the environmentally oriented behavioural attitudes formation is quite large [16, 17]. Thus, the smart city decisions are not only dependent on the behavioural attitudes presence of citizens who are able to support them, but also are forming the necessary behavioural attitudes means. For this reason, green city solutions should be implemented in accordance with the smart city general concept.

3. Approach to the Smart City Projects and Solutions Selection

The smart city technologies introduction is a non-trivial task [18]. Modern cities are complex systems with adaptive behaviour to any managerial influences. As a result, any long-term plans for the cities development, including the smart city solutions implementation, require regular correction and adaptation to changing conditions. For this reason, the most sustainable approach to the smart city technology implementation is focused on a flexible iterative process for selecting and planning the smart solutions implementation. Four main stages are distinguished – determining the city development priorities, assessing, and choosing suitable solutions, planning and realization, implementation and evaluating the selected solutions effectiveness, see Fig. 2.

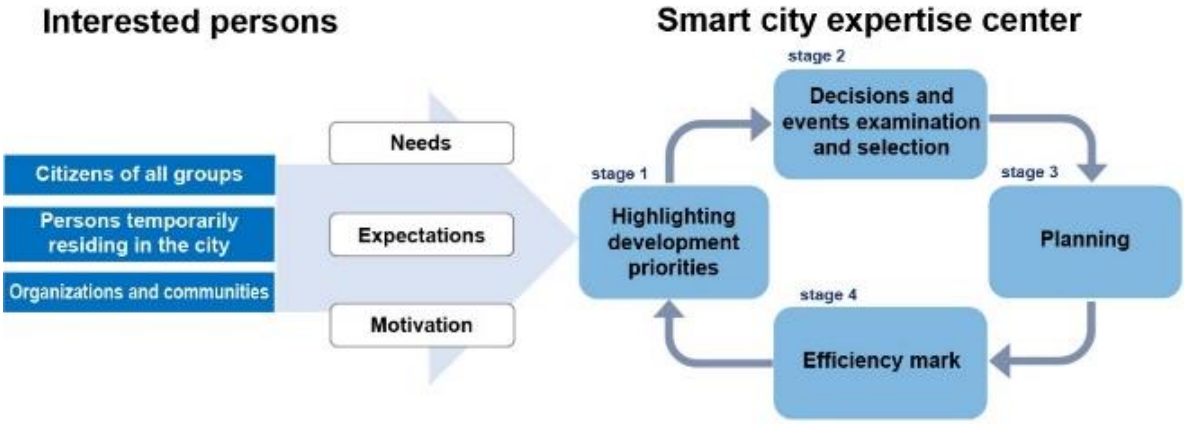

Fig. 2. Iterative procedure for implementing smart city solutions

The green decisions characteristics and the priority directions combination identified based on the digital image analysis allows us to formulate the project selection problem in the optimal planning logic, which increases the assessing the quality of life integral indicator.

3.1 Smart Green Practices in Citizens Behaviour Patterns

When considering smart cities from the population point of view, attention should be paid to the successful smart city's essential features. They are associated with the active citizens participation in the city life, which applies not only to the digital and information services use, but also generally to the people behaviour in the urban environment. From this point of view, they can distinguish behavioural patterns that correspond to the smart city paradigm. We call them "smart process" (smart practices).

The smart process is implemented by the citizens and assumes a stable behavioural attitude sets in interaction with the city, which reflects complicity in the rational and city sustainable development when the townspeople realize their everyday activities. Below we consider several behavioural patterns at manifestation different scales. We distinguish the behavioural pattern as corresponding or not corresponding to the "smart city" paradigm based on the smart cities general principles expressed in publications [19-20]. These processes can be formed as part of regular practices, social events, and when incidents occur at different levels. In this article framework, we consider the levels of the house, yard, district, and city, reflecting the city dweller involvement scale in urban processes.

4. Results

All city management units are important for citizens and they would like to participate in solution making, especially in finance and economy. Digital solutions gave city management instruments to involve inhabitants in solution making process and to validate and clarify the urban management decision. Smart city expertise centers (Fig. 2) can involve interested and active part of local society in decision making process by smart city infrastructure [21].

Smart project office is the management tool in conditions of limited resources (temporary, etc.), used to get a qualitatively new result. This tool is copied from the sphere of corporate governance and introduced in the field of public administration several years ago. This instrument can be used not only for the city but also for agglomeration because it could be more effective because of agglomeration process [22].

Participative budgeting is prospective mainly in cost part of the budget in the parts connected with projects and decision making about municipal investments (Table 1). For example, about alternative energy [23] or other green infrastructure of the city [24, 25]

City management in the development of the concept of green smart cities [26] can effectively use participative budgeting for archiving goals of sustainable development and for involvement of active citizens in city development projects.

Table 1. Project of participative city budget

№	Budget items	Participative budgeting	Classical budgeting
1	**Revenue**		**V**
2	**Costs**	**V**	**V**
2.1.	Obligatory costs		V
2.2.	Cost of developing/improving projects	V	
2.2.1.	Project 1	V	
2.2.2.	Project 2	V	
2.2.3.		V	

5. Conclusion

The research of publications in participative budgeting in smart green city context proves the enormous opportunities in city cost budget for participation of active citizens.

Nowadays city budget and financial and economic policy are under trends of digitalization and citizen's participation. Such attitudes and their formation depend on many factors, both public subjective and urban objective.

At the same time modern smart cities involve the technological solutions introduction that significantly changes the urban life, which forms new behavioural patterns of interaction between citizens, the urban environment and city (agglomeration) management.

Participation, individual capacities, and coordination are key factors for improving the efficiency of the financial and economic system and efficiency of urban management.

Through these important aspects, it opens strategy perspectives in the fields of participative urban management and the implementation of digital governance by the context of financial management and budgeting. Orientation of modern citizens to sustainable development values will give enormous impulse to the development of smart green infrastructure in the city by financial mechanism.

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Role of Financial and Valuation Indicators in Increasing Attractiveness of Investment Projects Implemented by Private Equity Funds

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Abstract

The purpose of this study is to justify the directions of further development of criteria for financial and investment attractiveness of projects. As the main objective of the study, the authors analyse an ability of private equity funds to increase the attractiveness of investment projects through the analysis of dynamics of various financial and valuation indicators. The research method is regression modelling.

The sample includes mergers and acquisitions, spin-offs, and restructuring carried out by private equity funds. As a starting point of the study, the authors suggest several hypotheses: (i) the key metric for evaluation investment attractiveness of a project is a set of financial and valuation indicators, (ii) investment attractiveness of a project is determined by increasing value of acquired companies during the implementation of an investment project, (iii) EV/EBITDA valuation multiple and operating efficiency expressed as EBITDA margin are appropriate indicators for evaluation of investment attractiveness of projects implemented by private equity funds. As a result, the authors conclude that analysis of financial and valuation indicators enables exploring new mechanisms of increasing investment attractiveness of projects and that private equity funds are able to increase attractiveness of investment projects and hence receive abnormal gain on invested capital by enhancing operating efficiency of the portfolio company.

1. Introduction

Boosting investments in all sectors of the economy is a priority for modern Russia, which must be reached in conditions of increased uncertainty, risk and competition.

Reliable evaluation of investment projects, measurement of their value and selection of criteria of their investment attractiveness has always attracted the attention of Russian economists and their foreign colleagues [1, 2].

For increasing the investment attractiveness of projects, it is necessary to improve a system of financial instruments, including financial modelling, which allows receiving more reliable results in terms of the cost of an investment project and the criteria of its attractiveness for investors of different types.

The issue of increasing an attractiveness of investment projects implemented by private equity funds is currently relevant both for Russian researchers [3, 4] and in the international scientific community [5, 6].

The purpose of this study is to justify the directions of further development of criteria for financial and investment attractiveness of projects considering actual trends.

The sample for the analysis within this study includes mergers and acquisitions, spin-offs, and restructuring carried out by private equity funds in Russia and other countries all over the world.

2. Methodology

The study of evaluating the attractiveness of investment projects is based on general scientific principles of research and methods of cognition, such as analysis, synthesis, hypothesis testing, modelling and others.

Within this study, the authors suggest analysing the ability of private equity funds to increase the attractiveness of investment projects in two directions:

- increase in the value of the acquired company measured by higher valuation multiple EV/EBITDA (enterprise value/profit before interest, taxes, depreciation, and amortization) for the period of the investment project.

- increase in the value of the acquired company by increasing its operational efficiency (expressed by EBITDA margin) for the period of the investment project.

The use of such techniques as classification and comparison made it possible to distinguish from the entire set of investment projects primary projects (the first stage of development) and secondary projects (further stage of the life cycle, up to restructuring) according to the repeatability criterion.

Analysis of the secondary investment projects allowed the authors to identify projects that are subject to further research. The initial sample of investment projects consisted of 8,824 observations (transactions) around the world. The data source was the Merger Market information database.

Observation in this study refers to a confirmed transaction completed between January 1, 2002 and December 31, 2019.

To evaluate the dynamics of indicators within the chosen methodology (multiple value and profitability indicator), transactions with the same companies were selected (purchase of a company by a private equity fund and its subsequent sale). An analysis of the availability of financial data of individual observations, such as EBITDA value, the amount of net debt, the transaction price and other, led to the conclusion of missed observations presented in the sample. The missed observations included companies and transactions in which at least one of the indicators is absent. After exclusion from the initial sample of the missed observations described above and the selection of pairs of transactions, 126 and 368 transactions remained to evaluate the first and second regression, respectively.

The authors suggested the following interrelated hypotheses:

1. The major metric for the assessment of investment attractiveness of the project is the value and value-based indicators. During the study, the dynamics in the value of secondary investment companies for the entire period of the investment project was analysed. For data comparability, a relative indicator EV/EBITDA was chosen, the increase of which demonstrates the investment attractiveness of the project.
2. The investment attractiveness of projects is determined by the positive trend in the value of acquired companies, an object of secondary investment during the implementation of the investment project, while the growth in the value of the company can be ensured by an increase in its operational efficiency.
3. The attractiveness of investment projects, including those implemented by private equity funds, is determined by analysing the financial and valuation results of the investment project in the following directions: (i) dynamics in the EV/EBITDA multiple at the time of investment and upon completion of the project, and (ii) changing operating performance indicators (EBITDA margin) before the transaction and after the completion of the project.

The suggested hypotheses were accepted using the modelling method – two regression models were justified and built.

3. Results

First, to analyse the effectiveness of investment projects in terms of changing the EV / EBITDA multiple, the authors evaluate the coefficients of the following regression:

$$\ln \frac{\mathrm{EV_i^{exit}}}{\mathrm{EV_i^{entry}}} = \alpha + \beta_F F_i * (1 + \beta_G G_i) + \vec{\beta}_{DF} \overrightarrow{DF_i} + \beta_{CB} CB_i + \beta_{Cr^{entry}} Cr_i^{entry} + \beta_{Cr^{exit}} Cr_i^{exit} + \varepsilon_i \quad (1)$$

where:

α	-	constant;
β_k	-	unknown parameter k, where $k = \{F, G, DF, CB, Cr^{entry}, Cr^{entry}\}$;
$\mathrm{EV_i^{entry}}$	-	EV/EBITDA multiple of the target company at the time of the investment;
$\mathrm{EV_i^{exit}}$	-	EV/EBITDA multiple of the target company upon the end of the investment;
F_i	-	binary variable: 1 – private equity fund participates in the transaction;
G_i	-	binary variable: 1 – the average annual growth rate of EBITDA during the period of ownership of the target company exceeded 50%;
$\overrightarrow{DF_i}$	-	vector of specific parameters of the transaction (binary variables);
CB_i	-	binary variable: 1 – the transaction was completed with the participation of the buyer and seller, the main activity of which is located in different countries;
Cr_i^{entry}	-	binary variable: 1 – the company was purchased in 2001 or 2007 (the crisis periods);
Cr_i^{exit}	-	binary variable: 1 – the company was sold in 2001 or 2007;
ε_i	-	vector of unobserved variables.

This regression model includes several parameters. The main parameter for the purposes of this study is a binary variable of the investor type participating in the transaction (private equity fund or other types of investors, mainly strategic investors). An analysis of the significance of the coefficient β in front of this parameter and its sign allows analysing the financial and valuation results of the acquisition of the target company by private equity funds in comparison with other types of investors, specifically the change in the EV/EBITDA multiple at the moment of acquisition and further divestment. Other parameters are included in the model to obtain more significant estimates of the regression and selected because of analysis of relevant statistical evidence of their significance [7, 8, 9]. Table 1 shows the key outputs of the regression (1).

Table 1. Estimates of the regression coefficients for the change in the EV/EBITDA multiple during the investment projects

Dependent variable: $\ln \frac{EV_i^{exit}}{EV_i^{entry}}$						
Regressors	**M1**	**M2**	**M3**	**M4**	**M5**	**M6**
Binary variable: 1 – private equity fund	-0.313 (0.398)	-0.303 (0.413)	-0.759* (0.054)	-0.764** (0.049)	-0.768** (0.047)	-0.901** (0.022)
Relative size of the buyer and the target	0.272** (0.012)	0.271** (0.012)	0.327*** (0.006)	0.330*** (0.005)	0.328*** (0.004)	
Binary variable: 1 – cross-border transaction	-0.088 (0.663)	-0.116 (0.563)	-0.033 (0.882)	-0.041 (0.849)		
Binary variable: 1 – purchase at the crisis	-0.131 (0.575)	-0.153 (0.511)	-0.023 (0.927)			
Binary variable: 1 – divestment at the crisis	-0.137 (0.764)	-0.124 (0.786)	-0.199 (0.686)			
CAGR EBITDA	-7.206+ (0.000)	-7.122+ (0.000)				
Binary variable: 1 – cash payment	-0.210 (0.298)					
Contstant	0.919+ (0.000)	0.856+ (0.000)	0.137 (0.484)	0.144 (0.447)	0.120 (0.391)	0.379 (0.001)
Number of observations	126	126	126	126	126	127
F-stat	1.50	1.76	3.53***	5.21+	9.12+	0.00
R–sq	0.26	0.25	0.10	0.10	0.10	0.04

+ - significance at 0.1% level; *** - 1%; ** - 5%; * - 10%.

Source: authors' calculations

The conclusions of the regression (1) regarding the influence of the funds indicate that, on average, the funds sell the companies at a smaller multiple than the purchase multiple in comparison with other types of transactions. This conclusion can be made on the basis of a negative sign of the coefficients β in front of the parameter characterizing a type of investors, i.e., when private equity funds are involved, the exit EV/EBITDA multiple is less than the entry multiple. These results are statistically significant (except for models M1 and M2). This can be explained by the fact that the sample contains funds engaged in investments in young companies that are at the stage of their initial development (venture funds).

Thus, the hypothesis of an increase in the EV/EBITDA multiple with the participation of private equity funds and, accordingly, of the influence of funds on the value of a portfolio company based on this type of financial and valuation indicator has not been confirmed.

The second direction of evaluating the dynamics in value of companies when private equity funds are involved is the analysis of dynamics in operational efficiency of the target companies, represented by EBITDA margin as described in the study [10].

If a strategic investor or other company that is not a private equity fund participates in the transaction, then it is impossible to obtain information about the target company after the transaction is closed separately form the buyer. This restriction arises since in most cases the target company is consolidated on the balance sheet of the buyer company. Then, to analyse changes in operational efficiency, it is

necessary to compare the operating performance indicators of companies, as if they were combined before the transaction, following the methodology described in the studies [11, 12].

To analyse the effectiveness of investment projects in terms of changes in operational efficiency, the following regression coefficients should be evaluated:

$$OP_i^{after} = \alpha + \beta OP_i^{before} + \beta_F F_i + \vec{\beta}_{DF}\overrightarrow{DF_i} + \beta_{CB} CB_i + \beta_{Cr} Cr_i + \varepsilon_i \quad (2)$$

where:

- α - constant;
- β_k - unknown parameter k, where $k = \{F, G, DF, CB, Cr\}$;
- OP_i^{before} - operating performance before the transaction;
- OP_i^{after} - operating performance after the transaction;
- F_i - binary variable: 1 – private equity fund is a party of the transaction;
- $\overrightarrow{DF_i}$ - vector of specific parameters of the transaction (binary variables);
- CB_i - binary variable: 1 – the transaction was completed with the participation of the buyer and seller from different countries;
- Cr_i - binary variable: 1 – the deal is closed in 2001 or 2007 (the crisis periods);
- ε_i - vector of unobserved variables.

Table 2. Estimates of regression coefficients for the change in operational efficiency during an investment projects

Dependant variable: OP_i^{after} – EBITDA margin						
Regressors	**M1**	**M2**	**M3**	**M5**	**M6**	**M7**
Constant	–0.054+ (0.000)	–0.047+ (0.000)	–0.049+ (0.000)	0.039*** (0.002)	–0.035*** (0.003)	0.011 (0.277)
EBITDA margin before the transaction	0.320** (0.022)	0.268** (0.041)	0.233* (0.078)	0.206 (0.126)	0.204 (0.130)	–0.001 (0.997)
Binary variable: 1 – private equity fund	0.059* (0.000)	0.058+ (0.000)	0.061+ (0.000)	0.060+ (0.000)	0.060+ (0.000)	–
Binary variable: 1 – cash payment	0.015 (0.204)	0.013 (0.272)	0.008 (0.488)	0.010 (0.313)	–	–
Binary variable: 1 – cross-border transaction	0.039*** (0.005)	0.037*** (0.007)	0.037*** (0.009)	–	–	–
Binary variable: 1 – crisis period	–0.036** (0.026)	–0.034** (0.035)	–	–	–	–
Relative size of companies	0.002 (0.259)	–	–	–	–	–
Number of observations	368	368	368	368	368	368
F-stat (p-value)	7.05+	7.99+	8.36+	10.94+	15.88+	0.00
R – sq	0.30	0.29	0.26	0.22	0.22	0.22

*+ - significance at 0.1% level; *** - 1%; ** - 5%; * - 10%.*

Source: authors' calculations

As in the first model, the main parameter for the purposes of this study is a binary variable of the investor type. Based on the significance of the coefficient β in front of this parameter, as well as its sign, the influence of the private equity fund on the value of the acquired company is estimated. Other factors are included in the model to obtain more reliable and robust regression estimates.

Estimates of the regression coefficients (2) are presented in the table 2. It should be noted that the results of the M1 regression are probably biased and presented for informative purposes.

Table 2 contains statistically significant evidence that participation of a private equity fund in transaction leads to a more significant increase in operational efficiency of the target company compared to other types of investors. This is confirmed by a positive coefficient β in front of the binary variable of the investor type, standing for a private equity fund on average increases the operational efficiency of a target company better than other types of investors. Estimates of the coefficients of a binary variable are significant. Similar conclusions are made by the authors in other research papers [13, 14, 15].

4. Conclusion

To summarize, it can be stated that the modelling of financial indicators of the target company allows identifying mechanisms to increase the attractiveness of investment projects, implemented by a private equity fund.

The results of the regression models lead to the following conclusions regarding suggested hypotheses:

- One of the key metrics for assessing the investment attractiveness of a project is the value of a business and value-based indicators, such as the valuation multiple and the indicator of operating performance.
- The attractiveness of investment projects is determined by the positive trend in the value of the target companies during the implementation of such project.
- The hypothesis of an increase in the EV/EBITDA multiple within the investment project has not been confirmed. In part, this result is explained by the fact that the sample had venture funds as investors, where the input multiple is quite high due to the growth prospects embedded in it. Another point is that the funds are aimed at increasing the value of the portfolio company as such, i.e. in monetary terms, and not in the form of a relative multiple.
- At the same time, confirmation of the hypothesis about the ability of private equity funds to increase the operational efficiency of companies on average better than other types of investors, indicates the effectiveness of private equity funds and the high attractiveness of such investment projects.

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Optimal Configuration of Digital Risk Control System for Industrial Enterprises

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Abstract

The purpose of research is finding of the methodical approach to optimal configuration of the Digital risk control system of the industrial enterprises which have to be implemented to manage both technical, natural (including economical environmental caused) and human (compliance) risks within Industry 2.0 paradigm. The methods are used: logical risk analyses (failure-tree method and barrier diagram method) and optimal decision keeping methods of operation research (linear planning). Models include variables, limitations system and target function which is formalized via maximum of risk exposure eliminated by means of implementation of barriers into the risk control system. The result of the paper is creation of the optimization model which can help managers to choose optimal scope of barriers (preventing measures) to be included into digital risk control system. The sustainability and validity of the model is determined, and recommendations given.

Keywords: risk management, optimal planning, barrier diagrams

1. Introduction

Modern industrial enterprises are located under huge exposure of operational, systematic and economical risks caused by technical [1, 2, 3, 4, 5, 6], economical [7, 8] and compliance (arising from conflict of interest [9, 10]) factors. Risks are becoming a key factor for sustainable growth [8] of companies and branches and risk management is becoming essential instrument for securing growth and development, achieving of target financial results of industrial plants and factories. Modern approach for business management is based on business processes re-engineering by means of implementation of digital process management and process control systems. Risk management process in a paradigm of “Digital Economy” and “Industry 2.0” can also by automated by implementation of digital risk control system which can work in multiple mode system depending on the nature of the risks of industrial enterprises:

- automated control of technical risks (hazard and systematic),
- supporting (advising) mechanism for decision-making in regards of natural-based (including economical nature) risks,
- automation of application for approval, receiving approval, reporting, risk assessment procedures for human-factor based risks such as compliance risks.

As of above it is clear that digital risk prevention system (which system-vise reflects the “barrier diagram” design of risk preventing measures complex) will include a set of modules addressed to solving of various aspects of risk management in regards of various risks. In the meantime as soon as some risk management/prevention measures may have alternative one to another character and also the risk priority issue exist while the budget limitation factor is also affecting the managers keeping a decision on risk management system configuration, the issue of optimal selection of the electronic (digital) risk management and prevention system configuration is arising. That means the management need to decide with risk management elements “barriers” need to be included into automated system to comply with a budget and in the same time to get the optimal value of management criteria (target).

2. Methodology

Solving of the detected problem of optimal configuration of digital automated risk management system of the industrial enterprises requires use of the following set of methods of breakdown analyses of enterprise internal and external environment and decision making.

Determination of the set of risks which the management deals with and the set of possible risk prevention/management measures/mechanisms could be included into the digital risk management environment could be done by use of methodological instruments of [11, 12, 13, 14]:

- Failure tree – method which determines the logical structure the risks and their causes with the results of negative event of risk realization and their impact by making a breakdown design graph (tree),
- Barrier diagrams – method of designing of prevention measures sets by applying of prevention measures to risks in order to prevent the negative economic impact to the company (Fig. 1).

Set of risk barriers determined by Barrier diagram could be integrated into the digital risk control system of the industrial enterprise.

Optimal selection of prevention measures and instruments (barriers) set to be included into the Digital risk control system of the industrial enterprise deals with such a factor like:

- Effect of measure – estimated in terms of negative impact prevented,
- Cost of measures,
- Budget limitation,
- Management targets and goals (usually maximization of risks prevention).

Standard methods of optimal decision choice belong to Operations research science. In particular case considered hereby Linear Planning and its' subdivision of Integer planning (as soon as number of barriers of each type included to the System must be integer or zero (either barrier is included or not)) is proposed for use. Thus, the purpose of the research is formulation of the linear integer optimization model which let to find optimal content of Digital risk control system of industrial enterprise in terms of barriers (risk prevention measures) included which is complying with budget and other management limitation and fulfilling maximization of management target criteria.

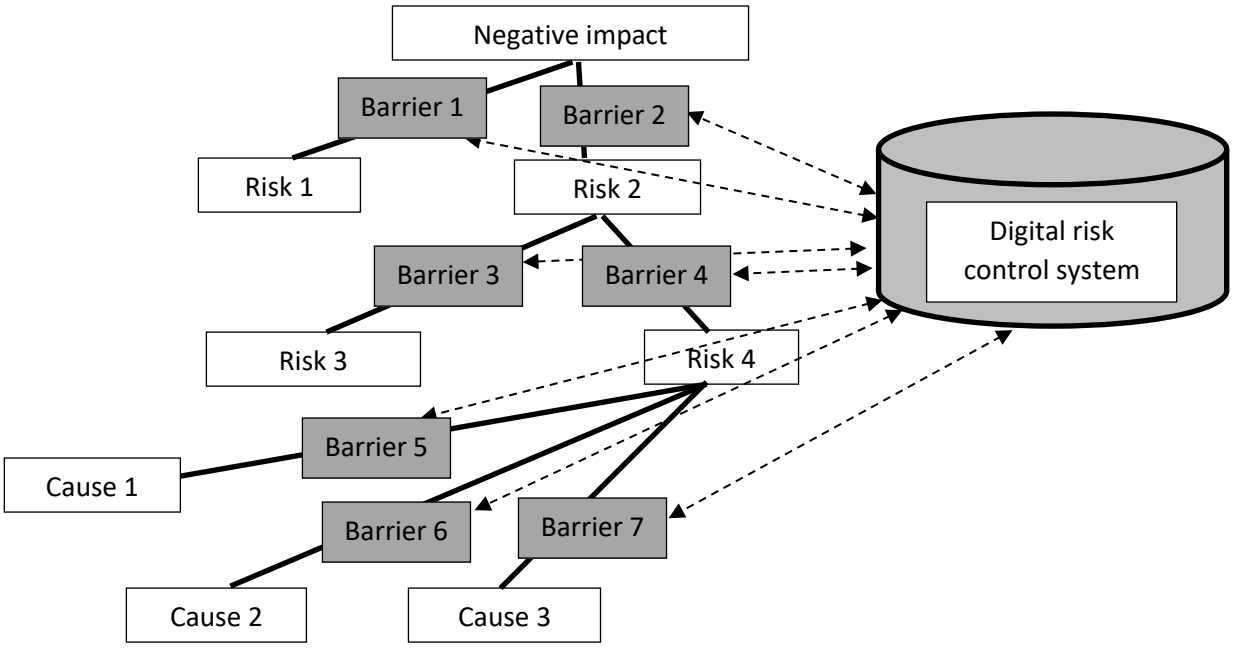

Fig. 1. Barrier Diagram of industrial enterprise and digital risk control system

3. Results

The developed digital risk control system configuration optimization model can be described the following way.

1. The variable of the model is matrix $\{X_{ij}\}$ which equals to bunch of values of inclusion or non-inclusion of prevention measures (barriers) (I = [1; N]) by risks/causes (j = [1, M]) into the scope of digital risk control system (table 1).

Table 1. Variable of the optimization model

		Barriers/preventing measures (i)			
		1	**2**	**…..**	**N**
Risks/causes (j)	**1**	X_{11}	X_{21}	**…..**	X_{N1}
	2	X_{12}	X_{22}	**…..**	X_{N2}
	…..	**…..**	**…..**	**…..**	**…..**
	M	X_{1M}	X_{2M}	**…..**	X_{NM}

Values of each variable can be “0” (in case the barrier/measure is not included into model) or “1” – if barrier is included, the values are integer (integer condition should be applied).

2. Limitations to the model.

2.1. Budgetary limitation: amount of the cost for including of the barriers into the model should not exceed the budget limitation:

$$\sum_{j=1}^{M}\sum_{i=1}^{N} X_{ij}C_{ij} \leq B$$

where C_{ij} – cost association to inclusion of prevention measure/barrier (j) to risk/cause (i) into digital risk control system estimated in currency,

B – budget of the Digital control system implementation.

2.2 Limitation on alternative measures (barriers) by certain risks. Some measures (barriers) may have alternative nature (could be implemented either 1 or another). It could be modelled via limitation:

$$\sum_{i=1}^{N(j)} X_{ij} \leq 1$$

2.3 Limitation on mandatory inclusion of certain measures/barriers into the digital risk control system – it might happen in case of for instance some mandatory technical systems which may prevent risks of heavy technical accidents (hazards, etc. [15]) or other mandatory risk management elements determined by the company policy:

$$X_{ij} = 1$$

or in case of possible alternativity between certain measures/barriers by 1 risk:

$$\sum_{i=1}^{N(j)} X_{ij} = 1$$

3. Target function – is a maximum of effect (E_{ij}) which is described by the value of prevented damage/lose by implementation of each barrier estimated in financial value (currency):

$$Z = \sum_{j=1}^{M}\sum_{i=1}^{N} X_{ij}E_{ij} \rightarrow MAX$$

Effect E_{ij} by each barrier and each risk/cause is estimated via risk exposure which is eliminated.

So, we have optimization model of integer linear planning which could be solved either via analytical methods (for example Gomory-method) or via numerical methods with using of standard linear model’s calculation software (including easiest way via Solver in Excel).

Sample of the optimal model calculations is provided in table 2 while calculations settings are shown at Fig. 2.

Table 2. Sample of optimization calculation of Digital risk control system configuration

	Barriers (i)			Summ	Limitation
Risks (j)	**1**	**2**	**3**		
1	1	0	0	**1**	**1**
2	0	0	0	**0**	1
3	1	0	0	**1**	**1**
4	0	0	1	**1**	
5	0	0	0	**0**	
Cost per barrier, 1000 USD					
i/j	**1**	**2**	**3**		
3	900	800	1200		
2	1200	1400	700		
3	1000	800	1100		
4	750	1350	900		
5	750	900	850		
Cost total					
i/j	**1**	**2**	**3**	**Total**	
1	900	0	0	900	**Budget**
2	0	0	0	0	
3	1000	0	0	1000	
4	0	0	900	900	
5	0	0	0	0	
Total	1900	0	900	2800	3000
Effect per barrier, USD million					
i/j	**1**	**2**	**3**		
1	5	4	5		
2	2	2	6		
3	10	8	7		
4	6	3	8		
5	5	7	6		
Effect total					
i/j	**1**	**2**	**3**	**Total**	
1	5	0	0	5	**Target**
2	0	0	0	0	
3	10	0	0	10	
4	0	0	8	8	
5	0	0	0	0	
Total	15	0	8	23	maximum

As shown at table 2 using of proposed optimization model provides a possibility to make the optimal selection of content of the barriers set to be included into the Digital risk control system. This plan complies with the budget and from the other hand provide the maximum of the target KPI – elimination of the risk exposure.

The optimal decision will consider implementation the following risk barriers: Barrier 1 by risk 1, Barrier 1 by risk 3, Barrier 3 by risk 4. Proposed barriers by risks 2 and 5 are determined as effective less under consideration of the budget available.

Meanwhile qualitative analyses of the plan proposed may lead the management to change the budget to include barriers by risks which do not fit into the present optimal plan.

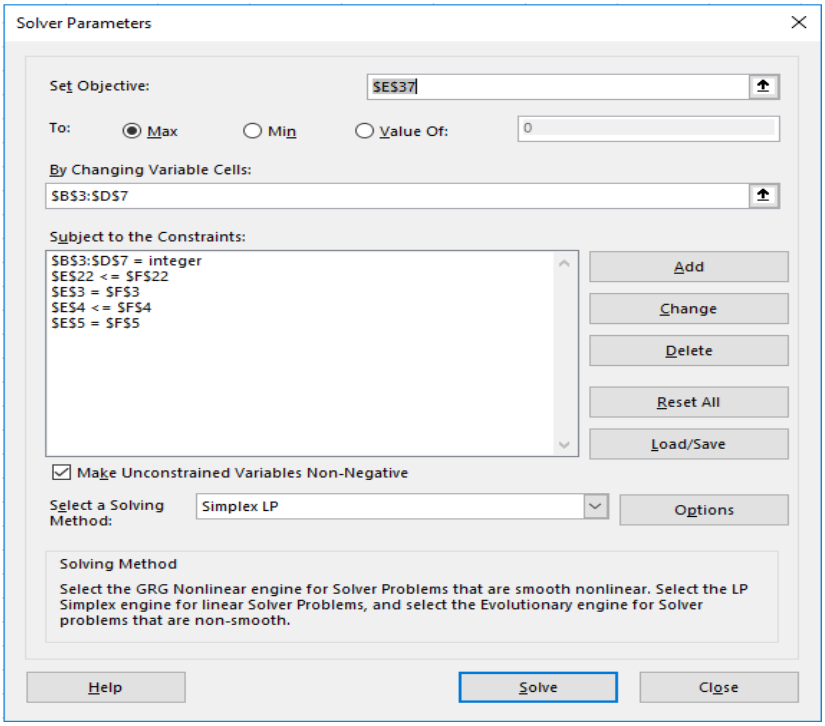

Fig. 2. Calculation settings of Solver pack corresponding to optimal plan table 2.

4. Conclusion

The results of this paper show the possibilities and potential of optimization approach to solving the problems of configuration of risk management systems within digital risk management control implementation. It might be strong analytical tool for managers based on quantitative indicators and methods.

The sustainability of the model calculations results depends much on accuracy of estimation of risk exposure eliminated by barriers. Linear planning considers use of determined indicators while risk exposure estimation tends to be more stochastic nature data. It may lead to reduce of model calculations validity.

Further approach to improvement of proposed method could be based on switching to stochastic optimization models which may consider in full the probability nature of risk exposure. Other option could be using of further sets modelling and integrating of it with linear planning approach.

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Impact of Digitalisation on the Fiscal and Regulatory Functions of the Tax System

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Abstract

Using a systematic approach, the authors highlight the main functions of the tax system as well as reveal its systemic change occurring under the influence of the most relevant laws of system change in this study. Based on a case analysis, we consider some examples demonstrating some ongoing changes related to the economy digitalisation, requiring a new justification for the manifestation of the tax system functions. We systematise some effects of the implemented functions of the tax system in conclusion, considering the interests of all participants in the new digital reality.

Keywords: tax system, tax system functions, economy digitalisation, tax system efficiency

1. Introduction

The process of digitalisation of all spheres of human activity currently constitutes an objective reality.

Digitalisation as an advantage in the economic sphere has already been used and continues to be used by some economic entities rebuilding their business models as well as forming a new type of organisations, the economic conditions of which are ahead of the established system framework and rules for the functioning of national economies. An objective need for restructuring some national tax systems, the goals and functions of which remain the same occurs under these conditions. A tax system is looking for any possibilities of using digitalisation, as an effective tool for implementing its goals and functions, under these conditions.

The priority national goal of the Russian economy is to become one of the five largest economies in the world by ensuring the growth rates above the world average ones as well as by creating some highly productive and competitive export-oriented industries. The role of the tax system in implementing these tasks is determined through some tax incentive mechanisms, the effectiveness of which may be achieved by the best combination of its functions. Some government documents reflecting the main areas of the country's budget and tax policy [17] provide a system of measures considering the digital reality as well, which will allow ensuring any set tasks within the framework of the priority goal, according to the Ministry of Finance.

The purpose of this study is to justify the need to consider the interests of all participants in economic relations operating within the framework of a single tax system, in the context of digitalisation as the objective reality of our times.

2. Methodology

To study the impact of digitalisation on the fiscal and regulatory functions of the tax system, the authors used the systems theory as well as a systematic approach. The tax system has some features characterising it as an artificial, open, changing system having the following system features: structuredness; interrelationship of system elements; integrity; the system operation is subordinate to the achievement of a specific goal; self-development [12].

The demonstration of subordination to the achievement of the stated goal is determined by the specific goal and the performance of certain functions. The purpose and functions of the tax system constitute some widely discussed categories. The essence of the tax system functions is a rather controversial issue. Some various general theories and sub theories of taxation considered different justifications for the essence of the taxes and tax system functions [11]. The classical tax theory, where taxes implement only the fiscal function, as well as the Keynesian theory, where taxes are the main lever of economic development, are the most fully consistent with the current level of the tax system development [1].

The number and maintenance of the tax system functions constitutes an urgent issue, the importance of which is growing especially in the context of the economy digitalization procedures. The taxes functions are an integral part of the tax system, which is a reflection of the financial policy in a country in its turn. A study of the economic thought development allows suggesting that most national scholars highlight the importance of the fiscal and regulatory functions of taxes [4, 5, 7, 8, 9, 14, 15, 25].

One may highlight the position of some authors classifying the functions into the main and auxiliary (primary and secondary) ones [15]. The control function will be auxiliary and the fiscal one will be main in this vein. However, the control function is equated to the tax control and tax administration as the management activities of the relevant executive authorities. In our opinion, the control function constitutes a special case of the fiscal function. The fiscal function absorbs the narrowness of control and administration by the scale of its mission in the tax system [2].

The implementation of these functions impacts the interests of all participants in tax relations. The insufficient attention paid to at least one of them entails a serious destabilising impact on the economy by the tax system.

It should be noted that these two main functions have some contradictions, and the tools for impacting the economy are accordingly multidirectional. The introduction of tax incentives related to a decrease in the budget representation, and hence to a weakening of the fiscal function, constitutes an example. An increase in the tax burden leads to a replenishment of the budget but is accompanied by "withdrawing into the shadows" or changing the tax jurisdiction, which means a weakening of the regulatory function. A solution to such contradictions may be found by applying some special tax instruments [3].

To study the impact of digitalisation, a case analysis is also used as the most relevant mean to reflect any main changes occurring in the tax system through the manifestation of its main functions: fiscal and regulatory ones.

3. Results

The tax system is a fundamental element of the impact on the socio-economic development of the national economy to the extent that it provides the state revenues as well as involves an effective mechanism including some methods and tools that allow impacting the economy on a multidirectional basis.

The development of any system occurs in accordance with some certain laws [12]. One may highlight the law of improvement and the law of systematicity extension or hierarchical structure amplification as the most important laws governing the system development for the purposes of our study.

The effect of the *System Improvement Law* is manifested in the following changes that have occurred in the tax system, aimed at improving its functioning: the tax control and tax administration forms and methods are being improved evidenced by the implementation of the tax and regulatory activities reform, which are considered in the Priority Project Charter within the framework of the economy digitalisation [18]:

- reduction of the material damage level under some controlled types of risks by .... 15% till the end of 2025 by ensuring the completeness of the tax obligations performance in accordance with the actual characteristics of the taxation items.
- reduction of the administrative burden on any controlled entities while performing the state control (supervision): decrease in the number of any requirements for the submission of explanations (documents) provided to taxpayers by .... 15% till the end of 2025.

The introduction of digital technologies as a tool for implementing the Improvement Law ensures an increase in the effectiveness of the tax system operation in terms of implementing the fiscal function, e.g., while organising the interaction of the tax relations participants. Thus, the Federal Tax Service of the Russian Federation announced the creation of an "adaptive platform" of the digital administration working exclusively with the digital data sources and digital identities of taxpayers, operating in real time and with the built-in tax compliance, in December 2018 [19]. The software package for the automated control of VAT has been applied since 2017. It ensures the complete automation of any desk audits as well as analyses any transactions in real time [6].

The manifestation of the *Systematicity Extension (Hierarchical Structure Amplification) Law* is implemented in the context of the development of the tax system as a subsystem of the financial system of the Russian digital economy, as well as a system operating in coordination with the tax systems of any other countries (harmonisation, unification and coordination procedures of the tax systems of any countries being parts of some international associations and groups). An example of not so much the fiscal function implementation as the tax system regulatory function manifestation may be provided here.

Since the regulatory function of the tax system is considered in the system of economic measures and manifested in a change in the list of taxes, the amount of tax rates, the establishment and/or cancellation of tax benefits, the definition of rights and obligations, responsibilities for the economic entities, the change in the general level of taxation [10], the implementation of this function switches to the indicators of the digital economy effectiveness, where the main production mean is represented by the "digital data", under some conditions of the digital economy as some special conditions of the economy management [16]. Therefore, it is necessary to highlight several problems forming some new challenges for the effectiveness of the regulatory function implementation as the manifestation of the *Systematicity Extension (Hierarchical Structure Amplification) Law*.

Firstly, there is a difficulty of establishing the taxing nexus of a specific business entity. It especially refers to such an area as the Internet commerce and Internet service provision. Besides, the versatility and replicability of some high-tech goods allows one using them in different tax jurisdictions and on a remote basis.

Secondly, there is a need for consolidating the categories of "digital goods" and "digital services" in Russian legislation. It will be possible in this case to establish some differentiated rates for VAT, incl. upon export and import.

Thirdly, some approaches to taxation of any companies related to BIG-Tech (such as Apple, Facebook, Google, etc.) are being formed in different countries. There is a situation where it is necessary to reform the taxation system in the digital economy. The OECD countries are currently awaiting a draft reform for the public discussion thereof to apply a single approach to resolving any aforementioned issues and any tax problems in the digital economy. The reform will be based on two main principles: "adaptation of the current tax regime of some transnational high-tech companies... to the changes that digitalisation has brought to the global economy" and "tax rates in different jurisdictions" [20]. However, the so-called "digital tax" has already been introduced in several countries. Thus, the digital tax has been applied in France, Austria, Hungary, Italy, and Turkey since January 2020. The UK, Belgium, Czech Republic, Slovakia, and Spain are ready for the digital tax introduction. Latvia, Norway, and Slovenia are likely to introduce this tax [22].

To evaluate any systemic changes of the tax system, a question of finding some proper methods and approaches, that would allow considering the manifestation of its functions in the context of the economy digital changes, arises.

The PwC company conducts some research and publishes results based on the data from 190 countries in cooperation with the World Bank Group. The Paying Taxes report is positioned as a rating of some countries applying any digital innovations that help facilitating the tax collection and payment.

This rating may be considered as an indicator of the effectiveness of the country's tax system, considering the application of digital solutions. The overall rating indicator includes the following sub-indices:

- Ease of filing and paying tax.
- Total Tax and Contribution Rate (TTCR) % is a composite index including different types of taxes, if any, in the tax system.
- Time to comply is a composite index that includes the time needed to prepare and pay the three main types of taxes – income tax, VAT and labor taxes (personal income tax and insurance premiums);
- Number of Payments is a composite index including a description of the sequence of payments for various types of taxes.
- Post-Filing Index is a composite index including the time for amending and modifying VAT and corporate tax returns.

It is obvious that the methodological approach to the formation of the Paying Taxes general rating considers both the fiscal function (terms of payment, preparation of reports) and the regulatory function (availability of different types of taxes, possibility of amending declarations considering any benefits) and characterises a systematic change of the country's tax system.

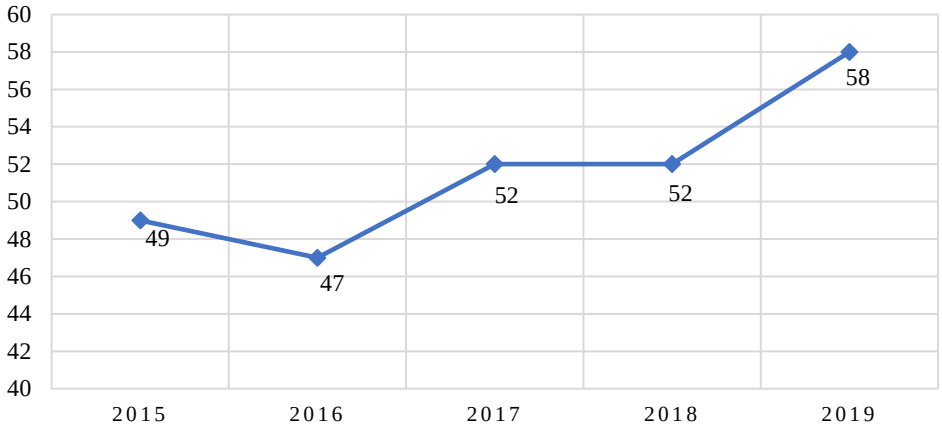

Fig. 1. Dynamics of Russia's rating on the Paying Taxes Index
Source: compiled by the authors based on some data from the www.pwc.com website [23]

Russia is on the 58th place among 190 countries in accordance with the results of the Paying Taxes report. One of the reasons for the rating downgrade was represented by transferring some functions of managing insurance premiums to the Federal Tax Service and, accordingly, an increase in the number of payments, that the rating takes into account, from seven to nine [24]. Besides, one should consider that the VAT rate in our country was also increased from 18 to 20% for the main types of goods and services.

4. Conclusion

A bias in favour of the fiscal function constitutes a serious challenge to an effective tax system in the context of digitalisation. It is necessary to optimise the organisation of financial flows in the tax system under such conditions for the purposes of balancing the interests of taxpayers and the state as participants in a single effective system.

Table 1 reflects the author's view of some resulting characteristics of any stakeholders in the tax system. It demonstrates the final effects of the implemented functions in accordance with the conditions of the economy digitalisation.

Table 1. Ratio of the Interests of the State and Taxpayers in the Implementation of the Main Functions of the Tax System

	Efficiency of the Implemented Functions	
Stakeholders	**Fiscal Function**	**Regulatory Function**
State	Financial resources sufficiency for the implementation of state tasks, the best ratio of digital tools for collection, administration, and control	Achieving the necessary level of economic growth, smoothing over socio-economic problems, harmonising socio-economic relations under the conditions of the objective digital reality
Taxpayers	Tax stability, obtaining socio-economic benefits within the framework of the established legislation	Resolving the problem of the "tax inequality", availability of benefits and preferences in general, and for the implementation and effective use of digital technologies

Source: compiled by the authors

There is also a need for reviewing and improving some methods for evaluating the effectiveness of the tax systems, considering the expanding scales of digitalisation. It is necessary to consider the effects of the implemented functions, forming some additional indicators for the inclusion into the final rating number. Any new indicators require the methodological study and testing thereof both within the framework of the national tax systems and at the level of the world rating formation.

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Basic Principles and Criteria for Evaluating the Financial Policy of a Corporation

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Abstract

The financial policy of the corporation regulates and determines the purposeful formation and use of finances to achieve the strategic goals and tactical tasks of the corporation, determined by the organization's mission and enshrined in the constituent documents of the corporation. The financial policy provides for a balance of material (outflow) and cash (inflow) flows to carry out core activities and repay liabilities; optimizing the structure and cost of capital; profit for opportunities for further development and growth, ensuring financial stability and independence, business and market activity; achieving financial openness to all stakeholders [1]. The financial policy forms a financial strategy for a perspective of 3 to 5 years and includes the following methods: analysis and assessment of the overall financial and economic condition; development of accounting, tax and credit policies; determination of the basic principles and methods of working with fixed and current assets, as well as accounts payable; formation of the structure of current costs; adoption of pricing policies and product sales management; choice of dividend, investment and innovation policies; profit distribution; assessment of the achievements of the corporation and its current market value [2, 3]. Thus, corporate finance of a corporation reflects monetary relations expressed in monetary form that arise in the process of production and financial activity.

The peculiarity and significance of corporate finance lies in the fact that they are an economic category, reflect the patterns and characteristics of the development of the corporation, are an integral part of a unified system of state finance [4]. Corporate finance is aimed at servicing production, which forms the gross domestic product of the state.

Keywords: financial policy, corporate finance, financial management, principles, financial and non-financial criteria

1. Introduction

The financial management of the corporation is since all the effective indicators depend on the material and monetary resources included in the circuit, balanced among themselves. At the same time, flows should be based on reasonable forecasted values of market demand [5]. The ability of finance to reflect the reproduction process through an interconnected system: price, revenue, profit, profitability makes it possible to predict and evaluate them [6].

The main principles of financial policy of the corporation are:

1) ***Financial independence.*** The corporation independently determines its focus on activities, implements its development strategy, and acts as a full-fledged market participant. The state regulates the activities of organizations by certain legislative restrictions.
2) ***Self-financing principle.*** The corporation strives to independently cover all its costs of production and sales, payments to the budget from its own sources. At the same time, the main sources of the corporation are retained earnings and depreciation. However, the implementation of the development process (investment and innovative projects) is not limited to own funds, which involves raising funds, but with the possibility of an independent return.
3) ***Ensuring the safety of working capital to*** conform continuity of their turnover and uninterrupted circulation. This principle is fundamental to maintaining financial stability and solvency.
4) ***Liability for performance*****.** The principle takes place inside and outside the corporation. It assumes that in case of violation of accepted contractual, payment and settlement transactions, violation of the terms for repayment of bank borrowed funds, tax legislation, the corporation is obliged to pay fines, penalties, and forfeits. To assess the likelihood of payment insolvency, the corporation should monitor its financial and economic situation. The principle of liability is applicable to employees of the corporation for the proper performance of their duties, which is stimulated by bonus payments or deductions from wages and the recovery of fines.

5) ***Creation of special cash funds and reserves*** to minimize the risk of non-payment for shipped products and, as a result, their own insolvency. Without the creation of special funds and reserves, a temporary lack of funds leads to a slowdown in the turnover rate of current assets, which affects the disruption of the production process. Financial funds and reserves are created from the net profit of the corporation.
6) ***Control over financial and economic activities*** to effectively organize and use corporate finance. In the corporation, control is carried out by the structural unit involved in financial management (directorate, management, department, accounting). Timely monitoring of the formation of cash reserves, the receipt of revenue, the use of resources, compliance with standards and planned indicators is carried out. Control over the movement and use of financial resources is also carried out by a higher structure, tax regulatory authorities, and a credit institution. Such attention to the flow of financial and economic activities helps to find and disclose reserves for reducing costs and production costs, which ensures the growth of financial results of the corporation as a whole.
7) ***Rational organization of corporate finance movement*** to ensure the sustainability of the financial situation. This principle contributes to the process of optimizing the movement of material and cash flows of interaction with counterparties. This makes it possible to maintain at a necessary and sufficient level the volume of working capital, ensuring uninterrupted production and commercial processes.
8) ***Science-based finance organization*** as a basis for the development and improvement of effective financial flow management tools based on monitoring, analysis, and adoption of determining ways to achieve the corporation's planned strategic goals [7, 8].

2. Methodology

The financial policy and management of economic and economic activities of the corporation can be assessed using certain criteria to analyse the effectiveness of the financial policy established in the corporation [9]. It is proposed to consider the criteria based on a previously developed system of balanced performance indicators of the corporation (table 1) [6, 10, 11].

Table 1. Map of the balanced scorecard: goals, indicators, target values

Projections of a balanced scorecard		Indicator	Target value
Projection	**Goal**		
Finance			
F1	Provide the optimal value for return on equity	Return on equity, %	max
F2	Ensure the achievement of planned sales	Revenue from external counterparties, rub.	max
		Revenue by product group, rub.	max
F3	Ensure optimal value for product profitability	Return on sales, %	max
		Revenue ratio, %	max
		Marginal profit on current expenses, %	max
F4	To ensure the optimal value of margins (marginal profit/cost)	Mark-up, %	max
		Mark-up for the product group, %	max
Customers			
C1	Achieve leading positions in product markets and hold them	Market share by product group, %	max
C2	Ensure the preservation of the existing customer base	Existing customers by product group, number of legal entities	max
		Clients lost during the period by product group, number of legal entities	max
C3	Ensure the influx of new customers	New customers by product group, number of legal entities	max
		Share of sales to new customers in total sales by product group, %	max
C4	Create and maintain a positive image of the company in the eyes of customers	Customer Satisfaction Index, points	max

Projections of a balanced scorecard		Indicator	Target value
Projection	**Goal**		
C5	Ensure high rates of product introduction and comprehensive offerings	The proportion of customers making complex purchases, %	max
C6	Increase the effectiveness of product promotion costs	The ratio of current expenses for the promotion of products to marginal profit, %	min
		The ratio of the costs of product promotion to revenue, %	min
Business processes			
BP1	Provide optimal values for the duration of the production and commercial cycle (CC)	Duration of PCC, days	min
		Inventory turnover, days	min
		Accounts receivable turnover, days	min
		The ratio of receivables to current assets, %	min
BP2	Increase the reliability of marketing planning and budgeting	Marketing Planning Quality Index, points	max
BP3	Improve customer service	The ratio of the value of undelivered goods to total sales, %	min
		Complaints related to the quality of service and actions of company personnel, pieces	min
BP4	Improve product management processes	The proportion of reject, %	min
		Yield of suitable products, %	min
		Losses on complaints, %	min
		Average processing time for complaints, days	min
BP5	Improve the reliability of budgeting	Exceeding the plan for current costs, %	min
		Exceeding investment plan, %	min
Infrastructure/Staff			
IS1	To increase the efficiency of the use of production and warehouse complexes. Introduce new complexes according to the schedule	The average deviation in cost estimates when entering new production and warehouse complexes, %	min
		The average deviation from the graphs, %	min
IS2	To ensure the growth of productivity and labor efficiency	Staff costs for revenue, %	min
		Revenue per number of employees, %	max
IS3	Improve management effectiveness	The effectiveness of the interaction of the leader and subordinates, %	max
IS4	Increase employee satisfaction	Employee Satisfaction Index, %	max
		Staff turnover (managers), %	min
		Staff turnover (engineering and technical p), %	min
		Staff turnover (workers), %	min
IS5	Improve prof. employee training	Percentage of employees who did not pass certification, %	min

Source: compiled by the authors

Financial and non-financial criteria for evaluating the financial policies of corporations can be represented by absolute, relative, and aggregated indicators. All criteria for the effectiveness of financial policy are criteria for the effectiveness of processes. For the most complete assessment of effectiveness in the practice of financial management, the criteria are used in mixed form as a combination of financial and non-financial. Criteria can be divided into four groups [12, 13, 14]:

1. criteria for assessing and analysing business processes as a whole: according to the development strategy (formation, achievement, limitation of growth), market potential (positioning, conquest, crowding out), production and financial potential (provision, diversification, concentration) (**К1**);
2. performance criteria for assessing changes and factors affecting them. Determined by the dynamics of the overall performance indicators of the corporation (**К2**);
3. criteria for the effectiveness of a corporation's financial policy as part of a management process based on a balanced system and highlighting key business indicators (**К3**);
4. criteria for assessing changes in financial processes: capital structure, payback periods for investment projects, development dynamics of capital investment financing, expenses for innovative research and development, revenue from the use of new technologies (**К4**).

Each group includes cost, natural, absolute, relative, and aggregated indicators. Table 2 presents the relationship of financial policy criteria and indicators of the balanced scorecard.

Table 2. The Matrix of the relationship of financial policy criteria and indicators of the balanced scorecard (BS)

Projection indicator BS	Financial policy criteria			
	К1	К2	К3	К4
F1				
F2				
F3				
F4				
C1				
C2				
C3				
C4				
C5				
C6				
BP1				
BP2				
BP3				
BP4				
BP5				
IS1				
IS2				
IS3				
IS4				
IS5				

Source: compiled by the authors

The key indicators of assessing the financial policies of the corporation are the volume of products sold and the level of their cost; corporate profit and production profitability; indicators of financial stability and solvency.

3. Results

The financial policy of the corporation is designed to ensure the sufficiency of financial resources in volumes that ensure the uninterrupted implementation of production, commercial and investment activities. Initially, the formation of financial resources is carried out at the expense of the authorized capital, in the future – at the expense of increasing own funds. The sufficiency of financial resources, and hence the financial stability of the corporation, is ensured by observing the basic principles of corporate finance organization, which are the requirements and recommendations for building a system of financial indicators, depending on the proportions, obligations, guarantees, responsibility for the results achieved.

In the developed matrix of the relationship of financial policy criteria and indicators of a balanced scorecard (table 2), causal relationships are traced between indicators and actions that must be performed to achieve the goals of financial policy. The presence of indicators allows us to evaluate the quantifiable economic results of actions expressed in numbers. It is with the help of such indicators that one can answer the question of whether the strategy implemented by the company helps to improve financial results, increase profitability.

4. Conclusion

This study identifies the basic principles and criteria for assessing the financial policy of a corporation and builds a matrix of the relationship between the criteria of financial policy and indicators of the balanced scorecard indicators. These indicators are conductors for specific purposes and at the same time reflect the potential of the corporation at the current time.

The criteria and indicators defined in this study have the following advantages [15, 16, 17]: the relationship between operational and strategic financial management; the formation of a scheme for implementing the innovative financial policy of the enterprise at hierarchical levels, taking into account four main aspects (finances, customers, business processes, infrastructure); orientation to training and innovation at all levels of the enterprise; integration with the management accounting system and linking with the analysis methods aimed at increasing the shareholder value of the company.

The proposed methodological model of the concept of evaluating the financial policy of a corporation can be used to solve the problems of financial management of industrial organizations.

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Some Features of Corporate Governance of Financial Results Under Conditions Digital Economy

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Abstract

The multidimensional nature of inflationary processes significantly exacerbates the problems of corporate management of financial results. And this is natural, because the modern management system is strictly focused on ensuring maximum profit. This approach allows you to ensure real independence, meet the interests of investors, the state, the company's staff and other subjects of economic relations. The purpose of this article is to identify some of the features of new socio-economic relations that arise in the process of corporate management of financial results, and to develop certain provisions for the development of electronic services in the digital economy.

The methodological basis of this system is based on the main provisions of modern economic theory, management theory, including institutional theory, and the works of leading foreign and Russian scientists in the field of Informatization. In the course of the work, we used systematic and interdisciplinary approaches to the problems under study. General scientific methods such as analysis and synthesis, deduction and induction, comparison, and generalization were used.

The working hypothesis assumes that investor confidence in domestic enterprises and companies can be increased by improving corporate governance of final financial results. Its improvement can be carried out by using the modified methodological approach proposed by us, which includes the proposed adjustments to the amount of different balance sheet items by conducting appropriate operations on a separate account that reflects the inflationary impact on the financial result.

Keywords: economic theory, analysis, deduction, comparison, enterprises, institutional theory

1. Introduction

The rapid pace of development of information and communication technologies, the Internet, etc. is one of the key factors of globalization and determines the vector of progress to a new type of economy and civil society. This type of development is called digital (information) economy.

Most of the conceptual approaches to the problems of ensuring effective corporate governance are based on the model of sustainable economic development of companies [3, 12, 17].

One of the effective methods of improving the corporate governance system is the use of a highly effective system called “Compensation policy” in companies. Its competent application allows preventing the possibility of a conflict of interest between shareholders and the company’s management during corporate governance [4, 11, 19].

The unpredictability of inflationary processes makes it exceedingly difficult to develop effective management decisions on the distribution of final financial results (revenues) due to distortions in the parameters of the results of production and financial activities.

Experts note that inflationary processes are particularly acute in the agricultural sector, since due to several features of agricultural production, agricultural enterprises are extremely vulnerable financially [15].

The absence of anti-inflationary models of corporate management of final financial results is one of the main reasons for the lack of certain opportunities for self-financing of agricultural producer’s production activities [8].

In these conditions, in our opinion, it is quite urgent to develop effective measures aimed at developing the anti-crisis aspect of corporate governance. To do this, first, you need to learn how to correctly use relevant accounting and analytical data. This approach improves the quality of functions implemented by management and stabilizes the financial and economic situation of enterprises [14,18].

2. Methodology

The methodology used in the article is based on the basic principles of a systematic approach to creating a rational organization of corporate management of financial results in the digital economy.

While writing this article, we used the provisions of the classical theory, the provisions of the main concepts of the theory of standardization, and the digital economy.

The theoretical and methodological basis of the study is the scientific publications of domestic and foreign authors, the regulatory framework for the regulation of corporate relations.

The work uses methods of logical generalization, scientific abstraction, as well as methods of mathematical analysis, system-structural analysis, the theory of financial and economic analysis of the dynamics of corporate systems, methods of comparison and groupings, the method of dynamic standards, balance sheet and statistical analysis.

4. Results

Analysis of special literature on the subject under consideration indicates that any accounting information about the impact of inflationary processes on the final financial result of an economic entity is subject to mandatory registration in accounting and reporting. And this is natural, because such information about the parameters of the actual profit (loss) of the enterprise, taking into account real inflation, is very relevant for managers when developing and making informed management decisions.

Hence, we must assume that such information should be reflected not only in financial accounting, but also in management accounting [15].

The tax Code of the Russian Federation, in principle, does not provide for types of income and expenses related to inflation. During inflation, the real value of income, relative to its nominal value, decreases, and expenses-increases, resulting in an economic entity bears inflationary losses. Experts note the importance of justifying this situation for entrepreneurs before tax authorities.

In the course of management accounting, when creating a reliable information base on the assets and liabilities of an enterprise with an adjustment for inflation, it is advisable to adjust the amounts of different balance items by conducting appropriate operations on a separate account to account for this phenomenon. This account may be the “Profit (loss) from the impact of inflation” account. On this account, it is advisable to register the impact of inflationary processes on assets, liabilities, income, expenses, and profits of the enterprise in the management accounting system.

In General, to reflect the inflationary impact in the financial statements, you can use the management form “Report on financial results”, where the considered impact is reflected for reference as a component of the consolidated financial result of the studied period [1, 5, 15].

Another problem with corporate management of final financial results is the wide availability of information asymmetry.

This concept means that information is distributed unevenly among corporate governance participants, i.e., there is always a party that has more information than the other party.

This situation provokes the possibility of forming opportunistic behaviour, that is, behaviour aimed at ensuring personal gain through deceit and other similar methods.

At the same time, opportunistic behaviour can be present already at the pre-contract stage through deliberate concealment or distortion of important information, as well as at subsequent stages of the contract implementation (non-performance, extortion, etc.) [10].

It is appropriate to mention another problem causally related to the provision of public services, which is the problem of multiple marginalization, in our case – double marginalization, which means consistent profit maximization by producers of intermediate and final products. It is usually manifested in markets of imperfect competition in the form of unjustified overestimation of prices for goods (services) due to the desire of each participant in these processes to maximize their corporate profits.

Under these conditions, any state should strive to reduce transaction costs, i.e., the costs of servicing transactions in the market (costs for sales promotion, organization of information support for transactions, etc.). Minimizing the total costs of enterprises reduces the total social costs, which in turn leads to an increase in the welfare of society. It should also be noted that cost savings can constrain the development of the enterprise, since costs can be reduced, potentially contributing to the improvement of economic activity. Finally, minimizing the transaction costs of enterprises can lead to a reduction in the scope of activities and other negative consequences in the long term. Reducing transaction costs can be achieved by neutralizing the objective factors that generate transaction costs – the unpredictability of the future and the asymmetry of information.

One of the directions of this approach of the state is purposeful work to increase the availability and transparency of information, which will definitely help to mitigate the problems of information asymmetry, thereby reducing some of the transaction costs related to information search, etc. [2].

The development of the digital economy makes it necessary to introduce a system of electronic public services and, thus, change the principles of relations between state structures, society and the founders created by them. The essence of these changes is that society and enterprises get access to the information base on the relevant state structures, which has a positive impact on the problems of information asymmetry. On the other hand, state structures themselves also get access to information about principals (citizens and organizations) and the ability to manipulate information and behaviour of principals [13].

It should be noted that in recent years, the increased use of information and communication technologies (ICTs) has not only neutralized many traditional transaction costs, but also created new types of them, including the costs of protecting information, the costs of interpreting it, the costs of distorting it, etc.

Currently, the Russian Federation is developing a set of new production technologies that combine such types as:

- Information technologies (they support the product lifecycle).
- Multidimensional modelling of complex products.
- Intelligent control systems for industrial high-tech production.
- Additive technologies.
- Laser surface treatments.
- Industrial robotics.
- Sensor technologies, etc.

In General, we can say that the corporate governance system in modern conditions is able to determine the sustainability of enterprise development.

There is a whole range of factors in corporate governance of financial results that strengthen confidence in companies, including confidence in property rights, a more significant level of transparency, the overall quality of corporate governance, a commitment to business ethics, and others [6].

To assess the company's performance, a balanced scorecard is used, its authors are Robert Kaplan and David Norton [16].

The use of this system of balanced indicators allows us to judge the effectiveness of corporate governance used by the enterprise.

Monitoring the effectiveness of business activities in the corporate structure is based on the resulting indicators that correspond to the strategic and tactical goals of the Corporation, the development of measures to reduce risks, which ultimately meets the interests of owners, managers, staff, and investors [9].

The history of development of the new state was accompanied by the complexity of forms and methods of management and control, which was accompanied by increasing parameters and the need to diversify the structure of state and political entities. In today's realities, the use of modern information and communication technologies will allow us to reasonably adjust this vector of development to the opposite.

Experts note that in practice, as a rule, the Board of Directors always slightly modifies the system in question, considering the peculiarities of the company's development using a personal system of balanced indicators. And this is natural, because this approach of sharing the above systems helps to improve the entire system of corporate management of final financial results.

5. Conclusion

Informatization is a translation into an electronic form of current human activity, as well as the need for radical changes in the forms of communication. A figure is a comfort and convenience that allows a person to get access to the good in the shortest possible time.

Digitalization (Informatization) begins there and then, when its data changes the behaviour of people, their choice, affects the degree of comfort of human life. This is the alignment of social opportunities for access to the modern world, the displacement of a person from the field of solving simple problems. If there is enough data, the decision can be made automatically, without human intervention. As a result, there is a decrease in subjectivity when making management decisions, and at the same time, an increase in the speed of their adoption.

Summarizing the foreign experience of corporate governance allowed us to highlight its key role in shaping the investment attractiveness of companies for investors, and to highlight its features caused by the significant effectiveness of external corporate controlling on the part of partners.

In our research, we identified the features of corporate financial management in the digital economy, consisting in the fact that they contain declarativity and formality, a weak stock market, an undeveloped banking system, lack of transparency of accounting information, reproduction of reputation and trust.

We believe it is necessary to take these features into account when developing Russian standards for corporate governance of financial results.

The proposed modified approach will allow companies to improve the corporate governance system, increase investment attractiveness, and strengthen investor confidence based on objective information about the corporate management of financial results in the companies under consideration.

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Use of Digital Technologies by Financial Services of Russian Companies

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Abstract

The purpose of the study is to show the role of digital technologies in the work of financial departments of Russian companies and to reveal the main directions of changes in the functionality performed by company's employees. The study used the data of inquiry of executives and specialists of financial departments of companies, who were studying MBA and advanced training programs at the Financial University under the Government of the Russian Federation in the period from 2018 to 2020.

The data from relevant studies were analysed.

The article explores the possibilities of using artificial intelligence, predictive analytics of big data, robotic process automation, machine learning, modelling visualization and their impact on improving business efficiency.

The use of digital technologies provides the financial service with such information resources that, through the integration of databases, make it possible to build the planning and analysis infrastructure, supporting the management activities of the development, marketing, logistics, sales, etc., into a single infrastructure for corporate planning and business analysis. Most of the executives of large companies around the world agree that the full-scale introduction of digital technologies into the global economy will provide a real opportunity to increase labour productivity, reduce costs and develop business. Due to the digitalization of processes, most Russian companies' executives can expect the increase of operational efficiency, reduction of costs, and, strategically, corporate growth. The results of the study confirm the relevance of the problem.

Keywords: innovation, technological development, digitalization, corporate finance, financial departments, financial management

1. Introduction

For the digital economy in Russia to be created, the Russian corporate finance management system, including the activities of financial departments, needs to transform. Therefore, it becomes crucial to develop a comprehensive program for the digital transformation of the economy and society as a whole, taking into account already existing promising achievements in the field of information and communication technologies, their productive application in order to minimize costs and increase the profitability of organizations, both of the manufacturing and the service sector. [1]

The digital economy covers an increasing part of the global economy: B2C transaction value has increased 3 times (from 0.5% of global GDP in 2010 to 1.5% at present), and the Internet industry takes almost 4 percentage points in GDP in the largest economies that generate 70% of global GDP. [14]

There is no doubt that the digital economy offers new, previously unknown, opportunities for expanding trade, increasing capital productivity and intensifying competition in the market [16], and can also increase the government's potential and create significant advantages (for more details, see [11]).

The advantages of implementing digital technologies can be significant not only for the entire Russian economy but also for each individual company. For example, reducing information costs allows the company to reduce the cost of transactions (economic, social and others) significantly. Digital technologies facilitate introduction of innovations, which in turn help to minimize and/or, most of the time, eliminate transaction costs completely; the cost of existing types of activities and services is reduced, and implementation processes of Russian companies become faster or more convenient. [5] Big data volumes are constantly growing: 90% of today's data has emerged just in past two years. [18] The cost of storing big data, cloud infrastructure and computing power has dropped 100 times over the past decade.

2. Methodology

The article systematizes information and shows the possibilities of using digital technologies in Russian companies. The methods used include an inquiry of executives and specialists of financial departments of Russian companies, who were studying in 2018-2020 at the Financial University under the Government of the Russian Federation as students of the Executive MBA program and qualification program, and an analysis of the results of similar studies published in professional literature.

A hypothesis was proposed: whether digitalization really improves productivity by reducing the time spent on routine processes, ensuring continuity and stability of customer service, and supporting sustainable business growth with increasing or constant resources. This hypothesis was confirmed during this study.

3. Results

A modern Russian company must consider the challenges of the digital age. The company of the future will depend on continuous innovation because profit margins will only correlate with the volume of innovation. Sustainable growth will focus on long-term results, and modern companies will, in most cases, compete through continuous innovations, new opportunities for optimizing their own business and increasing integration of digital technologies into it.

The classical business model suggests that companies focus on supply chains, whereas modern digital technologies create a platform-oriented business model. We distinguish two types of platforms within this model. Transactional platforms provide the exchange of information, goods or services (Uber, Amazon Marketplace, Airbnb and others). The other platforms are innovative platforms, which allow third-party companies to add additional products and services to the main product or technology (Apple iPhone, Google Android and other operating systems). The main characteristics of the platform-oriented business model are presented in the monograph of the Financial University edited by M. A. Eskindarov. [8]

An increasing number of Russian companies will become virtual in the digital era. Even today new high-tech companies with a low level of physical presence, which have huge potential for lowering costs, outperform existing expensive networks due to the effective use of innovations such as digital currencies. If we evaluate the business results of leading Russian digital companies on a global scale, their successes look modest (Fig. 1). This applies both to the number of successful digital start-ups and companies in Russia and their turnover. The largest Russian public companies in the information and communications technology sector account for less than 1% of the revenue of thousands of the world's largest information technology companies. According to data obtained using the information service of the crowdfunding platform AngelList, about 60 start-ups in the USA and, on average, 1.2 start-ups in Russia are registered daily, which is approximately the same speed of emergence of new start-ups in the Middle East. [19]

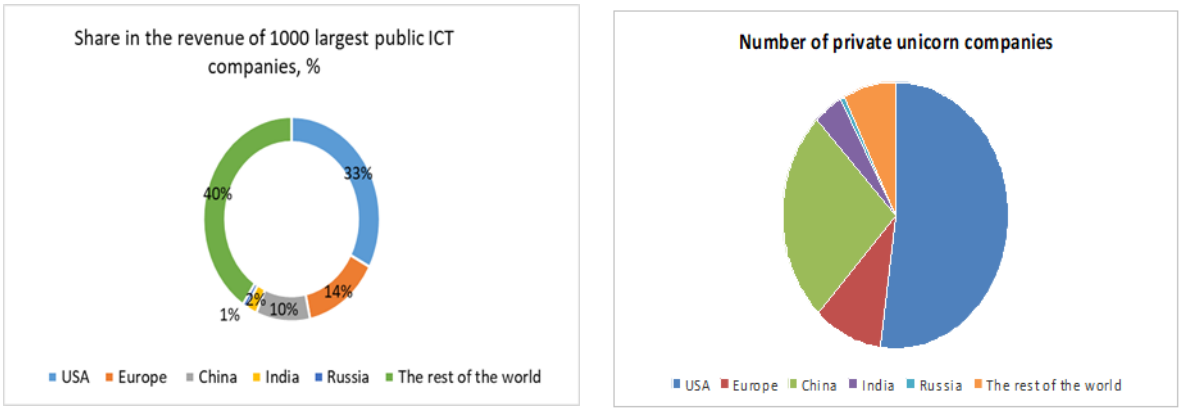

Fig. 1. Analysis of two key indicators of the development of the Russian digital industry [10]

Digital technologies are increasingly used by corporate financial services. We are talking about the use of technologies such as artificial intelligence, predictive analytics of big data, robotic process automation, machine learning and simulation visualization.

For example, *artificial intelligence* is already being actively used today in a wide range of software products and services, including in the companies' resource planning tools. For instance, IBM has

allocated USD 1 billion to commercialize Watson, its cognitive computing platform. Facebook has set up an artificial intelligence lab with the goal of developing artificial intelligence and cognitive computing.

Artificial intelligence helps make more accurate forecasts. By 2025, companies and governments around the world will be spending USD 553.4 million on artificial intelligence technology in meteorology and weather forecasting. [2] Just to compare, in 2018, investments in “meteorological AI” reached only USD 31.7 million. The money will be used to develop software, create services, and introduce “Internet of things” items that are responsible for monitoring the environment and collecting data to build accurate forecasts. According to Gartner analysts [13], in the next few years, almost all applications and services will get elements of artificial intelligence that are obvious or invisible to the user.

Predictive big data analytics includes data mining (customer behaviour, personalized services, social networks, etc.), study of historical experience, implementation of statistical modelling, planning of results based on the obtained models. The growth of the predictive analytics efficiency with the introduction of artificial intelligence is shown in Fig. 2. Experts believe that predictive analytics based on big data will become the rule, not the exception. Leading companies will differ in the availability of cognitive skills to synthesize available information.

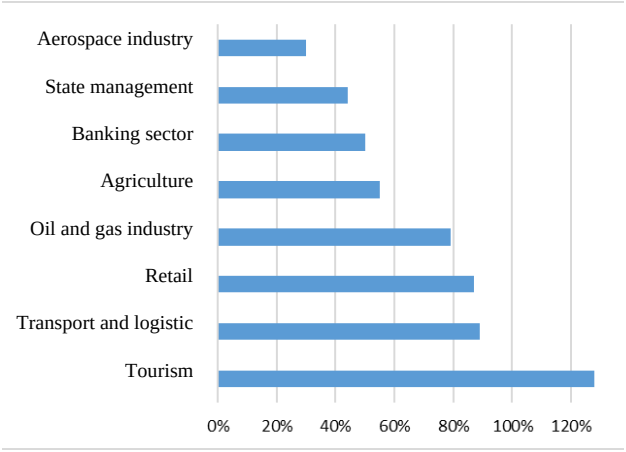

Fig. 2. Growth of the predictive analytics efficiency in industries with the introduction of artificial intelligence (forecast for 2017-2025) [9]

Robotic process automation (RPA) is being introduced to Russian companies; it is automation of actions based on certain algorithms using a software product that interacts with user interfaces and application data. The robot downloads data from websites or corporate systems, converts it to a convenient format and saves it for further processing. Financial services of Russian non-financial companies already use software robots in routine financial operations: accounting entries, conducting transaction procedures, generating electronic receipts, invoicing contractors, reconciling accounts receivable/payable and generating statistical reports. According to experts, it is advisable to purchase a robot if the company has enough routine work to keep the robot busy 24/7. [12]

Machine learning eliminates the need for a programmer to explain in detail to a computer how to solve a problem. Instead, the computer is taught to find a solution on its own. First, the algorithm receives a set of training data and then uses it to process requests. On the one hand, machine learning will simplify the work of many people; on the other hand, there will be those who will lose their jobs. Machine learning is used in conjunction with artificial intelligence to solve a number of problems that arise throughout the value chain:

Visualization will become an integral part of the work of financial services of Russian companies used to present the results of financial modelling, including key performance indicators (*KPIs*), on the digital dashboards. These dashboards must have a convenient format, be available on mobile devices, provide the executive and management with the KPI online; assess online the impact of unexpected events (for example, the emergence of a new market participant, the occurrence of supply disruption, the collapse of the stock market), and thus promptly provide the company’s executives with the results of the online analysis; dashboards work like a strategic command centre, predicting the company’s future, let’s say, for the next 3-5 years; assess the gap between the current and future state of the business (management needs to review the current state of the business and think about what needs to be done to achieve the desired future state). [4]

Most often, Russian companies set up digital dashboards to monitor accounts receivable in real time, meet budget goals for income and expenses, monitor bank account balances and so on. [12] One example of a cloud service digital dashboard is Oracle Planning & Budgeting. [17]

Using digital dashboards, financial services of Russian companies will be able to move not only to a new high-quality level of budget performance monitoring but also to deviation control. Based on the information received from control and measurement devices, we can track the quality and quantity of the company's products along the entire value chain: from the receipt of raw materials at the input of the production process to the sale of products to end users, which allows you to identify points of loss, changes in the quality characteristics of products in real time, identify problem areas and select/develop and implement corrective measures in due time. In the near future, according to experts, it is expected to switch from the ERP system (Enterprise Resource Planning) and its fragments (CRM, WMS, MES, etc.) to the direct intelligent management of the company, the IEM system (Intelligent Enterprise Managing).

As digitalization continues to evolve, an increasing number of Russian non-financial companies will be involved in fintech, which most scientific authors identify as "a complex system that combines the sectors of new technologies and financial services, start-ups and related infrastructure". [7] According to published data from the Bank of Russia, by 2020, about 82% of financial institutions will enter into partnership with fintech companies, and up to 50% of bank customers will be mobile bank users. Today, according to published data from Ernst & Young, the number of active fintech users is growing rapidly.

Thus, by the end of 2017, more than 33% of active users of innovative solutions use financial technologies, while in 2015 this figure was just 14%. [3] According to forecast data, it is expected that almost 97% of all payment and transfer transactions in Russia will be made using innovative services by 2035. The funding indicator is planned at the level of 37%: this is the share of all financial resources that will be allocated through innovative services. About 46% of the assets will be managed by innovative services under trust capital management.

According to a KPMG study, most Russian companies' managers expect to increase operational efficiency and reduce costs due to digitalization of processes. According to the study participants, the greatest economic effect in 2019 was due to the robotic business process automation, solutions for big data analysis and predictive analytics (Figure 3).

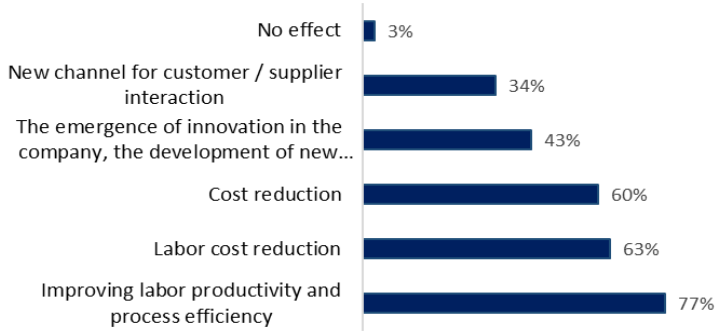

Fig. 3. Effect of using digital technologies [15]
Note: Respondents could select several answer options.

Each Russian company should think about the need to develop its own digital strategy. If they fail to do so, there will be someone who will find a place for this company in someone else's digital strategy: he will offer consumers a digital interface to products, taking away most of the margin. But much earlier, especially if we are talking about a public corporation, its shareholders/owners will get dissatisfied. [6]

4. Conclusion

Digitalization provides quick access to many databases and the ability to generate ad-hoc requests and reports used in business intelligence systems of Russian companies. The use of digital technologies will provide the company's financial service with such information resources that, by integrating databases, allow you to build a planning and analysis infrastructure, supporting the activities of the development, marketing, logistics, and sales management, etc., in a single infrastructure of corporate planning and business analysis.

The use of Advanced Analytics in financial processes will allow you to create financial budgets based on big data technology with reliable forecasting of the expected payment terms of customers, based on the previous payment discipline. In turn, this will increase the efficiency and business value of Russian companies.

Thus, the transition to the digital economy will open up new opportunities for financial services of Russian companies, the effective realization of which will have a direct impact on sustainable

competitive advantages and ensure the strengthening of their positions, both in national and foreign markets.

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The Financial Results of the Enterprise as an Object of Management

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Abstract

Currently, in conditions of economic instability, when the period of stability is replaced by a period of crises, organizations are required to increase the economic efficiency of their activities, which is possible only with high financial results.

Financial results are among the key categories of a market economy that are causally related to the achievement of the ultimate development goal of each organization individually. The problem of increasing the financial results of the organization's activities occupies one of the central places in the economic life of the organization. The essence of the problem of increasing the financial results of the enterprise is to increase the absolute value of the indicators of profit and profitability, which characterizes the economic results for each unit of invested funds in the process of using available resources.

The paper considers factors that influence the financial results of the company. A model of the financial performance management system of an enterprise, a methodology for evaluating the effectiveness of a financial performance management system are proposed and tested.

Keywords: financial results, enterprises, factors, management system

1. Introduction

The cycle of activity of any enterprise ends with the receipt of a financial result, which is the result of activities related to the provision of services and performance of work. The presence of a financial result ensures the investment attractiveness of the organization. In turn, the growth of its investment attractiveness is of high importance for increasing the financial results of the enterprise, which is a source of strengthening the state budget through tax deductions and indirectly contributes to its business activity in the manufacturing and financial sectors [1]. At the same time, the financial result obtained by the organization determines "the prospects and limitations of the existing potential for economic growth" [2]. The measure of business management is the positive dynamics of indicators characterizing its financial activities [3].

The financial result is understood as the result of the economic activity of the enterprise, which is expressed in the form of profit or loss [4].

The recognition by the market of the financial results of activities for any organization means receiving an additional incentive for further improvement of the work or services provided by the enterprise. For various market agents, the financial result will have different content. The final financial result of the organization's activities from the point of view of the state will be tax. For the owner – this will be part of the profit after taxation, for the investor – income distributed in his favour.

Improving the financial results of the organization is one of the most important sections in the strategic plan of the organization. It outlines specific ways and means of increasing profits and profitability that are set before the organization.

The problems of the formation of financial results of the enterprise, their assessment and interpretation are actively raised in the research of both Russian and foreign researchers. So, the frequency of use of the terms "financial result", "profit", profitability" in the title and keywords increases significantly, which is confirmed by the statistics of publications (Fig. 1 and 2). There is a lag between the publication and its appearance in the library or search engine. This explains a slight decrease in the number of publications in 2018-2019.

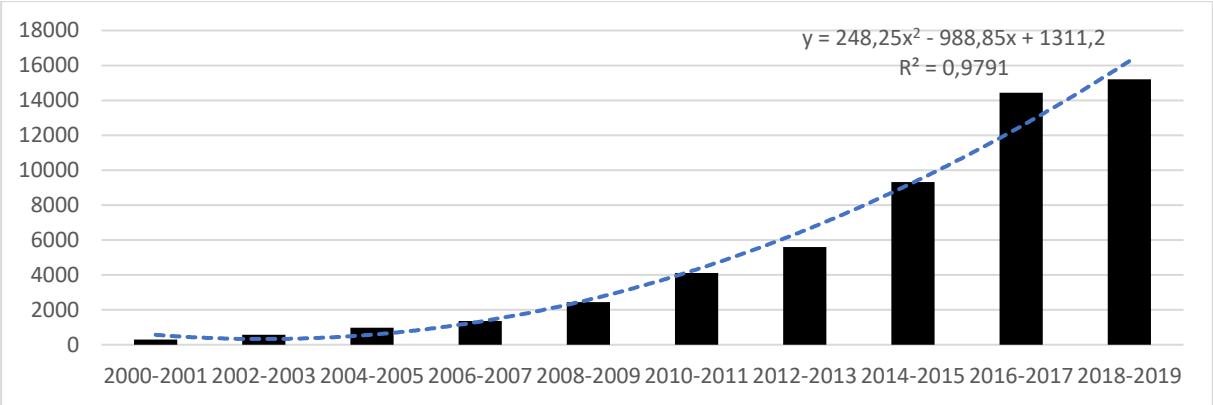

Fig. 1. Number of publications in the electronic library elibrary.ru
Source: own elaboration

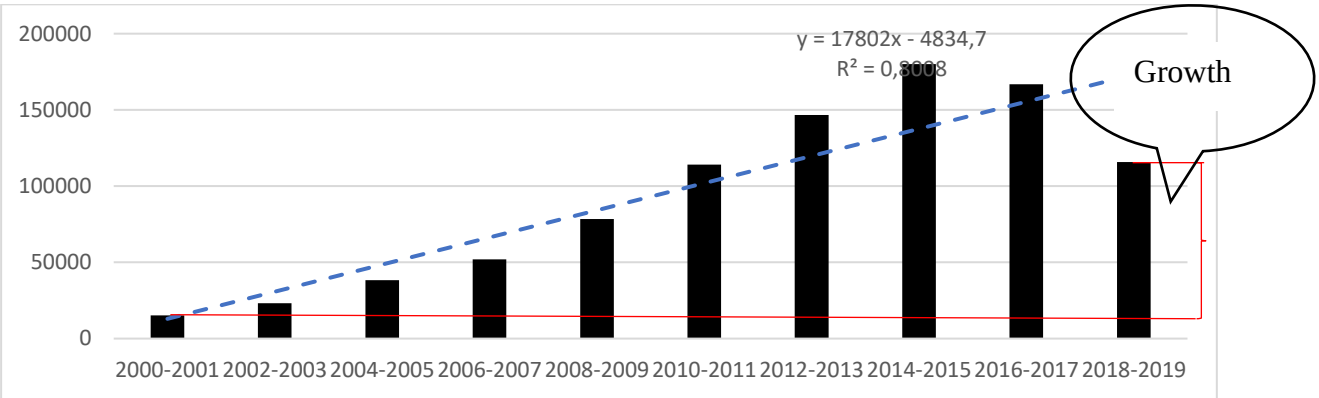

Fig. 2. The number of publications according to Google Scholar (Query in Russian)
Source: own elaboration

The above statistics confirm the interest in the study problem.

Questions of the formation of the financial result and its use were raised in their works by A. Ivanova [5], Fedorovich T.V. and Drozhzhina I.V. [6] Lukasevich I.Ya. *et al*., So I. Lukasevich & D. Sukhorukova [7] and Babin, A. & Gorbatcov, S. [8] emphasize that the financial result is subject to high volatility. The relationship of financial results with sustainability activities has been proven [9]. Moreover, the disclosure of information on sustainable development has a positive effect on the dynamics of the financial results of these companies [10]. Also, the decrease in the level of accumulated stress among employees affects the growth of financial results of companies [11]. Intellectual capital of companies is considered as a significant factor in obtaining high financial results [12]. The need for financial planning to maximize the financial performance of organizations and maintain liquidity is emphasized in the study of Bąk P [13].

Do not forget about monitoring the financial result. It allows you to identify the reserves of its increase [14].

Negative dynamics of financial indicators, insufficient profit, low profitability indicators indicate the inefficiency of the organization, increased risks, adverse environmental conditions. This situation may become a prerequisite for the deterioration of the financial condition of the organization and bring it to bankruptcy. Thus, there is a need to identify factors affecting the financial performance of the company.

These factors also act as areas of search for reserves to improve the financial results of the organization.

2. Methodology

There are different classifications of factors affecting the size of the financial result. The formation of financial results occurs under the influence of external and internal factors. Factors can be dependent and independent of the organization's efforts. Figure 3 shows one of the possible classification systems of factors affecting the financial result of the organization. This classification allows you to systematize many factors based on the characteristics of their impact on the financial results of the organization.

External factors are conditions that the organization cannot influence or transform in any way but must constantly consider in its functioning. The negative impact of external factors on the financial result

of the organization is difficult to compensate for. The contribution to the levelling of the negative impact is made by internal factors.

Internal factors are factors that an organization can control and regulate depending on a changing situation. As a rule, a strong interconnectedness is characteristic of internal factors. Changes in some factors entail the transformation of others. Table 1 shows their essential content.

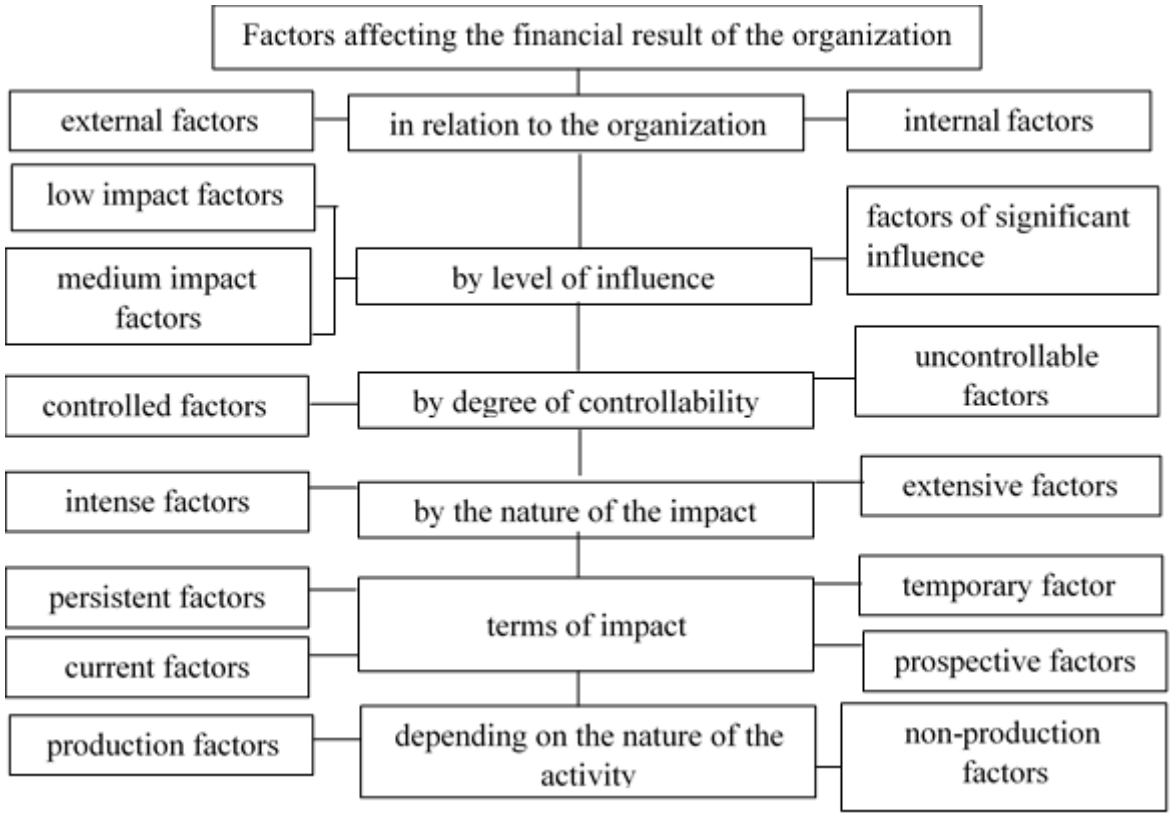

Fig. 3. Factors of influence on the financial result
Source: [15]

Table 1. The Composition of external and internal factors

External factors		**Internal factors**
General economic factors	**Industry factors**	
International sanctions	Business cycle of the industry	Quality of management
Import addiction	Industry structure	Capital structure
Fluctuations in the business cycle	Level of industry competition	Volume and quality of products sold/services rendered
Rate of inflation	Concentration and consolidation of the organization	Organizational structure
Tax policy	Industry Cost Level	Qualified staff
Stability of the national currency	Industry development prospects	Cost Level and Management
Tariff policy	Industry level of labor organization	Pricing policy
Quality of current legislation	The industry level of organization of core activities	Economic interest
Level of infrastructure development		Technical level of production activity
Socio-economic conditions		Creative initiative

Source: own elaboration

In the implementation of the financial and economic activities of the organization, all the above factors are closely interrelated and affect each other.

The financial result of the organization's activities also depends on such factors as natural, scientific, technical and innovative, etc. Their composition and influence will be presented in Fig. 4.

A modern approach to managing financial results of organizations is based [17]:

1) A system of principles, methods and techniques for the development and implementation of management decisions to improve the financial results of the organization.
2) Knowledge of the functions and mechanisms of managing financial results of organizations, the skills of their use, as well as accounting for organizational, informational and legal support in the process of managing financial results.
3) Methods of analysis, planning, control and stimulation of increasing the financial results of the organization.
4) Methodological and practical tools for managing the financial results of the organization.

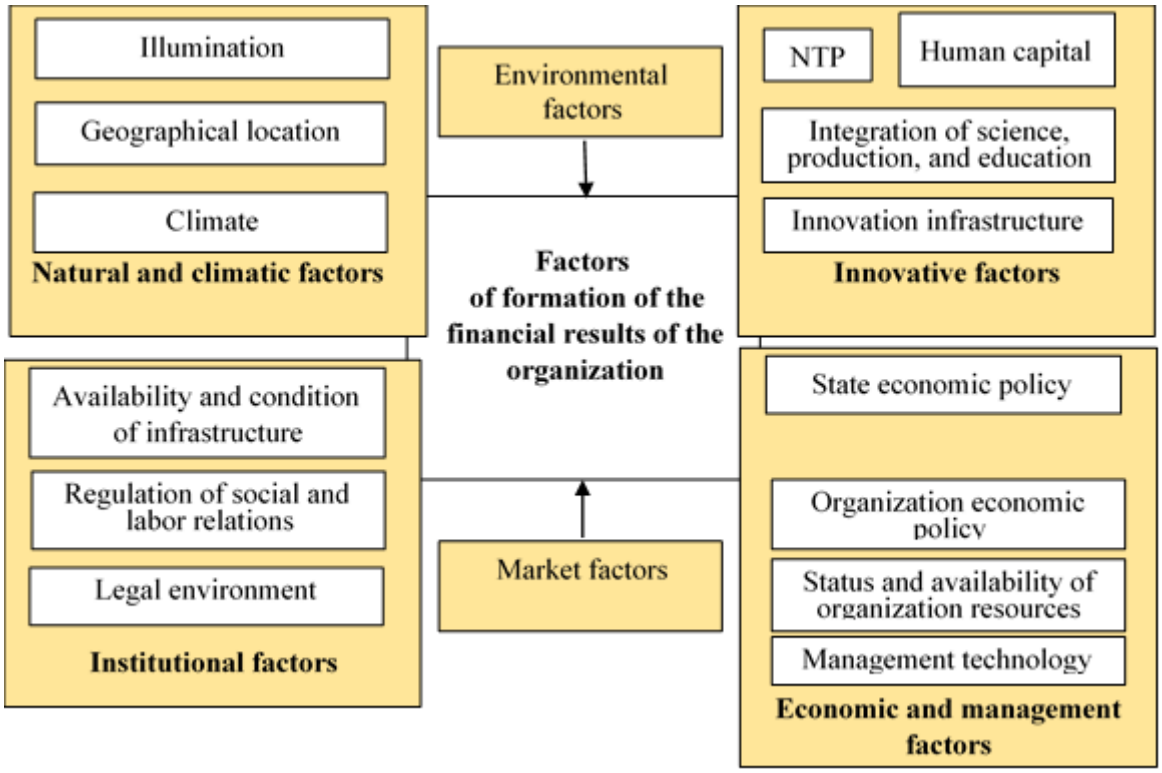

Fig. 4. Key factors in the formation of the financial result of the organization
Source: [16]

The formation and management of the financial result of the organization's activities is carried out within the framework of the information field, the basis of which is constituted by principles. The most significant principles include [18]:

- The principle of conformity, the application of which obliges, when calculating profit, to follow the requirement of conformity of expenses incurred in the reporting period with the income received. At the same time, it is mandatory to link the expenses incurred and the income received to a specific reporting period, as well as the allocation and appropriate accounting of expenses for future periods.
- Business continuity, according to it, the presence of a positive financial result is the basis for the functioning of the organization in the foreseeable future. Therefore, knowledge of the current situation by the management of the organization and other interested parties allows us to adjust actions and make managerial decisions to form and increase financial results to ensure business continuity.
- The principle of conservatism. This principle implies a greater willingness to recognize in accounting expenses and liabilities than possible income and assets. For example, if the market value of current assets at the reporting date is lower than the cost of acquisition, the resulting difference is recognized as a loss. However, if the market value of stocks exceeds their prime cost, then this is not recognized as income and accordingly is not reflected in the formation of the financial result of activities.

In addition to the principles discussed in detail, there are principles of monetary valuation, property isolation, rationality, etc.

The purpose of any commercial organization is to increase the financial results of its activities, which is impossible to implement without building and implementing a financial results management system.

Management of financial results is considered as a process of making management decisions. Like any system, a financial performance management system consists of the following elements [19]:

- Goals and objectives of management.
- Management mechanism.
- Organizational and information support.
- Methods of analysis and planning of financial results.
- A mechanism for monitoring financial results.

The financial results management system presented in Figure 5 is part of the general enterprise management system and has the properties, functions and relationships that can improve the efficiency and competitiveness of business activities.

Each of the presented in fig. 5 subsystems performs specific tasks inherent in it.

The subsystem for forecasting financial results allows you to [20]:

- To link material and financial proportions at macro and micro levels.
- Determine the sources of formation and volume of financial resources of the organization for the forecast period.
- Substantiate the direction of use of financial resources by organizations for the forecast period based on an analysis of the trends and dynamics of financial indicators, considering the internal and external factors affecting them.
- Identify and evaluate the financial implications of decisions taken by management bodies.

The subsystem for planning financial results is aimed at solving the following tasks [21]:

- Substantiation of the necessary volume of sales of products and services to ensure the achievement of goals.
- The achievement of such gross income (gross profit), which provides expanded reproduction.
- Optimization of costs for the production and sale of goods and services.
- Calculation and optimization of profit by its types and components.
- Determination of the most rational distribution and use of profit: the formation of funds: reserve, accumulation, social development, as well as the payment of dividends.
- Optimization of tax payments.

The subsystem for analysis of financial results include [22]:

- analysis and assessment of the level and dynamics of profit indicators.
- factor analysis of profit from the sale of products (works, services).
- analysis of financial results from other sales, non-operating, and financial activities.
- analysis and assessment of the use of net profit.
- analysis of the relationship of costs, production (sales) and profits.
- analysis of the relationship of profit, working capital movement and cash flow.
- analysis and assessment of the impact of inflation on financial results.

The tasks of the financial performance control subsystem are [23]:

- reduction of negative impacts of possible circumstances.
- safety of assets.
- achievement of the goals set in the business strategy.
- compliance with the law.
- ensuring the reliability of accounting (financial) statements, etc.

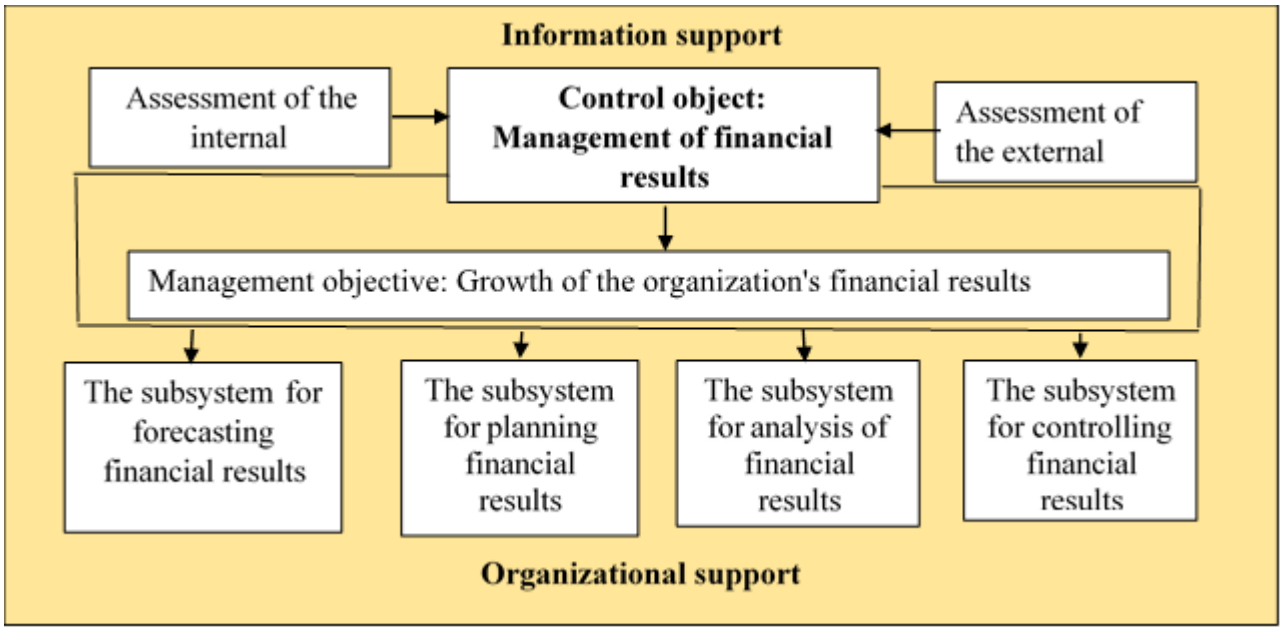

Fig. 5. Organization financial performance management system
Source: own elaboration

To assess the effectiveness of the enterprise financial performance management system, the above tasks were evaluated.

All quality in dictators were evaluated on the following scale:

$$a_i = \begin{cases} \mathbf{0}, if\ this\ task\ is\ not\ implemented\ in\ the\ enterprise; \\ \mathbf{1}, if\ the\ task\ implementation\ is\ very\ low\ or\ insignificant; \\ \mathbf{2}, \quad if\ there\ is\ a\ partial\ implementation\ of\ the\ task; \\ \mathbf{3}, if\ there\ is\ a\ full\ implementation\ of\ the\ task. \end{cases}$$

The final assessment of indicators within the group is determined by the formula (1)

$$C = \frac{100}{a_{max} n} \cdot \sum_1^n a_i \,, \% \qquad (1)$$

where a_{max} is the maximum possible score in accordance with the scale
n – is the number of tasks to be evaluated.
Integral assessment of the level of effectiveness is carried out according to the formula (2)

$$F = \frac{100}{a_{max} \cdot m} \cdot \sum_1^m a_i, \% \qquad (2)$$

where m is the number of performance indicators of subsystems.

3. Results

Evaluation of the effectiveness of the enterprise financial performance management system was carried out on the example of an enterprise in the engineering industry, which is in the Vladimir region.

The assessment was carried out over two years: 2015 and 2019.

Table 2. Assessment of the effectiveness of the financial management system of the enterprise

Efficiency	2014	2018
The subsystem for forecasting financial results	50	33,33
The subsystem for planning financial results	71,43	61,91
The subsystem for analysis of financial results	80,95	71,43
The subsystem for controlling financial results	66,66	60
Total	83,33	75

Source: own elaboration

As a result of the analysis, it was found that the overall effectiveness of the financial performance management system decreased. The greatest decrease is observed in the block “Forecasting financial results”. The reasons for this fall are, on the one hand, the state of the external environment, its instability and unpredictability, and, on the other hand, the internal problems of the enterprise. The decrease in the effectiveness of the financial results management system of Iskra explains the decrease in profit by 4 times, the decrease in profitability of products by 8.8 times and profitability of sales by 6.5 times (Table 3).

Table 3. Analysis of financial results of AO «Iskra»

Financial results of the company	2014	2018	Absolute deviation	Rate of decline, %
Net profit, thousand roubles	33619	8221	-25398	75,55
Product Profitability, %	28,44	3,23	-25,21	88,63
Profitability of sales, %	16,98	2,62	-14,36	84,55

Source: own elaboration

4. Conclusions

Our study allowed us to systematize the factors affecting the financial results of the enterprise. We also proposed a model of a financial performance management system for an enterprise. It consists of 4 blocks: a subsystem for forecasting financial results, a subsystem for planning financial results, a subsystem for analysing financial results, a subsystem for controlling financial results. We have determined that the effectiveness of the enterprise financial performance management system has a direct impact on profit and profitability indicators.

The results can be used to build an effective system for managing financial results at the enterprise.

The presented study of the authors will continue in the direction of expanding the empirical base of testing the methodology for evaluating the effectiveness of the enterprise financial performance management system and verifying the conclusion made about the impact of the effectiveness of the enterprise financial performance management system on the enterprise financial results.

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Typology of Digital Currencies

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Abstract

The goal of the present paper is to identify the main ways of use of cryptocurrencies and to clarify the place of cryptocurrencies in the system of digital currencies. Technological (use of distributed ledger) and organizational (absence of the center of emission) features of crypto currencies were identified.

These features were used as a basis for a strategic classification matrix of digital currencies. Four main types of digital currencies were identified. It is demonstrated that cryptocurrencies can be divided into classic (decentralized) and centralized (collective) currencies. A description of specific features and prospects of development is given for each type of digital currencies. It is demonstrated that cryptocurrencies will mostly be used to increase the efficiency of payments, not as a substitute for traditional money. It is demonstrated that the refusal to use distributed ledger technology is not equal to refusal to use blockchain. Blockchain can be used to ensure high level of security for payment system with a sole emission centre.

Keywords: cryptocurrency, distributed ledger, blockchain

1. Introduction

Although cryptocurrency as an economic phenomenon came up quite recently, the public attitude towards it has already changed, rather drastically, many times, and the concept of cryptocurrency continues to be controversial [8]. Initially being an exotic product for crypto enthusiasts who believed that cryptocurrency was able to replace traditional money [16, 20], it was perceived by public with considerable scepticism. Later, when the popularity of cryptocurrencies and their value (first of all, the rate of Bitcoin, the most well-known cryptocurrency) began to rapidly increase, cryptocurrencies attracted the attention of investors who did not think about their potential as an alternative currency and were mostly interested in benefiting from the rate growth. Cryptocurrency was being perceived as the investment asset. At the same time, the first steps were taken to include cryptocurrencies in the currency system and some countries recognized bitcoin as their legal tender. Cryptocurrencies started being the financial basis of a new technological structure [18] (cryptocurrencies, as a special case of the FinTech revolution, represent the spread of digitalization [19] in the sphere of money circulation). However, around that time concerns emerged that in the best-case scenario cryptocurrencies represent a new bubble on the financial market, and at worst, are a gigantic fraud.

The Bitcoin rate slump in the winter of 2018 and the capitalization drop of all other cryptocurrencies seemed to confirm these concerns. The gold crypto rush was over, and the public got rid of the high expectations associated with cryptocurrencies and lost interest in them to a large extent [1].

Crypto revolution quickly came to an end (as did the FinTech revolution in general [7]). However, Bitcoin and other key cryptocurrencies continue to exist, and their rate has stabilized and even keeps gradually increasing. Thus, we can talk about the existence of a certain contradiction between the current, relatively stable status of cryptocurrencies and a certain disappointment of the public.

Under these conditions, it is interesting to try to find out what are the prospects for cryptocurrencies in the global economy, or, more precisely, in what areas cryptocurrencies can develop and what areas of application they can find. We can frame the question of our research more specifically as follows – in what forms can digital currencies function and where do cryptocurrencies belong among these instruments? Note that this question has never been framed like that; although there are quite a few publications on the nature of cryptocurrencies and on the prospects for their development [2, 3, 6, 9, 13, 14, 15], their classification relative to other digital currencies has not yet been proposed.

2. Methodology

We decided to use a binary assessment for the two main components of cryptocurrencies. It is convenient to use such a simplified approach for strategic analysis when it is important to understand the general laws of research objects' functioning. The methodological basis of our research is the strategic matrix method which is efficiently used to analyse the market environment [5] (including the financial technology market [11]). We used the most common 2x2 matrix, i.e., in accordance with the mentioned approach, we selected two main components of cryptocurrencies, each of which received a binary assessment (yes-no).

3. Results

Cryptocurrencies, despite the ambiguity of their economic nature, comprise technological and organizational components (see table 1) [10, 14].

Table 1. Technological and organizational specifics of cryptocurrencies

Technological component	**Organizational component**
- Use of encryption technologies - Distributed storage of information about operations (distributed ledger technology)	The absence of a single emission center issuing a cryptocurrency, withdrawing it from circulation and controlling its rate

Although the main focus has traditionally been on the technological aspect of cryptocurrencies (distributed ledger technology implemented in the form of a blockchain), it was the organizational aspect that allowed them to claim the status of new alternative money circulation tools which was rejection of a single emission center. In many respects, both the advantages (lack of centralized control over the rate and transactions) and disadvantages (high volatility, opposition of the state government protecting its monopoly of currency issuing) of cryptocurrency were related to this.

Obviously, the technological and organizational aspects are intricately connected. Only a distributed ledger is able to provide financial transactions when there is no single emission center. At the same time, the use of distributed ledger technologies is only justified if there is no single emission center.

It can be assumed that in the future there are several options for the development of digital currencies, depending on whether the technological and organizational components are retained (see Table 2). Note that these options may be implemented in parallel.

Table 2. Strategic classification matrix of digital currencies

		There is no single emission center	
		Yes	No
Distributed ledger technologies are used	Yes	I. Classic cryptocurrency	II. Centralized cryptocurrency
	No	III. Electronic quasi-money	IV. Electronic money

The first quadrant of table 2 corresponds with the classic cryptocurrency which combines the distributed ledger technology and the absence of a centralized emission. The record shows that, at least in the mid-term, this development option is not a priority. The lack of regulation, both external (no legal framework developed for the circulation of cryptocurrencies in the "real" world) and internal (due to the absence of a single emission center), discourages the investors and prevents the expansion of cryptocurrencies. In addition, on several large markets, the use of cryptocurrencies as a payment instrument is prohibited which further limits their applications. Such cryptocurrency most likely may be used for niche operations as a specific investment asset and as a payment instrument for illegal transactions (payments to hackers, money laundering, etc.). Obviously, regulators are going to resist such use of cryptocurrencies. This means that the classic cryptocurrency in the mid-term is going to be pushed into the gray or even black area and will not be able to compete with traditional payment instruments. Moreover, this is related to the organizational aspect of classical cryptocurrencies.

Quadrant II includes payment instruments based on distributed ledger technology but at the same time relying on a single emission center. These exclude the organizational component of cryptocurrencies so only the technological aspect is applied. Thus, the centralized cryptocurrencies are a downsized version of the classic cryptocurrencies. Their task is to use the technological advantages of a distributed ledger and reject inconveniences associated with the absence of a single emission center.

The very concept of centralized cryptocurrencies seems internally contradictory. Indeed, with a single emission center, the use of distributed ledger technologies seems redundant as the center itself may register all transactions. However, this contradiction may be removed by the fact that the emission center is collective. In this case, unlike with the classic cryptocurrency where there is an unlimited number of participants providing circulation (miners) and with traditional money the issue of which is controlled by a single organization (central bank), the use of a collective emission center suggests that the issue and circulation of the payment instrument is provided by a limited number of financial institutions (primarily, banks). The cryptocurrency issued by them simplifies the conduct of financial operations (in particular, cross-border transfers) [4]. In this case, transactions may be made not directly between users but between banks themselves that use distributed ledger technologies to register all operations and protect them from hacking. This is the way cryptocurrencies are developing in the West where bank and interbank cryptocurrencies are actively being created [12, 17].

Such a cryptocurrency cannot claim the status of alternative money and even as a payment instrument has a limited use. It is designed to simplify the interbank transactions and protect them from malicious external interferences. At its core, the use of centralized cryptocurrencies means integration of cryptocurrencies in the traditional financial industry to increase its efficiency. It is the way of the key financial and technological innovations right now [7, 10, 11], and cryptocurrencies are no exception.

Interesting prospects for such centralized (basically, collective) cryptocurrencies open in the current geopolitical situation when the United States artificially limit the access of a number of countries to the international dollar system. Countries subject to financial sanctions may agree to create interstate cryptocurrencies for international payments without the use of the US dollars. Of course, the United States will oppose the use of such cryptocurrencies but their potential pressure in this case is much lower than in a situation where the parties make payments in dollars.

Another area of use of collective cryptocurrencies may be their use for interstate payments in agglomerates created by Russia (the EAEU, the Union State of Russia and Belarus, etc.) [4]. This would improve transaction transparency and protect payments from malicious external interferences.

Quadrant III is extremely specific. In this case, there is no single emission center, however, distributed ledger technologies that could ensure transactions are not applied. We are talking about payment instruments created in an unregulated fashion that are used in confined communities as an addition to more common payment instruments (primarily, traditional money). These are local equivalents that do not spread beyond these confined communities. Initially, they do not emerge as payment instruments but as benefits, however, subsequently, due to their convenience and versatility, they naturally acquire the functions of a payment instrument (they may also naturally lose these functions). Such equivalents are widely used in the real world, but it is difficult to create them in electronic format. An example would be “likes” on social networks which theoretically may be used for payments at a certain rate when interacting on these networks.

Obviously, these instruments are not cryptocurrencies and cannot be called actual money. Due to limitations of their use and the specifics of their application, they are called quasi-money.

Quadrant IV describes electronic money, an electronic form of traditional money issued by the country central bank, or electronic instruments issued by a payment center to provide payments between individuals and organizations. They have a single emission center (central bank or payment system) which eliminates the use of the distributed ledger technologies. This is a classic version of electronic money.

Nevertheless, technological solutions that cryptocurrencies offer can also be used to increase the efficiency of the electronic money circulation. As mentioned above, existing cryptocurrency distributed ledgers rely on the blockchain technology, however, the blockchain is not equivalent to the distributed ledger as it can also be used to increase the security of internal organization operations. Thus, rejecting the distributed ledger technology, these organizations can transfer their operations to the blockchain ensuring a higher level of security.

4. Conclusion

Our analysis allowed us to identify the fundamental types of cryptocurrency (classic or decentralized, and centralized or collective). Inflated expectations regarding cryptocurrencies as a new stage of the money circulation system development designed to replace traditional money and as the financial basis of a new technological structure are unlikely to come true, at least in the mid-term perspective. Demand for classic cryptocurrencies will be low while centralized cryptocurrencies will be used as an auxiliary instrument to increase the efficiency of payment transactions. Thus, centralized cryptocurrencies are the most promising but even they cannot become an alternative to traditional money and will be integrated into the existing financial system.

The strategic matrix we constructed (Table 2) allowed us to develop a classification of digital currencies and determine the place of cryptocurrencies in the system of these instruments.

We consider it especially important to note the fact that the distributed ledger technologies are not equivalent to blockchain. Blockchain can be applied even when a distributed ledger is not used. Thus, technological solutions that cryptocurrency can offer may be used to increase the efficiency of traditional payment instruments.

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Part III
DIGITALIZATION AND INSURANCE

Modern Operational Trends in the Insurance Industry

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Abstract

This paper discloses a new insurance paradigm towards insurance company as it is and its part about operational processes. Major research methods used are practical experience, observation through the consultancy scope, trainings with the leading world insurance companies. Insurance industry experience much of the changes, passing through transition period, orienting towards changing needs and priorities of their customers, learning, and implementing latest technologies, digitalizing their processes. New corporate culture builds new relationship between all players within insurance market.

The article focuses on insurance company operational processes within the new digitalization trends.

New generation of digitalized customers pushes insurance companies towards products with flexible price, affordable, easy to understand and use, transparent sales patterns from one side, and digitalized, adaptive, smart operational processes from the other. Customer also is looking for the opportunity to create a product for himself in cooperation with insurance company (co-production), which requires insurance company have high level automized processes so that to follow customer needs. It has to be stated also that overall literacy in financial services was increased, and it's a win-win process, demonstrating the intention of customer to be helpful in the creating product process for himself, that's what appreciated by the company, from one hand, from the other – the company is moving towards satisfying customer's needs, simplifying processes and product usage.

Keywords: digitalization benchmark, new insurance products generation, insurance online channelling, client-oriented modernization, new operational era in insurance, insurance optimization and automation

1. Introduction

Insurance Market might be described as a part of financial market, where insurance services are provided by the Insurance companies, regulated by the State Regulator. Where the market is driven by the competitiveness of the insurance companies; foundations and rules are presented in the Federal Law N 135-FZ "Protection of Fair Competition" (2006) [2] that regulates the market and presents key performance indicators for fair competition within insurance market.

Insurance market demonstrated good results, thanks to, most of all, OSAGO/KASKO market, that growing rapidly according to the KPMG report [4], [5]. To understand the way insurance market is moving it makes sense to make a glance towards changing needs and preferences of the customer and assume the trend it makes for the insurance companies. One of the cores trend shares is digitalization, where all the market players use latest technologies, digital tools for all kinds of activity [10]. The customer has changed dramatically and now faces new insurance operations paradigm, dealing with new products in order to fit new needs [7].

We observe changing portrait of contemporary customer on the market. Online customers are dominating, decision-making traffic reduced to 1-2 site visits.

The global insurance market experience sharp move towards direct sales, online, digital sales from agent distribution channels. Emerging markets, especially China and Latin America, are developing rapidly in this direction [1]. Today in the world up to 20% of all insurance services are sold online. In Russia – up to 92% users fulfil payments online: 86% – from desktop (computers and laptops), 69% – from their smartphones (Li, 2017). At the end of 2018, up to 30% of the population of developed countries use mobile services to make payments.

According to Fitch Ratings, Insurance is a "fertile ground" for the possibilities of blockchain technology, which could potentially make big changes in the industry in the long run. By using blockchain, the insurance industry can cut between 15% and 30% of annual expenses.

Digitalization of the insurance operational processes gives a shift from the formal established procedures with the settled and validated processes towards automized, flexible and adaptation approached highly based on the customer feedbacks. Object oriented technologies brings flexibility into the coded algorithms of the IT supporting programs. Smartphone, online, telephone communication gives ability to receive customers feedback data on any stage of the operating process with the following actions changing operational process toward more client oriented.

Another big advantage of insurance operational processes digitalization is the increasing transparency to the clients. Fully digitalized operational cycle may easily provide client with the ongoing status of his/her matter (claims, cancellation settlement, status of the policy-account, payment accounting).

This paper is created based on a practical experience of multinational insurance company, abstracted main trends of development, main drivers, that influence the success of the industry, presented new insurance paradigm that could be characterized by moving to new technologies and digitalization [8], [9].

2. Methodology

Research methodology used in the paper is:

- Practical experience through the job for the leading foreign insurance companies, collecting and processing information, statistics for actuarial calculations and report presentation (cabinet research),
- Observation and practical experience through consultancy job, dialog with the companies, questionnaires, problem solving, solutions findings,
- Trainings with the leading world insurance companies- risk management and change management courses for insurance companies,
- Collecting and processing data through communication with Actuarial Guild, Central Bank, learning state regulation system in insurance industry.

3. Results

3.1 New insurance products

As for the products trend – it is to introduce insurance services within the simplified and flexible product, that is transparent for the users, avoiding intermediaries and insurance agents. Previous complicated and fixed products with almost no opportunities for modification and price change are replaced by products with digitalized and online sales, which allow to avoid some stages in the sales process, and present understandable, transparent, accessible, modified product directly to the end user.

To assist customers in decision-making process, totally new products were introduced to the market – insurance calculators and insurance constructors, that can choose and create insurance cover, suitable for the customer. In this case customer finds himself involved into production process in getting the product customized for him (co-production).

3.2 Digital technologies challenging insurance operational processes

Nowadays we observe strong move from the formal verified operational processes towards the digitally formed ways. New generation of customers' expectations are to have transparent, easy to buy and to use, flexible in ways of payments and benefits products. As a result, it pushes insurance companies to modernize their operational processes so to be able to support these needs.

Current approach may be characterized as:

- formal way,
- validated and verified operational processes.

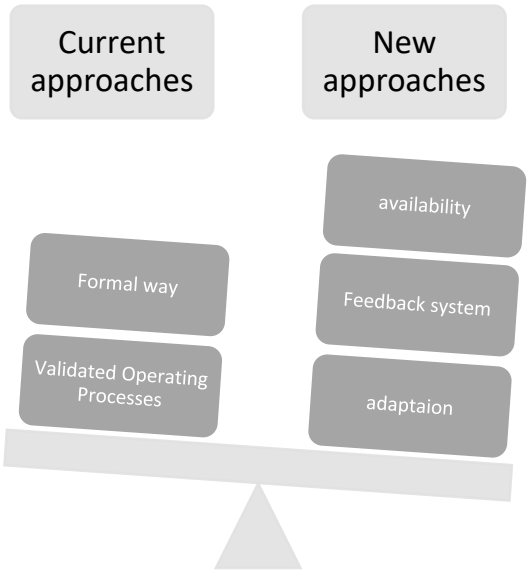
This would mean that company operational department function within the fixed and agreed actions sequence. Where each stage and its controls are defined and predetermined. This approach often includes significant part of supporting paperwork, creating the hardcopy documents flow. Valuable advantage here is that the processes are verified and secure. Those actions sequences were settled and verified through the long periods of time, being formalized by different guidelines and instructions.

Though core disadvantage of this approach is substantial inflexibility. Change of any part or stage of the process assumes relatively long and time and cost consuming procedure to change verify and properly document all the new implementations. Thus, it mostly motivates not to change existing processes unless there is an extraordinarily strong reason. So, we get so call "operational process for the sake of operational process" situation.

New approach with the support of digital instruments would shift the focus towards:

- flexibility, availability,
- easy feedback system,
- rapid adaptation.

New digital structure would provide the company abilities to modify its processes, information flows quickly. Perform changes and modifications in accordance with emerging needs. Emerging needs may be organized through the various feedback collection. Having digitalized processes makes possible to implement feedback indicators, so that to receive customers, users' feedback that would initiate further modification and optimization.



4. Conclusion

It must be stated that insurance companies must move towards deeper customer involvement, customer engagement; they need to provide customer is long – life value. Customers need to be sure that they can rely on the insurer, be safe and protected.

Besides using customized interfaces, online calculators, chatbot, insurance company may also substantially modernize its operational processes toward client orientation. Further development would allow client easily to receive any information about their policy or processes anytime, anywhere, from any device. New technological solutions move insurance companies towards new abilities to adapt and improve all the stage of the company operations [3], giving opportunities for automation and optimization.

Last but not least is the point that such new digital solutions need to be planned and implemented today, otherwise insurance companies' risk to find themselves overboard in a few years, as new digital paradigm assumes significant investment of money, time and own involvement.

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Blockchain Technology and its Application in Insurance

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Abstract

In various sectors of the economy, losses caused by natural disasters, earthquakes, landslides, and other climatic factors are observed, the number of people killed and injured because of disasters and accidents is increasing. Insurance is a universal tool for the economic protection of property, health, and life. This statement proceeds from the fact that individuals and legal entities in the course of their activities face many types of risks, the impact of which can adversely affect their lives and activities.

Insurance acts as a financial stabilizer, allowing you to compensate for losses in the event of insured events. In such conditions, insurance provides individuals and legal entities with specific guarantees in damages.

An efficient insurance market contributes to the stability of the economy, provides flexible management of individual, general risks.

The digital economy implies the use of IT technology in all areas of public life, insurance is no exception.

The purpose of this study is to study and analyse the automation of the insurance industry.

The article discusses the blockchain technology in insurance, the results of the study show the predominance of advantages over the disadvantages, presents the characteristics of projects using blockchain technology in the insurance industry.

Keywords: blockchain, insurance

1. Introduction

Of course, for modern society the digital economy is a relatively new phenomenon, in a simple form, represents the exercise of economic activities using information technology.

Not an exception and insurance, which also spread the digitalization. In modern conditions the development of the insurance market is impossible without digitization. Using automatic production lines allows insurance process more capacious and high-tech, improves the quality of services provided.

It is obvious that the activities of insurance organizations in the conditions of digitization requires the development of standards for the use of digital technologies in the insurance business, the special knowledge of experts in a given area, and digital solutions in the insurance industry.

In modern conditions one of the digital solutions in the insurance industry is using the blockchain that are associated with the use of new technology a reliable distributed platform for direct customer experience with their personal data, collective insurance policies and smart contracts. The use of the blockchain in insurance will provide automatic insurance payments, reduce risks and improve the quality of service of insurers.

The paper presents characteristics of projects that use the blockchain technology in the field of insurance offered by the company Digital Forest. On closer examination, the author came to the conclusion that each project has a practical application in different branches of insurance that allows to conduct scientific research on the stated research topic.

Methodology. The study applied general theoretical methods of cognition. A study of the concepts of “digital economy”, “blockchain”. In addition, the methods of deduction and induction, as well as the dialectical method of cognition, were used. As the results of the study, a systematization of all the above categories is proposed.

Using the comparative method, the general trends in the development of the blockchain are identified, as well as attention is paid to its specific features in the context of the projects offered by Digital Forest.

Using alternative approaches made it possible to obtain more complete information about the nature of projects using blockchain technology in the insurance industry.

The methods of organizing and processing information justified the use of projects using blockchain technology in the insurance industry.

2. Results

In 1995, for the first time, the definition of “digital economy” – N. Negroponte [9]. Initially, the blockchain technology was created to keep track of payment transactions applied using various types of digital money, but at the same time it can be successfully applied in the insurance industry.

Currently, there are two approaches to the definition of “digital economy”. The first approach involves the use of exclusively IT technology. The second approach is more extensive, associated with the introduction of IT technologies in production, which will ensure economic growth and improve the quality of life of the population.

On this occasion, K. Varlamov, in his speech, emphasized “... the implementation of the Digital Economy program should lead to an improvement in the quality of life of Russians in all significant areas [5]”.

The implementation of the digital economy in the Russian Federation is based on the use of the following digital technologies:

- Big data.
- Neurotechnology’s and artificial intelligence.
- Distributed registry systems.
- Quantum technologies.
- New production technologies.
- Industrial Internet.
- Components of robotics and sensors.
- Wireless technology.
- Virtual and augmented reality technologies.

The above technologies are present in the insurance market, but to varying degrees. It can be argued that the development of the insurance market without digitalization is impossible.

In their research, N.V. Apatova and O.L. Korolev emphasize “blockchain, like a database similar to the universal registration journal, contains records of all types of transactions, which allows us to formalize economic relations of exchange, reduce document flow, and ensure data protection [1]”. At the same time, the authors emphasize that the insurance industry has the unique potential of using blockchain technology in a system to increase efficiency and reduce costs by automating key issues.

Based on the foregoing, we believe it is true that subject to a large number of insurance entities (insurers, insurers, insured persons, beneficiaries, etc.), for the different purposes of providing and acquiring services, the same documents are used, which, of course, requires relief maintaining contractual obligations digitization of the submitted data.

D.V. Lipnitsky expresses “... the blockchain owes to the growth of computing capabilities of computers and the globalization of the Internet, which allows you to create instant demand anywhere and for anything [3]”.

A team of authors led by T.N. Sokolova notes that blockchain is used in a variety of areas [4]. The authors I.V. Kuryanova and M.S. Abibullaev emphasize that “... the use of blockchain covers different levels of chain implementation – from infrastructure to platform development to specific applications [2]”.

The use of blockchain technology for insurance organizations will automate the following data: number, date and time of conclusion of the insurance contract, object and subjects of insurance, cost of the insurance object, amount of the insurance amount, etc.

That is, all the above, it can be argued that in the current conditions it is appropriate to use smart contracts, which essentially replace paper insurance contracts. And this, in turn, will provide automatic insurance payments, reduce risks and, in general, improve the quality of service for policyholders.

At the same time, despite all the advantages, the drawbacks of using blockchain technology in insurance are also obvious, we include technological unemployment and a lack of qualified personnel.

Here is a description of projects using blockchain technology in the insurance sector, offered by Digital Forest [7]:

- Etherisc [8].
- Medishares [6].
- PAL Network [10, 11].
- Teambrella [12].
- VouchForMe.

Etheric start-up has developed a decentralized insurance platform based on the Ethereum blockchain.

The company independently develops products on this platform, and also provides an opportunity for other organizations to use it to create and distribute their own applications, providing them with a common infrastructure, product templates and an insurance license as a service.

The company was the first to develop a product for insurance claims with delayed flights. The system allows passengers to purchase an insurance policy using cryptocurrencies or traditional money, and payments are made automatically when an insured event occurs flight delay. The platform is based on open source smart contracts, which makes the system transparent and provides a high level of trust.

Decentralized system avoids a conflict of interest.

The solution was developed using its own token omics. To conduct transactions on the platform, the DIP utility token is used.

The start-up also works on solutions for hurricane insurance, crop insurance, cryptocurrency wallet insurance and others [13].

MediShares is a decentralized marketplace for mutual insurance of users in various fields of activity.

This open source platform is based on the Ethereum blockchain and uses smart contracts to bring users who need insurance services to those who provide them.

The MediShares insurance model assumes that by joining the system, insurers contribute a certain amount, providing reserves for insurance payments by purchasing MDS tokens. In order to motivate insurers to keep reserves in the system, they are paid remuneration in tokens of the MDS platform.

Users who want to purchase insurance get access to the smart contract template, according to which they can pay for insurance in an acceptable amount for themselves.

The platform is built on the principle of DAO and does not require personal data on both sides, which increases the reliability and confidentiality of the system. Due to the lack of intermediaries and the decentralization of the platform, the insurance fee charged is minimal.

Decentralized applications for health insurance, insurance for participating in extreme sports, insurance of expensive cars and others will be developed for the platform.

The MDS token is traded on 9 exchanges, including Huobi Global, Gate.io, Dcoin and others [14].

AL Network is a start-up from Singapore that provides insurance on the blockchain using artificial intelligence and machine learning. The platform was created with the aim of providing insurance coverage to people outside the banking system, reducing the gap between consumers in developing countries and insurance providers. PAL Network provides a new level of accessibility and reduction of restrictions associated with the traditional insurance industry.

The PAL Wallet mobile app is available on the Play Market, and GitHub has a desktop version. Using the application, users can apply for a car insurance policy in case of cancellation or delay of a flight, earthquake, cancer diagnosis and even a broken smartphone screen. The insurance policy can be purchased for traditional currency or platform tokens, in which case insurance will cost 50% cheaper.

Insurance payments are also made in the usual currency or PAL tokens of your choice. PAL Network also provides partners with access to the RESTful API to simplify the distribution of insurance products.

Alpha and beta versions of the platform were launched on the Ethereum public blockchain. Now, the platform release operates on its own blockchain network PAL Network.

Start-up Tamberelli provides users with P2P insurance services. Service users are united in teams and provide insurance for each other [15].

When an insured event occurs, the decision on compensation in the team is made by discussion and voting, ensuring the transparency of the process. An open process ensures fair decisions and strengthens social relationships. Users do not have to constantly take part in the vote; they can appoint a proxy in their place. Voters receive compensation in platform tokens, the amount of remuneration varies depending on the user confidence rating.

Team members pay insurance payments from cryptocurrency wallets located on the Bitcoin and Ethereum blockchain, which they control independently. Private keys to them are stored only inside the individual client system.

Tamberelli platform, as well as iOS and Android applications are already available to users. Now on the platform there are several pilot teams:

- Pets insurance in Peru, Argentina, and the USA.
- Bicycle insurance in the Netherlands and Germany.
- Car insurance in Russia.

VouchForMe, formerly known as Ensure Pal, is a blockchain platform with a unique concept. The application is the world's first decentralized social insurance based on approval from the community. A similar mechanism is already used in other areas, for example, in lending, when the borrower receives any benefits if he has a surety.

The main principle of the platform is to provide discounts to customers of insurance companies if they have guarantors providing a financial guarantee.

A platform user can ask his friend or acquaintance to become his guarantor on the platform to earn a sufficiently large discount on the insurance premium. The guarantor provides a financial guarantee, which will be withdrawn from him only if the applicant violates the terms of the insurance contract. The guarantee is motivated by the instant payment of platform tokens, which they can store as investments or sell on the exchange. The platform guarantees that the insured client will receive final compensation if the other party has violated the mutual agreement.

The VouchForMe model is a classic combination of traditional insurance and P2P blockchain endorsement backed by social proof. According to the founders, this approach creates a positive incentive for the insured and allows him to become more responsible. VouchForMe solution is patented.

Not only start-ups are trying to actively introduce blockchain into the insurance industry, but large companies are joining to study in detail the capabilities of this technology. For example, the B3i consortium has united such insurance giants as Allianz, Liberty Mutual, Munich Re, Swiss Re, Zurich Insurance Group and others. IBM and Guard time are actively implementing their own blockchain platform for the insurance industry.

We see that blockchain technology can indeed modernize such a conservative industry as insurance and bring it to a new level of development.

3. Conclusion

The use of blockchain technology simplifies the approval, implementation, and entry into force of insurance contracts. Smart contracts will replace paper-based insurance contracts, which will provide automatic insurance payments, reduce risks and, in general, improve the quality of service for policyholders.

For the development of the Russian insurance market, it would be very promising and innovative to introduce a blockchain system in the work of insurance companies.

The use of blockchain will help insurance organizations minimize the costs of society, reduce damage from fraudulent activities, increase transparency, and speed up the technological operations of insurance companies.

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Features of Using Fin-Tech Solutions for Environmental Risk Insurance

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Abstract

Goal
Justification of the use of modern financial solutions in environmental risk insurance by automating key processes.

Method
The paper proposes new principles of interaction between the insurer, insurance broker and the insured on the basis of blockchain, which will significantly simplify the work, speed up the exchange of information, effectively manage cash flows, and accumulate statistics on rare environmental risks.

Based on the blockchain platform, you can enter smart contracts between several parties at once (an insurer, a broker, or a policyholder-a source of increased danger). This, in turn, can provide a consistent automated environment that reduces the administrative burden of multiple stakeholders.

Such development of modern and efficient processing of insurance transactions will require General standardization and a mechanism that combines the attraction of financial resources and the creation of blockchain programs of the environmental direction.

Results
It was evaluated how blockchain technology can be established as a viable tool for the insurance industry in General and for insurance clients.

Conclusions
The results of the study can be used by insurance companies to assess the competitive environment in terms of using blockchain technologies in the process of strategic planning, and in developing new products, in particular, environmental insurance, as well as by the state to control and participate in the insurance market in the formation of the digital economy and in the creation and implementation of the concept of sustainable development.

Keywords: blockchain, green economy, sustainable development, FINTECH solutions, digital Finance, environmental insurance

1. Introduction

Blockchain technology has been a breakthrough technology for the past five years. PwC experts put It at the top of the list of key business technologies [1]. Technology can improve the development of many industries the insurance sector.

According to a survey of company executives conducted by PwC [2], in 2017 years, blockchain was rated by top managers as a key breakthrough digital technology on the horizon of the next five years [3]. In addition, according to the results of the Deloitte survey, in 2019 – 53% of companies think, that blockchain is a strategic priority technology, and in 2018 – only 43% expressed this opinion [4].

Blockchain technology is a chain of information blocks that follow each other in a strictly verified sequence. Information about the ownership history contains for each entry. This eliminates all possible falsifications of information.

The blockchain consists of the following components (figure 1).

“Blockchain technologies are applicable in various sectors of the financial market. They can be considered as a system of regulation and compliance with the interests of the parties, for example, in insurance”, says the study by N. V. Apatova [6].

The introduction of blockchain technology within the Russian insurance field will also depend on the formation of an ecosystem and the development of interaction between all stakeholders. Effective communication between all insurance market players, the state and solution providers are coming to the fore. The development of effective dialogue between participants, considering international experience and regional peculiarities, will determine the development of the most relevant formats for using technology in Russia.

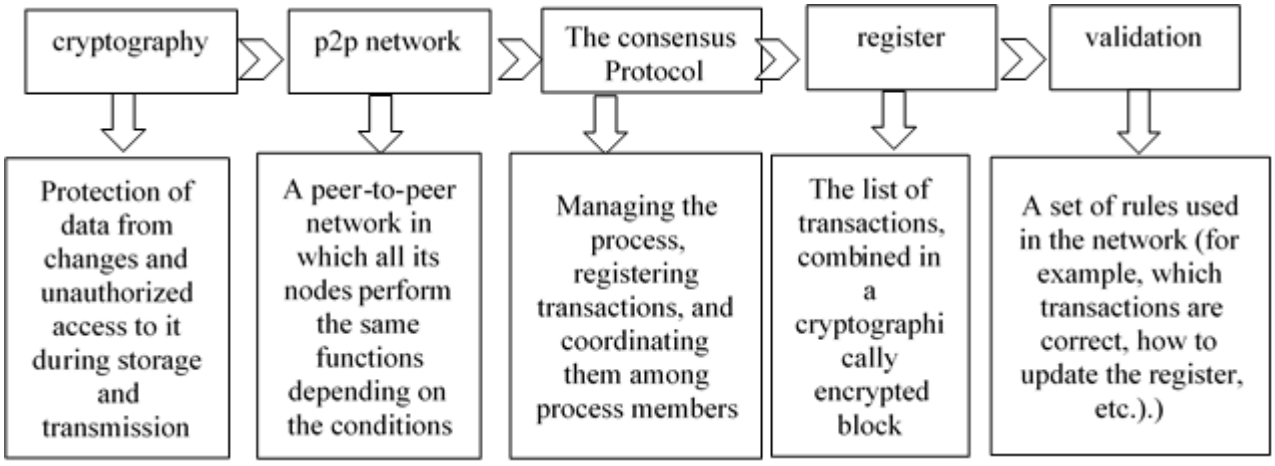

Fig. 1. Blockchain technology components [5]

Currently, Russia has not developed a mechanism to effectively prevent and compensate for environmental damage. Digital technologies in the field of ecological management and environmental protection, approved by international and Russian legislation as a part of the implementation of the sustainable development state concept and the "Digital economy" program launched in Russia [7], aimed at stimulating the development of technologies, have not been introduced into corporate schemes.

The main principles of ensuring sustainable development through the introduction of modern blockchain technologies: Sustainable development is intricately linked to the processes of modernization and greening of the economy. Russia is on the way to a new technological order, gradually developing priority production (industry, regional). This allows us to take a leading position in the world market, which Russia can come to, given this fact. This requires a comprehensive development system that covers the creation of “clusters of technologically related industries” [8]. This concept of “advanced development” will be able to work with the coordinated interaction of venture and investment funds, innovation centers, financial clusters, public-private partnerships, and innovation-oriented economic zones.

Implementation of the “advanced development” concept is the main direction to form a “green” economy in Russia and to transit the sustainable development, which will increase GDP by 2-3 times at the current level of withdrawal of raw materials and exploitation of natural capital and reduce the level of environmental pollution [9].

To build a vector towards increasing energy efficiency for our state, it is necessary to switch to an innovative sustainable development path. The Concept of long-term socio-economic development of the Russian Federation for the period up to 2020 focuses on improving energy efficiency and strengthening the role of environmental factors, which will have a significant impact on the development of our country in the next 10-15 years [10].

The option of moving to a green economy at the global level was proposed in the framework of the United Nations “Global green new deal”. “Global investments to restore the destroyed financial system amount to about $ 3 trillion. At the same time, to achieve a critical mass of green and energy-efficient technologies and transition to a sustainable economy, only half of this amount will be required”, is estimated by the authors of the course [11].

“The discussion of environmental problems in the context of the formation of a new model of economic development of the country and the world is of the utmost importance”, according to S. N. Bobylev [12].

It is necessary to develop a green economy with sustainable and fair business practices. For example, some blockchain technologies track green projects and allow you to invest in them through a system of decentralization. The United States and European countries have become the undisputed leaders in the number of blockchain projects, which is associated with the development of renewable

energy sources, the promotion of “green” energy and effective regulation of processes related to the use of blockchain technology in these countries.

2. Method

Let’s consider in detail the mechanism of interaction between the insurer, insurance broker and policyholder through blockchain technology to prevent fraud, poor-quality data on environmental risks (lack of data), as well as the General inefficiency of business processes (table 1).

Table 1. Using blockchain technology in environmental insurance

Problem	Blockchain solution	Output product
Fraud prevention	A centralized repository of information	Everledger – allows you to check information about current and previous insurance claims. Openid-secure collection and exchange of statistical data.
The management of claims	Unified layout of claims with automatic filling in	Insurwave is a platform for marine insurance. It can be used in environmental insurance to process smart contracts in real time.
Identification of clients	Collection of personal data for brokers, insurers, reinsurers, banks and other participants of insurance operations for compliance with KYC requirements (Know your customer)	**Customer Identification Program (CIP) – checks first and last name, date of birth, address, and identification number.** **Customer Due Diligence (CDD) − identifying the customer’s goal.** **Current user monitoring – the status of the user and compliance with the current risk level specified in the insurance contract.**
Reinsurance	Using a Blockchain Ledger that allows insurers to quickly and securely transmit information about insurance policies	**iXLedger (formerly ICO InsureX) is an efficient data exchange between insurance service providers and networks of insurance agents. Effect: saving large amounts of money for the environmental insurance industry.**
Peer-to-peer insurance	Combining several policyholders into groups (partnerships, communities) to form a mutual assistance Fund (Environmental Fund)	**Teambrella-members of the community take a decision on joining new members based on the results of an open vote, determine the level of risk and the amount of contributions for them, and confirm the occurrence of insurance events. insChain platform allows you to use It technologies to automate decisions about the occurrence of an insurance event. It is also possible to use artificial intelligence for underwriting and making decisions on insurance payments.**

Source of information: compiled by the author

So, the environmental insurance industry will become more secure, reducing the processing time of requests and the cost of monetary transactions.

In addition, there will be full transparency of business processes, which will increase confidence in the system and the industry. Smart contracts automate document management, insurance payments, and the relationship between actuaries, underwriters, environmentalists, environmental agencies, insurance supervision services, the state and society.

3. Results

In our opinion, one of the key areas of implementation of this technology in insurance, through which the blockchain can contribute to a significant breakthrough in the insurance market, can be qualitatively new principles of interaction with customers, allowing them to offer cost-effective products and develop new insurance products, implementing them via the Internet (figure 2).

According to the authors [14], “it is necessary to make changes to the traditional model of organizing business processes in the insurance industry by introducing modern information systems based on blockchain technology, which will solve a number of problematic issues related to the interests of insurers and policyholders”.

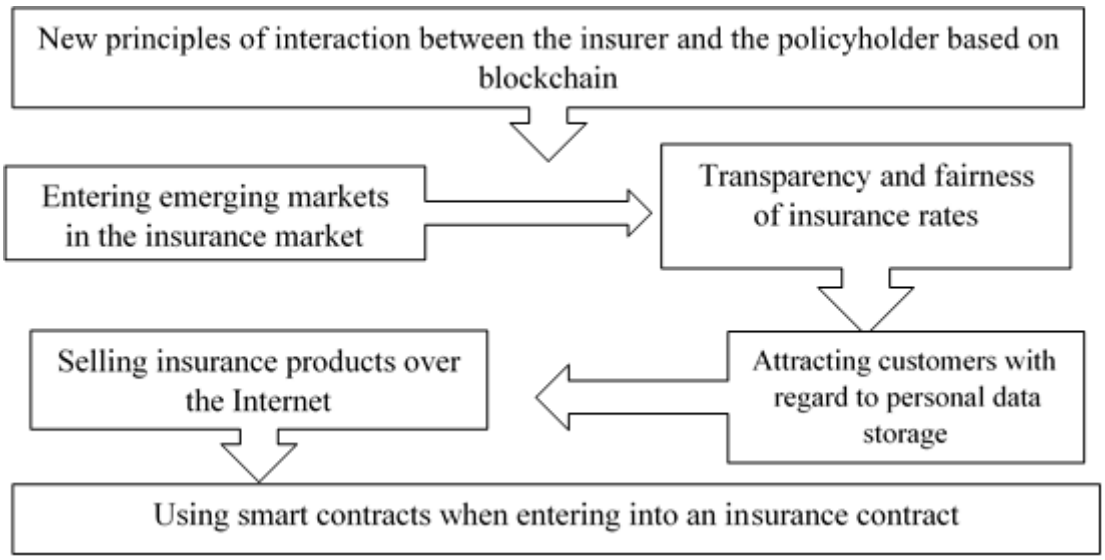

Fig. 2. Algorithm of interaction between the insurer and the policyholder based on blockchain technology [13]

The authors [15-17] call the main advantages of using blockchain technology in insurance activities, such as

- Optimization of the Bank’s structure and management.
- Cost reduction.
- The preservation and protection of information.
- Increasing the speed of processing insurance transactions.
- Transparency of operations.
- Approximation of the control.

The introduction of new production technologies in the insurer’s business processes can lead to the so-called “digitization of business processes” [18], which will cover a number of business processes of insurers: from accounting and reporting, risk assessment of the insurer in the process of pre-insurance discipline to the sale of insurance services and settlement. This will encourage insurance companies to develop blockchain technologies and use them in various business processes.

4. Conclusion

The program “Digital economy in the Russian Federation” allows to see the legal possibilities for the introduction of blockchain technologies by insurance companies for:

- assessment of the competitive environment.
- in the strategic planning process.
- in the development of new products environmental insurance,
- improving the efficiency and profitability of insurance activities.

This research can be continued in further work related to the development of a universal digital technology for assessing environmental risks, since this product is still poorly developed in the Russian insurance market. This will increase the attractiveness of policyholders to this product and allow them to take a fresh look at the availability of this insurance product, identify the competitive situation on the market, allowing them to more accurately determine the insurance risk and calculate the solvency and financial stability of insurance operations.

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Principal Trends in the Insurance Market of Russia: The Role of Digital Services

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Abstract

The aim of the paper is to analyse and identify trends in digital This article is devoted to the study of the role of digital technologies as the main trend in the development of the insurance market in Russia in recent years. The purpose of this work is to analyse and identify trends in digital technologies for the insurance market in Russia. Online sales of insurance policies in Russia since 2012 were studied using statistical methods and financial indexes. In our study, calculations of average values were made for the first time to evaluate Russian insurance. The work contains an analysis of the structure of online sales by type of insurance from 2014 to 2017, as well as a study of the activities of leading companies in life insurance. The reasons for the lack of digital and information technologies in the field of life insurance are revealed.

Keywords: insurance market of Russia, trends, digital technologies, online sales, telematics

1. Introduction

From year to year, the insurance market is undergoing several changes, including those related to the use of digital technologies. Many of these changes immediately become a clear trend, and some only begin to shape future development trends over time. The relevance (problem) of this topic is due to the fact that most of the existing works on the topic of digitalization in insurance only describe technologies and gadgets that are being developed in the insurance market. The purpose of this work is to identify the main trends in the Russian insurance market, consider the development of new digital technologies as a possible driver of growth in this market. In the course of the work, it is assumed that the presence of digital technologies in the market of one type of insurance can act as an indicator of sustainable market development. The results of the study were obtained, including using statistical methods and calculations of financial indices, in the period from 2012 to 2019.

The implementation of digital technologies can be considered as a factor that improves the process of providing insurance services. For the consumer, it means reducing the time for making an insurance transaction, reducing the time for settling losses, and ensuring transparency when making an insurance claim. For an insurance company, it reduces the costs of selling, promoting insurance products, and settling losses; reduces the cost of an insurance policy by conducting electronic transactions, and simplifies the flow of funds (fewer intermediaries); getting more detailed information about the policyholder and their behaviour. However, the introduction of digital technologies to the insurance market is hindered by certain aspects of legal regulation of digitalization processes and the specifics of the insurance service itself.

Are we seeing a rise or fall in the insurance market in Russia? In absolute terms, we can talk about growth, but it does not exceed the level of real inflation, adjusted for GDP growth. The exception was 2016, in which there was a mass launch of “Investment life insurance” programs. This product was the result of cooperation between banks and insurers: a simple transfer of citizens’ funds from Bank deposits to insurance programs. The growth of the ICI provides additional profitability to the banking sector (through Commission fees) and does not form the basis for long-term investments in the economy.

Consequently, insurance premiums for this type of insurance distorted the real dynamics of the market. On the other hand, in 2015, the increase in the cost of credit programs (due to the high key rate) led to a decrease in the volume of insurance policies for mortgage insurance and car insurance.

The growth of the market is mainly provided by premiums for personal insurance: with the gradual replacement of one driver in the form of Investment life insurance with another – voluntary medical insurance. Of course, this is due to Bank sales channels, through which other financial products are sold. Banks maintain a leading position in sales of life insurance products, including borrowers.

However, online sales are growing due to e-insurance of CTP, especially in so-called toxic areas, where it is not profitable to open branches for large insurance companies. According to some estimates, by the end of 2019, almost 90% of insurance companies used Internet-related information technologies in their sales process. Consumers can buy online policies through the company's official website, mobile apps, and the use of gadgets (telematics systems). The role of telematics in insurance is to use various computer, sensor, and telecommunications technologies to provide services to the driver of a vehicle at a distance. The share of online sales of insurance policies in the total volume tends to increase during the period under review. [1, 2]

The main types of insurance products sold online are car insurance, voluntary medical insurance, insurance for people traveling abroad, insurance against accidents and diseases, and bank card insurance. The analysis shows that the development of sales of insurance products online is gaining significant momentum, as evidenced by the high growth rates of revenue received from the sale of insurance policies over the Internet. This is primarily due to the adoption of Federal laws that allow the sale of insurance policies online. Thus, the market is changing the structure of the insurance market, both in terms of sales channels and in terms of types of insurance. [3, 4]

To analyse and evaluate the current trends in the development of digital technologies in insurance, the average values of the growth rate and increase in insurance premiums for insurance contracts concluded via the Internet were calculated. Quarterly data were taken from the 1st quarter of 2012 to the 3rd quarter of 2019. Calculations showed an uneven change in the volume of premiums received via the Internet, although in most cases there was a positive increase. However, in the first quarters of 2013 and 2015, there was a decrease in the volume of premiums and, accordingly, their negative growth. The period from 4st quarter 2016 to 1st quarter 2017 also falls out of the General trend. There was a sharp increase in premiums (2.6 times). Further, the first three quarters of 2017 also showed a significant increase in premiums collected via the Internet. The year 2018 was different: a sharp increase in the volume of premiums (the maximum for the entire period under review in the 2nd quarter), and then the same sharp decline (the minimum increase in the 4th quarter). Most likely, this is due to the shift of the

Central Bank's attention to the assets of insurance companies and the transition to Solvency II. [3, 4, 5]

Calculations show that the growth of insurance premiums under insurance contracts concluded via the Internet has accelerated. In 4st quarter 2018, compared to 1st quarter 2012, insurance premiums for online insurance contracts increased almost 50 times. Our estimates confirmed the statistics of the Central Bank of the Russian Federation that in 2019 the share of Internet sales of policies decreased, when compared quarterly with the previous year. However, some companies insist on increasing this value. [3]

Over the past 4 years, insurance companies have faced a significant tightening of requirements for financial activities: the size of the authorized capital, to increase the level of liquidity of assets accepted to cover their own funds from insurance reserves. According to experts, the Central Bank of the Russian Federation is not a mega-regulator, but a mega-controller in relation to the activities of insurance companies. Such actions led to a drop in the profitability of investment activities of insurers, leaving a significant part of insurers from the market. [6]

Market consolidation and business growth of insurance companies continue. Companies ranked below the 50th in terms of premiums show a growth rate below the market average, and outside the top 100 show a negative trend in premiums for the fourth year in a row. One hundred of the largest companies collect more than 99% of premiums. As a result of the current situation in the insurance market in recent years, FINTECH solutions and technological innovations will soon become the most important element of transformations, which can act as an optimizer of the financial market on the basis of the transition to savings on transaction costs, as well as a driver of the development of alternative financial instruments and even institutions. This corresponds to some extent to the provisions of the State program on the introduction of digital technologies in the Russian Federation. [4]

To check the degree of monopolization of the Russian insurance market, the Herfindahl-Hirschman index was calculated in the context of certain types of insurance and the whole market for 3 years (see table 1). The index for CASCO and CTP tends to decrease, which can be explained by balancing the level of monopolization of these industries through the introduction of digital technologies. In the field of CTP, this is the growth of Internet sales, and in the field of CASCO-the use of convenient mobile applications and telematics.

Table 1. Indices of firms' concentration in the insurance market in the main industries for the period from 2016 to 2018.

Year	Life Insurance	Car Insurance	CTP	Whole market
2016	1490,69	981,05	1083,86	494,83
2017	1569,09	948,45	811,85	459,16
2018	1885,45	948,20	813,37	568,02

Interesting results were obtained for life insurance. 2018 showed a weak monopoly on the market.

This may be due to and confirmed by the fact that five companies in this market collect more than 70% of premiums. These companies do not need to develop sales channels, do not need to seek to lower insurance rates and to be first in the market (competition). Therefore, it is not profitable for them to introduce new digital and innovative technologies.

2. Conclusion

Based on the current trend in recent years, we can assume that the retail segment will continue to grow in the coming years, the growth trend of the online sales channel will not change, and banks will still remain the driver of sales. Moreover, Russia is a country with a Bank-oriented economy. [7] In the field of CASCO, there will be increased price and non-price competition, as a result of which online services will be expanded, new tariff factors will be taken into account, and policies with an individual set of risks will be further developed and distributed. The focus of attention of insurers and the market regulator will still be the need to build financial capacity.

However, special attention is paid to the fact that the development of online insurance can ensure that the insurance market enters a qualitatively new stage of its development. A striking example is the CTP, which was initially rejected by some large insurance companies, citing the high loss-making capacity of this type. However, with the introduction of digital technologies in this area of insurance, the situation has slowly and gradually become and will change for the better.

The calculations and structural analysis carried out in the course of the work allowed us to prove that the main trend in the development of the insurance market for the next couple of years will be digital technologies. First of all, there will be a sharp increase in insurance premiums due to the sale of policies over the Internet. Thus, we can talk about such sales as a driver of growth in the Russian insurance market. As the industry develops and moves towards this innovative future, insurance companies that see digital transformation not just as a priority, but as a continuous improvement process will be able to give a new impetus to the development of the insurance culture, and not just improve the performance of total sales and net profit.

When analysing the monopolization of the insurance market, it was found that the insurance industry, in which there is a high concentration of firms, is least interested in the development of digital and information technologies. The level of the Herfindahl-Hirschman index for the life insurance market in Russia allowed us to identify this trend. Thus, innovative development will occur when there is moderate competition.

The digital technologies considered in this article, such as Internet sales and telematics systems, already give us a visible result of their introduction to the market. In the future research project, it would be interesting and relevant to analyse the role of digital technologies such as blockchain and Big Data analysis, which are implemented within insurance companies and do not have direct advantages or disadvantages for the consumer.

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Features of Innovation Insurance in Russia

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Abstract

The purpose of the study is to study the features of innovation insurance in Russia and abroad. The subject of analysis is the consideration of definitions: “innovation insurance”, “innovation activity insurance”, “innovation risk insurance”. The study used general scientific (theoretical modelling) and special (description of the studied phenomena, a comparison of existing examples, etc.) methods. The author of the work adheres to the following classification of innovative risks: uninsured and insurance; with a favourable and unfavourable development of events. Innovation insurance, in turn, is divided into full and partial, and partial – into proportional and disproportionate. The paper considers the advantages and disadvantages of different methods of insurance of innovative risks, and the international experience used in this type of insurance. The main results of the work showed that innovation insurance in Russia is only at the beginning of its formation. Insurance companies in our country need to adopt positive international experience in the field of innovation insurance, and government support is also especially important. The recommendations proposed at the end of the study can be used in practice by persons wishing to develop insurance of innovative activities and innovative risks in Russia.

Keyword. Insurance market, insurance features, types of insurance, innovation insurance, innovation activity

1. Introduction

Increasing competition in the international market is dictated by the processes of globalization and integration. The effective use of innovations has a positive effect on the development of the domestic and foreign markets of the country, which indicates their high economic role. Innovative business in Russia is one of the key factors for overcoming crisis manifestations in the domestic economy. [1]

Innovation is a rather risky business, and innovation insurance is a way to reduce the likelihood of an adverse outcome. However, domestic insurance companies are reluctant to undertake insurance of innovative risks, which is associated primarily with the danger of probable high losses. This type of insurance can increase the innovative activity of companies. The underdeveloped system of insurance of innovative risks in our country leads to the fact that entrepreneurs choose other areas for business.

Innovation activities are often engaged only in large, long-existing companies in the market. To increase the volume of companies engaged in innovative activities, such conditions are necessary under which it will be possible to attract investment. To positively change the situation and increase the competitiveness of Russian companies, transformations, and innovations in the field of domestic innovation insurance are needed. Nevertheless, at present in Russia you can insure risks of loss of rights to intellectual property, professional liability of patent examiners and patent attorneys. Relying on international experience and correctly identifying the prospects for the development of domestic innovation insurance, it is possible to get quite good results in this area of insurance activity in a fairly short time.

2. Methodology

Using the general scientific research method, definitions of terms related to the main topic of the article, as well as their classification, were given. Special analysis methods made it possible to compare the level of development of the international and Russian innovation insurance markets.

The concept of “innovation” in the scientific literature is interpreted differently. In innovative activities, scientific developments and achievements are applied to extract commercial benefits, because of which the range of goods and services is expanding and improving. J. Schumpeter – a pioneer of scientific analysis of the processes of improving the material life of society, so classified the types of innovations:

- Creation of new goods.

- Use of new technologies and new equipment.
- Development of a new sales market.
- Discovery of new sources of raw materials.
- Organizational innovations [2].

The stages of development of innovative projects also have their own classifications. Most often in the scientific literature the following is mentioned:

1. The formation of a business idea (Seeds – “grain”).
2. Start phase.
3. The initial stage (Early stage – early period).
4. Expansion of production (Expansion – expansion).
5. Management of capitalization of innovative business (Bridge financing – the transition to public recognition).
6. Exit from an innovative business (Exit) [3].

The main characteristics that determine the development strategy, when evaluating innovative activities are the degree of novelty and potential; breadth and innovative climate; position of the organization; market orientation; the presence of an innovation management mechanism. [4]

The main characteristics of entrepreneurship are responsibility for the safety and augmentation of own and borrowed resources involved in the business process. The introduction of innovative products is one of the riskiest areas of commercial activity; risks are caused by the uncertainty of factors that may affect the results of this type of activity. Uncertainty has not only negative, but also positive aspects, which makes the innovation activity highly attractive only for those who are prepared for risks. [5]

In the field of innovation, the main carrier of risk is the business entity itself, that is, the head of the enterprise (entrepreneur). [6]

The main types of risks in innovation: the wrong choice of project (selective risk); insufficient level of financial support (risk of financing); problems of sales and supply (logistic and marketing risk); the impossibility of fulfilling a contract or contract (operational risk of transactions); unforeseen costs and lower revenues (production, technological and commercial risks); increased competition (market risk); insufficient provision and protection of intellectual property (title risk).

Innovative risks are divided into insurance and non-insurance, insurance in turn – with a favourable and unfavourable development of events.

Innovation insurance is a set of necessary measures taken to protect against possible social or uncontrolled risks (damage or loss of income). When ensuring innovation, it is necessary to take into account such elements as the material base, potential markets for goods, the degree of implementation risk and the qualifications of employees. With the help of this type of insurance you can: indemnify for damages in case of an adverse event; cover indirect losses; protect financial resources; Compensate for damage to life, health and ability to work in the event of the occurrence of random events, etc. [7]

According to the degree of responsibility between the parties, two types can be distinguished: full and partial insurance. With full insurance, the maximum possible amount of damage specified in the contract is covered. In case of partial – only part of the obligations for compensation of damage falls on the insurer, therefore the cost of partial insurance is of two subtypes: proportional and disproportionate.

In the case of a proportional type of partial insurance, the amount of payments for an insured event directly depends on the total amount of damage, payments make up the part prescribed in the contract.

With disproportionate insurance, it is possible to separate the financing mechanism based on the criterion of the magnitude and origin of risks. Disproportionate insurance methods: “first risk” insurance, franchise insurance and marginal risk insurance. The “first risk” insurance (first losses) fully compensates for losses within the insured amount. Franchise insurance does not compensate for damage if its amount is below the limit. Marginal risk insurance is resorted to in cases of the possibility of large risks.

In countries with a developed level of insurance risk, three basic approaches to promoting insurance services from the insurer to the insured are most often used: extensive, exclusive and selective.

1) An extensive approach. The activities of insurance agency intermediaries are actively used, which can draw up one or more insurance contracts of a certain type.
2) An exceptional approach. The insurance company interacts with the main insurance agent, who has the exclusive right to draw up insurance contracts on his own behalf and at the request of the insurance organization.
3) Selective approach. The insurance agency interacts with two or more general insurance intermediaries who act on its behalf and on behalf of the region. [8]

In many European countries, innovation insurance occupies an important niche in insurance activity; without it, the innovation economy cannot develop correctly.

In international practice, when determining insurance risks, not only the state of the company (amount of investments, insurance period, etc.) that is insured is considered, but also the situation in the country. Factors such as political and economic situation, degree of development of infrastructure, industry and agriculture, potential financial opportunities, GDP, volumes and structure of the state's internal and external debt, inflation rate and geographical location are considered. All these factors affect the total amount of insurance. [9]

The risks associated with dishonest business partners are not insured (non-payment of goods, delay in payment, etc.). There are also restrictions if: the size of the insurance premium and insurance payments is overestimated, there is a high probability of the occurrence of risk, the expected damage is catastrophic. [10]

Insurance of losses from a break in production is one of the important points in the practice of insurance of innovations. But there are pitfalls here: some entrepreneurs specifically underestimate profits, referring to a break in production, which makes it impossible to fully assess this type of risk. In some countries, business interruption insurance is tantamount to unprofitable business insurance, and unprofitable business insurance agencies often refuse to insure. [11]

3. Result

In Russia today, this type of insurance is considered one of the most difficult. This is primarily since in the practice that has developed on the domestic insurance market, in most cases, a new insurance product is a modification of an old product. [12] And innovative risk insurance is a completely new type of insurance that is not like the rest.

Also, from the main reasons that impede the full development of innovation insurance in our country, the following can be distinguished:

- Insufficient development of the Russian market.
- Ill-conceived functioning of the mechanism for investing insurance reserves.
- Weak competition.
- Lack of clear insurance algorithms.
- Insufficient development of the infrastructure of the insurance services market for certain groups of the population.
- Shortage of employees trained for activities in the innovation sphere.
- Lack of special organizations for the development of innovative projects.
- Insufficient activity of many potential insurers. [13]

4. Conclusion

Despite the existing problems, insurance of innovative activity is a very promising business, both for the development of entrepreneurship, and for the economy.

Domestic insurance agencies need to systematize and summarize the best practices of international practice in this industry. Healthy competition in the insurance market improves the organization and performance of insurance companies. Many refuse to recognize this fact that they practically do not leave insurance agencies a chance to succeed. Another important point in the effective activity of insurance companies is the constant reform of management systems, which, in turn, leads to the activity of competitors in this direction. [14]

By order of the Government of the Russian Federation of July 22, 2013 No. 1293-r, the Strategy for the Development of Insurance Activities in the Russian Federation until 2020 was approved, which states the need to stimulate the development of voluntary types of insurance, including by launching new products on the market: "An intensive way to develop the insurance industry will be ensured by the introduction of new conditions for voluntary insurance, new insurance products and methods for their implementation, which will better meet the needs of consumers in protecting their property interests, which proves the need to encourage the development of voluntary insurance and fair competition for quality innovative development of insurance business in the Russian Federation". [15] In addition to the implementation of the points of this Program, the state could accelerate the development of innovation risk insurance, for example, through directing financial resources directly to innovative projects and through the support of individual insurance companies interested in this type of insurance.

Acknowledgments

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The Impact of Digitalization on the Recovery and Development of the Insurance Market in Syria

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Abstract

With the development and penetration of digitalization in all types of business, its target orientation is changing, namely, the emphasis on customer focus. Researchers note a certain lag in some segments of the financial market, which is far from using the advantages of digitalization in all operations due to the specifics of its activity. This also applies to the leaders of the insurance market. But the most lagging are the subjects of insurance markets in developing countries, including Syria, which is characterized by aggravating circumstances associated with the political crisis. The purpose of the study was to assess the state of digitalization of the insurance market in Syria, to identify the level of readiness of Internet users and the territory of Syria to perceive the digitalization of the processes of providing insurance services and the possibility of implementing digitalization in the system of mutual guarantees – Takaful.

Empirical research methods were economic-statistical analysis and mathematical modelling, correlation-regression analysis of statistical data. The article outlines positive possible consequences of developing the digitalization process of insurance activities in Syria, readiness of certain Takaful insurance products, which have signs of customer focus, for sale and maintenance via the Internet, using the benefits of digitalization to control the expenditure and investment of insurance funds within the framework of the mutual guarantee system.

Keywords: Digitalization, Insurance, Network Readiness Index

1. Introduction

Proliferation of the Internet and mobile technologies has had a substantial impact on a number of productions with low entry barriers, having changed them beyond recognition. At the same time, in the field of financial services, innovations can lead to disruptions in the operation of payment systems, although they do have an effect in reducing costs and do increase the level of functionality. The insurance industry, in which managers do not consider it development their main competence, is belatedly moving towards digitalization, moreover, customer focus is not yet the norm for creating insurance products and insurance services [1]. Nevertheless, the leaders of the international insurance business consider smart contract technologies to be a breakthrough for the insurance industry, since they reduce the functions of arbitration and inspections, which are traditionally performed by independent third-party organizations, such as banks, auditors, and clearing houses. Studies conducted with the support of IBM, indicate the emergence and promotion of new requirements for the insurer, which seeks to be called digital: the transition from B2B to E2E requires the insurance company to create symbiotic, contextual and cognitive business models [3]. One of the tools for implementing new strategies is Big Data, the use of whose capabilities allows insurance companies to develop new markets and create new insurance products based on accelerated underwriting processes that have a lower load level compared to traditional ones [4]. Of course, digital technologies in insurance have their limitations, they are well-known: regulation, confidentiality, risk specifics. Practice shows that at the present stage only insurance giants introduce digital technologies, and so far to a limited extent. On the other hand, in many countries in the Arab East, including Syria, a trend towards the digitalization of insurance operations has not yet even taken shape. This is understandable: low level of awareness in the field of insurance culture and financial literacy, lack of experience in insurance operations, low costs of marketing research – all this is the reason for the almost complete absence of the use of digital technologies and, in turn, an obstacle to the renewal of the insurance sector of these countries [5].

Hence, the purpose of this study is to analyse the level of technical readiness to implement elements of digitalization in business processes in the insurance market of Syria, which is characterized by a special political situation, to determine the prospects for accelerated recovery of the insurance market

through the introduction of digitalization in insurance business processes, especially in the system of mutual guarantees (Takaful).

2. Methodology

The study used official statistics provided by the Insurance Surveillance Authority of the Republic of Syria for 2014-2017, data from international websites on the level of Internalization in the world, including the level of Internalization among Arab countries. The research applied system-wide methods of analysis and synthesis, methods of economic and statistical analysis and mathematical modelling, methods of correlation-regression analysis. The objects of analysis in this research were indirect indicators, such as the NRI network readiness index (Networked Readiness Index), which is a complex indicator, developed in 2001, and which characterizes the level of information and communication technologies (ICT) development in different countries of the world, as well as the level of internalization through analysing the dynamics of the number of Internet Commerce users.

3. Results

The main results of the study show that the indicators of digitalization and internalization applied are objective. Tracking the change in the indicator – the network readiness index for the 8-year period, the trend of digitalization level increase in Syria from 2.66 in 2010 to 3.98 in 2017 was revealed. Undeniably, there has been a decline in digitalization level during hostilities period and its gradual recovery as such danger decreased. Table 1 presents the digitization level assessment of the Insurance Market in Syria among other countries according to the Network Readiness Index for the period 2010-2017 [6].

Table 1. Level of digitization of the Insurance Market in Syria among other countries according to NRI for the period 2010-2017

Year	NRI	Position
2010	2,66	96 of 151
2011	3,05	96 of 152
2012	3,15	96 of 155
2013	3,22	102 of 157
2014	2,78	98 of 166
2015	2,98	99 of 176
2016	3,13	118 of 176
2017	3,98	116 of 176

Fig. 1. shows the dynamics of the digitization of the Syrian insurance market according to the network readiness index for the same period

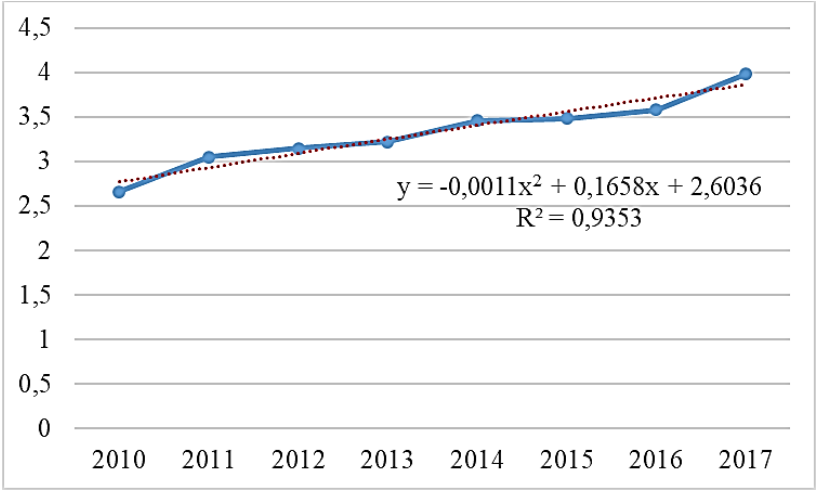

Fig. 1. Dynamics of the digitization of the Syrian insurance market by NRI for the period 2010-2017

Thus, according to data available from the UN, by the beginning of 2015, about 220,000 people had died in the conflict. 20% of which had life insurance policies with average amount of insurance payments of USD0.5 million [7]. Total payments accounted for USD4.4 billion, which led to the crisis of insurance companies and forced them to introduce new methods of work, including digitalization. According to researchers of the digital revolution, an indicator of the possibility of using new technologies is Internalization, which, in turn, is measured by the number of Internet users [8]. According to the data presented, the level of Internalization of Syria between 2000 and 2017 tended to increase, but by a large margin from the leading countries in the development of Internalization. Thus, in terms of the number of Internet users who operate Internet commerce, Syria ranked 65th out of 206 countries, which showed a fairly high level of development of the Internalization process in the country [9].

Assessment of Internalization level of Syria among other countries for the period between 2000 and 2017 is shown in figure 2 [6].

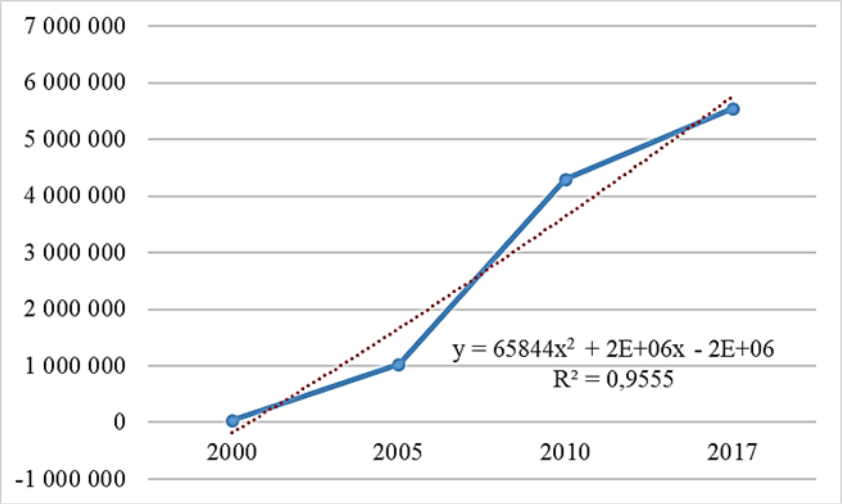

Fig. 2. Shows the dynamics of Internalization of Syria between 2000 and 2017

Assessment of Internalization dynamics in Syria for the period 2000-2017 showed the trend of Internalization increase in the country. The number of Internet users involved in Internet commerce increased from 29,715 to 5,546,986 during that period [9].

Based on analytical data, the state insurance company of Syria – the Syrian insurance Company – is most ready for digitalization, having as one of key performance indicators an increase by 30% of insurance services Internet sales by 2021. On the other hand, there are certain objective circumstances that boost the development of Internet sales in the country: a number of offices of large companies were destroyed during the war, large Syrian companies switched to providing services (insurance contracts) in electronic form-via the Internet, which expanded their sphere of influence. About 20% of commercial insurance companies in Syria are ready to step up their activities in the use of new technologies and invest in the development of digitalization.

At the same time, the insurance companies of the mutual guarantee system (Takaful) show a significant lag from the current and planned level of digitalization. Among the 13 insurance companies operating in the territory of the Republic of Syria, Takaful accounts for only two which, however, are very popular among the population and showed significant stability during the war, which was shown, as can be seen from figure 3, in the growth of insurance premiums and equity immutability. [7]

Based on the principles of Sharia, Takaful insurance companies are banned from risk and rapid innovations, which, at least in the first stages, can slow down the introduction of digitalization in the system of mutual payments. Promotion of digitalization through the Takaful system will depend on the specific type of insurance. For example, family takaful, an analogy of health and life insurance, is the most common and customer-oriented type of insurance, for which you can expect a higher level of digitalization, which is largely due to the promotion technology (to fill out an application for life insurance, there is no need to conduct an assessment, it is enough to operate with parameters such as gender, age, type of activity). Thus, this type of insurance is technically easier to implement remotely when the insured provide medical certificates (copies) indicating the state of their health.

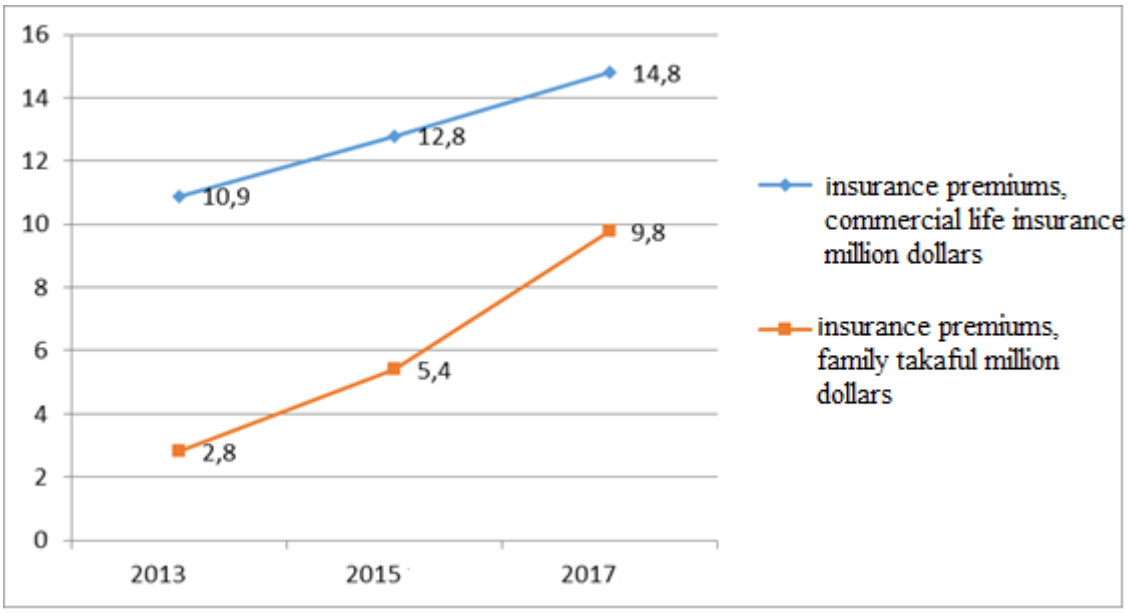

Fig. 3. Dynamics of Syria's insurance portfolio – life insurance and family takaful (volume of insurance premiums)

4. Conclusion

Taking into account that in practice the insurance organizations of Syria have proved to be very resilient to the crisis, through the system of takaful insurance in particular, the digitalization of the insurance market today has a fairly strong basis, and the financial reserves spent on it can be considered as potentially payback investments that will not destabilize the market.

The family Takaful insurance products offered on the Syrian insurance market have a high demand from the population because they are customer-oriented and are most likely to involve the use of digitalization, since for technical reasons they are free from the need for a special risk assessment and can be implemented via the Internet.

Despite the opposition to innovations, Sharia law prescribes participants in the mutual guarantee system to exercise full and reliable control over the movement of insurance funds and the legality of management, not only for the purpose of taking into account the results obtained, but to a greater extent for the purpose of excluding speculation and other violations of religious norms, which can best be done by digitalizing insurance business processes.

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Corporate Ways of Fighting Insurance Fraud in Europe

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Abstract

One of the main tasks for the insurance industry and other businesses is to find the appropriate ways to fight against fraud. The purpose of this article is to review the issues of combating insurance fraud, as well as trends in its prevention in Europe.

The study was conducted based on a systematic analysis of the insurance industry, which is a complex economic system. The analysis is based on survey data conducted by FC Business Intelligence. This paper identifies the main causes that prevent companies from implementing an efficient corporate strategy of fighting against fraud. The most significant ones are the following: problems with internal control quality, undetected fraud within a company, and issues with data protection. Apart from that, this article identifies the main causes of insurance claims being fraudulent.

The manuscript also provides the possible solutions of preventing fraud in the digital age.

The European companies have excellent experience in the insurance industry. Nevertheless, even their expertise of dealing with fraud may sometimes not be sufficient. The manuscript gives recommendations for the timely prevention of fraud schemes.

Keywords: insurance; fraud; corporate strategy; collaboration; fraud indicators

1. Introduction

Insurance fraud refers to illegal activities performed by an individual or insurance company designed to give an advantage to the individual or company responsible [1, 2]. These actions cost companies billions of US dollars worldwide [3]. Insurance companies must create a fundamental structure, introduce automation, and act against fraud [4]. There are more and more ways to manage risks and mitigate negative events. Despite the actions taken, scammers come up with new and more efficient schemes that enable the perpetrators to increase income, as well as bypass the internal control systems [5, 6, 7].

Before taking the appropriate measures, it is essential to make sure that all challenges and threats to the most vulnerable parties of companies are identified and the obstacles to combating illegal actions are detected. Even though the fact against insurance fraud goes beyond the staff's competencies, it is important to keep up with the new schemes used by fraudsters to respond to emerging issues on time.

Several research studies regarding the issue of insurance fraud have been conducted worldwide [8, 9]. However, despite searching for new ideas and acting against fraud, scammers tend to come up with newer and more advanced ways to bypass them to increase their personal income. Consequently, the issue of finding the efficient ways of fighting against it remains unresolved, to which the current article is dedicated.

2. Methodology

The study was conducted based on a systematic analysis of the insurance industry, which is a complex economic system. This paper uses the following methods and procedures:

1) Generalization. To identify issues companies, face in responding to insurance fraud. The paper includes the survey conducted by FC Business Intelligence.
2) The analysis is essential to discuss the features of the studied object: the main challenges of fighting against insurance fraud and what impact they have on insurance companies.
3) Synthesis. The article presents several examples of insurance fraud that may be a warning signal to an insurance company to take forehand action. Despite the universal ways of fighting against fraud do not exist, it is still possible to defeat scammers at an early stage.
4) Expert assessment was used to state the most promising methods in dealing with fraudulent actions. These methods are also meant to facilitate maintaining customer trust.

5) Elaboration that includes recommendations to increase efficiency in responding to prevent insurance fraud from further progression.

Insurance fraud is the object of the study, while the corporate ways of fighting against illegal actions and solutions of acting against fraud in the digital age are the research subject.

The article contains the words and surveys matching the following criteria:

1) Conducted in Europe.
2) Published in English.
3) Collected data being up to date. The literature and materials used in the article are the most recently published.

It is important to note that digitalization has been affecting and changing every aspect of our lives as it does to the insurance industry. The paper mentions several possible ways to detect actions that disrupt the customer trust in the industry.

3. Results

Any company may face risks caused by fraudulent actions. Insurance fraud is known to be extremely hard to discover, especially on early stages. What is more, it has become the biggest economic crime in the world within the past few years. Therefore, it is important to review the pending issues in fighting against insurance fraud to take suitable decisions. A networking summit called “Insurance Fraud Europe” took place between June 30 and July 1 2016 in London, United Kingdom. In the run up to the summit, more than 200 experts of the insurance industry were asked to take part in a survey conducted by FC Business Intelligence (Figure 1) [10]. The goal of conducting the survey was to identify the causes making responding to fraud challenging.

Figure 1 shows that the poor quality of data within companies, particularly since unsorted data are stored in many systems, is the main issue insurers have to deal with. These systems are either outdated or used on desktop computers (actuarial software). What makes this software’s structures multi-layered and more complex is the new applications installed over time. At the same time, there is a lack of general data models, as well as their structure and definition. This point of view was expresses by the half of the respondents.

Another problem insurer must deal with is undetected fraud within a company itself, which undoubtedly leads to a decrease in operating capital. This situation may indicate theft or embezzlement.

Meanwhile, the costs may rise to an extent of inability for a company to pay its bills, introduce and efficient management strategy, and even maintain the same employee wages. In case of an insurance claim, if an insured had specified losses, either compensation payments become a burden, or an insurer may simply not have sufficient funds for a settlement.

32% of the experts mentioned the problem regarding data protection, which is one of the key priorities for many businesses. After the data disclosure, i.e. about assets and policyholders, companies may lose the once gained trust of customers and partners. Additionally, this would lead to the increase in costs of investigating the cause of hacking or the source of the information disclosure by either involving a third party or paying staff for overtime.

The next noticeable obstacle to a successful combat against fraud is the siloed organizational mentality. This applies to those companies, in which the staff from different departments do not interact with each other, thus create internal competition. In those organizations, the working information is “meant” to be stored in different databases and, as a result, is not properly structured. Each department’s personnel are mainly focused on their day-to-day responsibilities and are not concerned about the situation within a company. Whenever this type of companies has to deal with a case involving insurance fraud, without acting as one, they are unable to respond to threats in time and face additional losses.

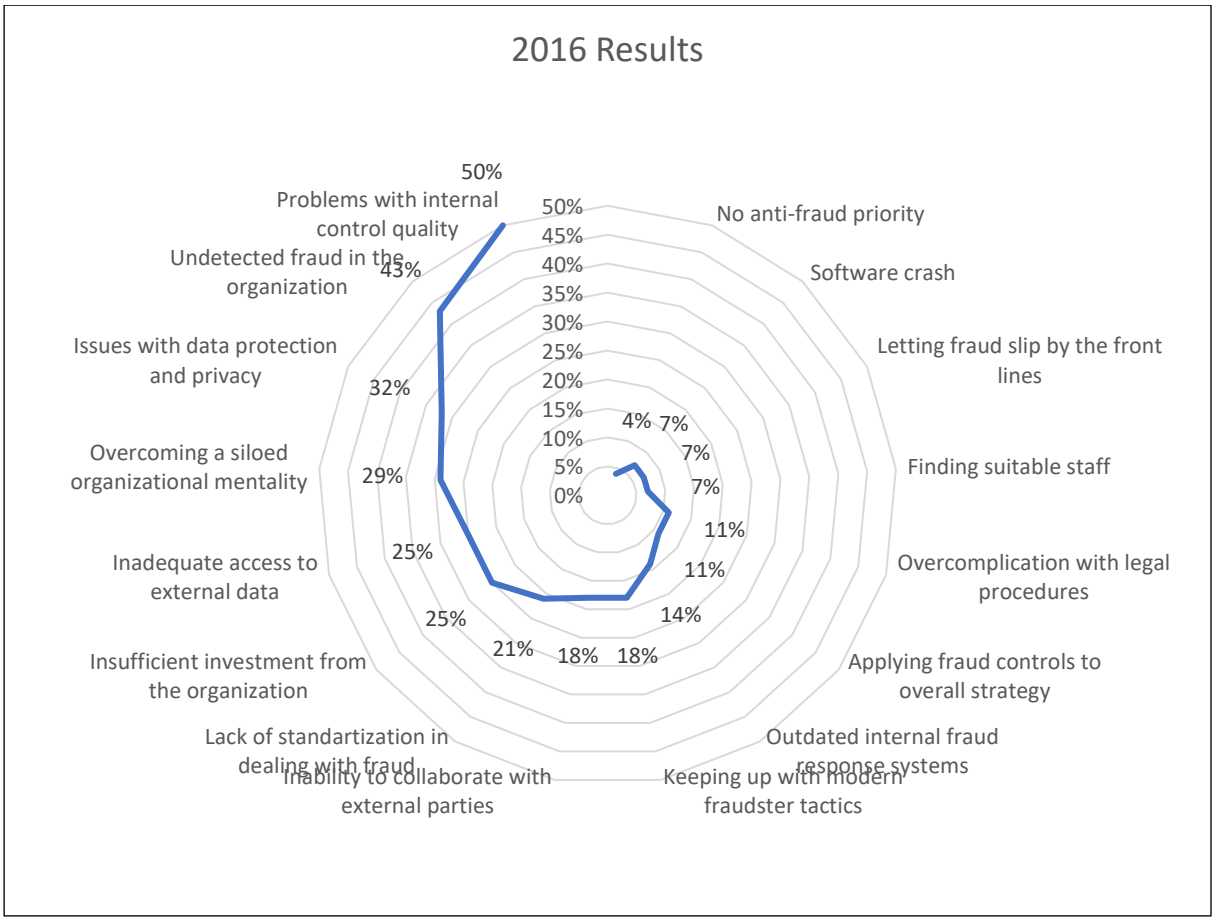

Fig. 1. Results of the FC Business Intelligence survey:
"What are your biggest challenges in effectively responding to fraud in your organization?"

Even if sharing information with external parties is essential, many companies would still prefer not to disclose it. However, this approach leads to the emergence of policyholders having the same risks covered by many insurers. As a result, the fraudster insured may send an insurance claim to all insurance companies for their own gain simultaneously.

21% of those who took part in the survey claimed that the investment in the fight against fraud remained the same compared to the previous year and only the remaining 21% noted a significant improvement. The insurance industry is highly based on trust. With lack of investments, this trust can be questioned, thus lead to long-term negative consequences.

As previously stated, many insurance companies tend to preserve their siloed mentality, which certainly prevents companies from creating a culture of fighting against fraud. Only a third of all companies have adopted this culture. The anti-fraud culture implies efficient communication between departments, insurance fraud awareness training, management's involvement, and performance standards accepted by the staff.

Nowadays, those involved in insurance fraud create more advanced strategies and use new tactics.

They target the most vulnerable members of the society, for example students whose incomes are exceptionally low. The lower the income, the bigger chance people will be looking for cheaper insurance.

The fraudsters, known as "ghost brokers", sell their victims fake insurance policies. In addition, the perpetrators may also adopt new fraud schemes. Previously, auto insurance was once the most vulnerable to insurance fraud. However, the scammers have recently shifted to life insurance instead.

14 and 11% of the respondents pointed out the outdated ways of combating the insurance fraud and the problems of implementing the fight against it in the overall strategy. A large number of insurance companies avoid involving experts from other companies and using their software in solving the emerging problems, relying exclusively to their own staff and the existing resources. If the company's methods are outdated, it will be impossible to track the fraudulent actions.

Another issue an insurance company faces while investigating an insurance claim or its own department for fraud is the complexity and length of the application to law enforcement agencies. Less than 5% of all insurance fraud detected in France is reported to the police.

No complete list of possible fraud indicators has been created so far. However, there are several obvious examples of causes that may be signals of illegal actions [11]:

1. Policyholders having financial troubles at the beginning or the first claim comes shortly after the contract with an insurance company is signed.
2. An increase in the policy limit shortly before an accident.
3. No police clearance (where applicable).
4. Forged documentation.
5. Removal of the valuables shortly before fire or explosion.
6. Presence of items blocking access to premises for firefighters.
7. Delay of an insurance claim.

Around 10% of all insurance claims in Europe are fraudulent. Despite there is no statistics of investigating insurance claims for fraud, the results of the frequency of them being checked are still available. The recent studies of six countries with different economic development were conducted in 2017 (Figure 2) [12].

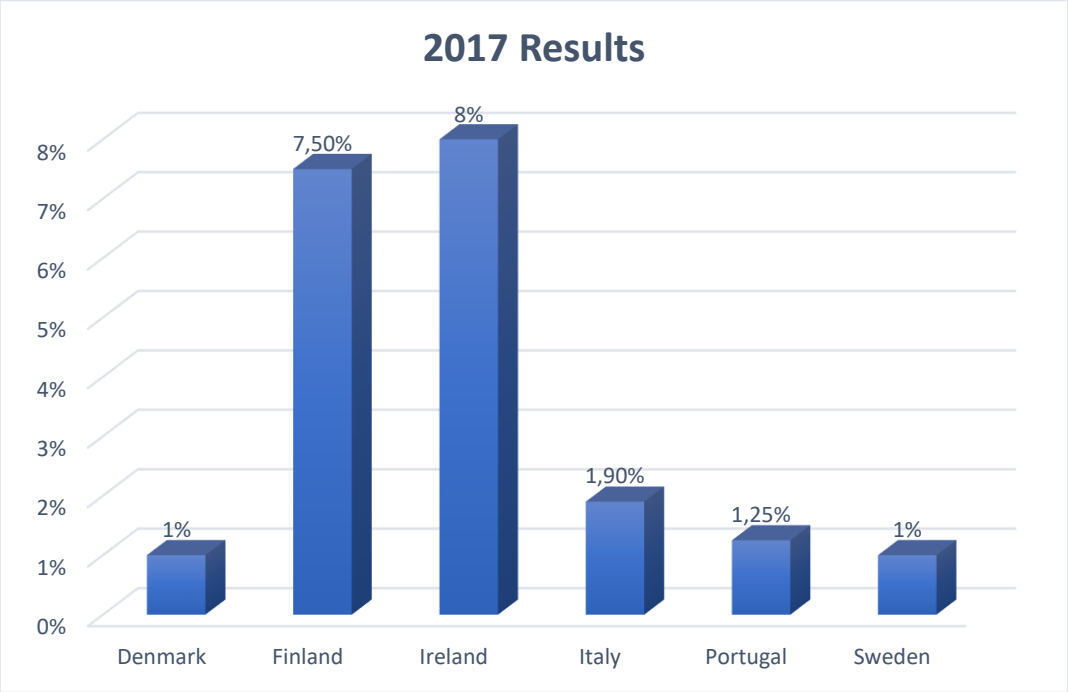

Fig. 2. The share of insurance claims investigated for fraud

Figure 2 shows that the number of insurance claims being investigated for fraud is relatively small and ranging from 1% in Denmark and Sweden to 8% in Ireland. It is also important to note that despite there is no precise data about each European country. Around 27% of the surveyed people in Finland admitted they personally knew those involved in insurance fraud [13].

However, the need of shifting to new fraud detection systems is on the rise due to the continuous digital transformation in insurance. With the use of artificial intelligence (A.I.), insurance companies can accelerate the process of tracking perpetrators and reduce the likelihood of further damage. According to the results obtained (Figure 1), the fight against insurance fraud must be based on the following four pillars:

1) Behavioural biometrics. By using the latest software and exchanging the information with other insurers, insurance companies can analyse their customers' past behaviour, as well as merge several profiles with the same name and/or personal data into one. Thus, by tracing the previous schemes, companies are better prepared to act against fraud.
2) Data analytics. In the digital age, it is also possible to correlate certain user characteristics with risks of fraud. There are several ways detecting suspicious behaviour such as measuring users typing speed, form corrections, and copying/pasting rate. By applying this approach, insurance companies have better chances to tackle risks that can cost them a fortune.
3) Keeping all the data and documentation structured. Insurance companies must possess a unique database that is able to track potential fraud at any stage. Therefore, all essential files, documents, and other relevant data are supposed to be stored in all used software systems and

available to all departments within a company. Otherwise, a siloed organization is more likely to face fraudulent insurance claims.

4) Continuous risk scoring. The final and most important approach for an efficient dealing with insurance fraud is to constantly review and recalculate chances of risk-occurrence. With an advanced software and skilled staff, insurers are capable of tracking suspicious activities and distinguish customers for the honest ones and scammers.

4. Conclusion

Solvency II Directive, adopted in 2016, implies that insurance companies must possess detailed actuarial data regarding financial information, assets, and risks. According to Solvency II, it is essential ensure the sufficiency of reserve funds to be able to cover all insurance claims received by companies [14, 15].

Insurance companies deal with a large amount of information from both internal (employees) and external sources. The received information presents details on customers and assets, as well as applications and detected cases of insurance and fraud. It also helps to identify trends, risks, and value of portfolios and insurance policies. However, there are technological and human factors that prevent companies from efficiently using the data. To reduce the risk of human factor's threats, insurance companies must hire the right staff and provide them with regular trainings to keep their skills up to date.

The automation of fraud detection is another task. This can be done by installing the latest software to facilitate staff's performance.

To eliminate corporate insurance fraud, insurers are supposed to unite in fighting against it and share the necessary information both with each other and international anti-fraud organizations whenever spotting illegal actions. This is the only way to detect, prevent, and stop organized corporate fraud from further progression. The mentioned strategy will help insurance companies be aware of new fraudulent schemes and ahead of scammers.

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The Review of the Selected Methods of Estimating Non-Market Costs of Human Health as a Base for Cost-Benefit Analysis of Specific Health Care Policy Measures

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Abstract

Economic activities in the public sector such as the construction of infrastructure facilities, undertaking comprehensive programs of measures aimed at improving human health, reducing environmental pollution, and so on-often have effects that are not only financial and commercial, but have a wide range of direct and indirect social consequences, both positive and negative, for the life of individuals and communities. These situations pose complex challenges for decision-makers who have the obligation to review, analyse, evaluate and compare all these effects, to make decisions that are optimal in terms of the best possible allocation of public resources and the achievement of the greatest benefits with the least cost. The paper presents some of the most important methods for measuring the non-market and/or non-financial effects of public investments and policies in the field of health. These methods are now widely accepted in theory, but also in the practice of a large number of countries in which very concrete decisions regarding the formulation of health policies, (e.g., the implementation of the vaccination of the widest population and alike) are made based on the application of these methods.

These methods allow for remarkably diverse measures and decisions to be reduced to units of measure which ultimately could be expressed in the financial amounts, so that they can be analysed and directly compared. Monetization of the phenomenon in the field of healthcare has allowed their application to be expanded in the framework of the complex Cost Benefit Analysis cases.

Keywords: Costs and Benefits, Risk to Human Health, Environmental Pollution, Externalities, Monetization of Non-Market Costs, CBA

1. Risk for Human Health as Externality: Market Vs. Non-Market Value of Health

External costs (externality) of certain economic activities appear because of activities that affect the third party that has not chosen to take over these costs for any reason. A good example of this is road traffic, which on the one hand enables the comfortable and rapid transfer of passengers and goods from one point to another, and on the other hand presents the risk and creator of potentially very high costs related to environmental pollution. To these negative traffic effects are exposed not only the people who are using transportation services and who have certain benefit from it, but also all the other people who come by the circumstances (e.g. because they live in a particular urban environment). In all such cases, the effects of the observed phenomenon (in the case of traffic) are external economic effects, or the negative *externality*.

Externalities related to human health costs (environmental health risks) can be divided into two groups (Figure 1):

- The first one consists of market or commercial costs arising from losses due to productivity decline due to diseases that reduce people's working ability (opportunistic costs) and direct treatment costs, e.g., costs of admission to the hospital, engaged time of health workers, cost of modern technology use in the diagnosis phase, costs of prescribed pharmaceutical products (medicines, preparations and so on), costs of monitoring the treatment process, etc. All of these can be considered as resource costs in the widest sense.
- The second one is non-market costs or the costs of disadvantages due to premature death and adverse effects of the disease (such are pain and stress caused by illness or by taking care of other, etc.). Economists consider this type of cost more and more as important for the national economy and try to express them in monetary units using different methods (often those based on the evaluation of individual preferences in the allocation of public resources.) Analysis has

shown that this group of costs of pollution can be significantly higher than the first group of market-financial costs [4].

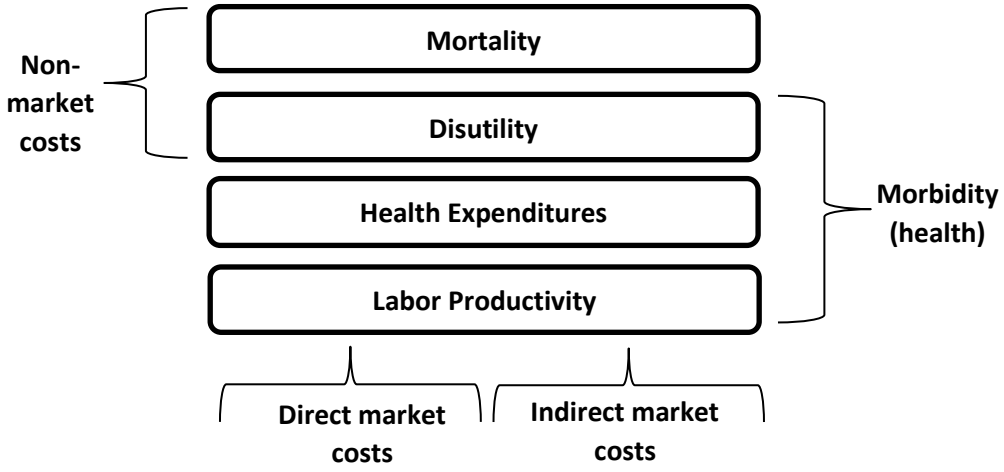

Fig. 1. Types of costs associated with poor health (morbidity) and premature death (mortality)
Source: [21]

Analysis and evaluation of both types of costs and their expression in monetary terms can be extremely useful for economic policy makers when defining concrete measures aimed at protecting the environment. Knowing the types, dynamics and magnitude of these costs is a good basis for economically measured and justified intervention in the field of environmental protection. Of course, in addition to this basic application, an analysis of this type of costs can be especially useful in making several other decisions, both at the public interest level and in optimizing private investment interests.

Discipline Economics of Health and Economics of Environmental Protection is somewhat different in its goals. The first is focused on optimizing the allocation of available resources in terms of their focus on points where the lowest cost (maximum cost efficiency) is achieved by the highest results expressed in the rate of recovery of the sick and in the degree of improvement of the quality of their lives in the period of the disease [24]. Economics of Environmental Protection is more often applied in situations where the available budget is not known in advance. It focuses on the assessment of non-market costs, which is most often done by determining public preferences and its willingness to accept certain costs of intervention in the protection of the environment. The assessment of market and monetized estimates of non-market costs is then used in the Cost-Benefit Analysis (CBA). Hence, the Health Economics is aimed at increasing the efficiency of the use of resources for the health sector, while Economics of Environmental Protection considers both the costs and benefits, compare them, thus enabling the optimal decision-making process. The CBA is predominantly used in environmental economics, while Cost-Effectiveness Analysis (CEA) is a more often used in evaluating human health [17].

Giving the monetary value to the specific health outcomes such are deaths or disadvantages, caused by environmental pollution, is making possible to compare market and non-market factors and in that way to perform CEA and CBA. In this way, it is possible to compare the relative values of different measures and policies, as well as the relationship between the monetary costs of economic activity and health risks which is related to them. In this way, the cost of non-action (the cost of the absence of action) in certain situations can be estimated, which is a key indicator for assessing the efficiency and effectiveness of the planned activities and measures.

One of the important reasons for the monetization of the impact that certain environmental phenomena have on human health is the so-called, “internalization” of associated costs. For example, by introducing higher taxes on cars using engines that are more polluting to the environment, the cost of this pollution is “internalized”, i.e., it became an integral part of the operating cost structure of car users. The use of indicators that express a measure of these environmental impacts in accordance with its environmental and human health effects can be especially useful in defining the measures of “internalizing” costs associated with these activities.

Some of the reasons for monetizing health expenditures caused by environmental pollution are listed below:

- Improving the PR of public institutions, i.e., understandable and clearly informing the public about the costs of endangered human health due to pollution,
- Comparable measurement and analysis of the effects of some activity on health risks,

- A clearer explanation of the adopted measures taken to internalize costs (e.g., taxation and pollution charges) and the definition of certain standards,
- Facilitating the analysis and comparison of various alternative scenarios for the implementation of policies aimed at reducing pollution of the environment.

Below are some of the most used methods for estimating non-market costs of human health.

2. The Non-Market Methods of Health Risk Assessment

2.1 "Quality-Adjusted Life Year" (QALY)

One of the most widely used methods of assessing the impact on non-market costs of human health is Quality-Adjusted Life Year (QALY). This indicator considers both, the impact of a phenomenon on human mortality and its impact on the state of their health (morbidity). The QALY method relies on the way in which people are ranking different health conditions. They are asked to rank different aspects of their health (mobility, the ability to perform their regular activities, the level of pain and anxiety). Their answers are presented as index or score, which allows comparing different health state, and they are ranging between two extremes – between 0 (death) and 1 (perfect health).

QALY could be defined as the year of life spent in perfect health. In the specific cases QALY is calculated as a multiplication of the score obtained by the patients interviews and the years of the healthy life. So, the patients who has spent 10 years in perfect health will have score of 1 and that will give a result of 10 QALYs. A patient who is being treated in this period could, for example, to assess it position with the score of 0.7 for 10 years, which gives a score of 7 QALYs. If the same patient is not medically treated and as a result, he suffered continuous worsening of his health, he may be assessing 1 year as 0.7, 2 years for 0.4, 3 years 0.3 years and for a period of 4 years – 0.1. This is resulting in a final score of 2.8 QALY (Figure 2). The value of QALY can be discounted in a situation where the patient prefers to have health benefits from treatment now in relation to possible benefits in the future.

In this way, decision makers can compare different situations based on QALY analysis, e.g., the one in which some of the health interventions take place, in relation to the situation when it is absent; they can also compare the application of different medical procedures and the application of different technologies etc. Some of the national health insurance agencies (e.g., in England and Sweden) use this monetized value of QALY when deciding on the allocation of resources to different technological options.

In certain situations, the use of QALY could be questioned by some ethical issues and constraints.

The basic question is whether the one, who gets the most benefits by intervention, should really have the advantage in using the resources for treatment, in relation to one who have less benefits expressed in QALY. Some authors, for example, give priority to the younger population by giving their QALY certain positive ponders. Also, in the situation of major social inequalities, it is possible to decide by abandoning the options that bring greater benefits expressed in QALYs, to achieve greater equity and fairness in relation to social equality.

The European Consortium for Health Care Assessment and CBA Research (ECHOUTCOME) conducted a survey to test the possibility of using QALY in the management of real health policies. The survey covered 1,400 subjects in Belgium, France, Italy, and Great Britain. Based on the results of this research, the Consortium concluded that QALY does not provide a fully consistent method of measuring costs and therefore does not provide a scientific basis for making concrete decisions.

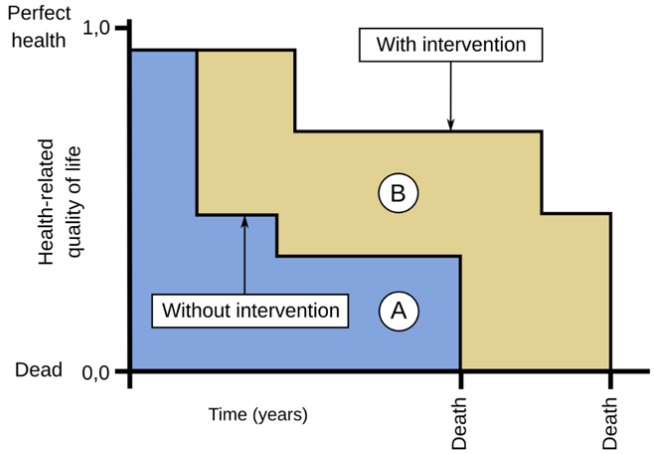

Fig. 2. Example of Comparing Health Condition with QALY
Source: Creative Commons Attribution-Share Alike 3.0 Unported

In addition, the Consortium proposes five recommendations for the implementation of cost efficiency studies:

- Differences between CBA methods, the method of Cost Efficiency and the method of Cost Utilization should be made transparent and clear to public
- QALY as a method should not be used to make decisions in the field of health
- *Cost-Effectiveness Analysis* should be expressed as a ration of cost with treatment outcomes
- A *Cost-Effectiveness Analysis* should be verified by an interdisciplinary research team
- A *Cost-Effectiveness Analysis* should use different methods and instruments that would be applied on a case-by-case basis [14].

The National Institute for Health and Care Excellence (NICE) has come up with counter arguments that the QALY method is an useful method which has been improved, but it has acknowledge the fact that it should not be used solely, but rather it should be used in a synergetic way with other methods of the evaluation of the non-market effects on health practice.

2.2 The Disability-Adjusted Life Year (DALY)

The very important and often used in practice method of estimating non-market costs for human health is a method known as The Disability-Adjusted Life Year (DALY) which indicate the year of life corrected for disability, i.e., limitation of abilities due to reduced health.

DALY can, conditionally, be viewed as “inverse” QALY: namely, QALY is focused on benefits, i.e. on the positive effects of medical interventions; while DALY focuses on “costs”, i.e., on the negative effects of the disease [20]. DALY represents the sum of the number of years of life that a patient must suffer from illness with a certain disability and/or restriction in everyday life and the number of years of life lost due to premature death:

DALY = YoLL + YLD

In the above formula YoLL represent the years of life lost due to premature death (mortality), and YLD represent the loss of healthy life because of the disease (morbidity). According to the World Health Organization (WHO) definition: “one DALY can be understood as one lost year of a healthy life”. The sum of all DALYs in the population represents the sum of all “costs” of the disease, and it is expressing the burden of the disease. This burden represents the difference between the current state of health and the ideal health situation in which the complete population lives long, free from disease and disability. (http://www.who.int/healthinfo/globalburdendisease/metricsdaly/en/)

The DALY method was jointly developed by World Bank (WB) and World Health Organization (WHO) experts and was applied in the Global Burden of Disease studies.

DALY is most often used in less or medium developed countries in assessing and defining health care priorities and programs, as well as assessing the effectiveness of individual interventions, while QALY is more commonly used in countries with higher incomes [11], [25]. In one of the recent studies, it has been tried to determine whether the measurements of the effectiveness of the vaccine (HPV) with DALY and QALY will yield the same or similar results, or they will differ [2]. The conclusion of the study is that the benefits assessed by using QALY are higher in relation to losses (costs) measured using DALY, which means that, depending on the application of one or the other method, somewhat different results are obtained In the analysis of other vaccines, no major differences were observed in the results obtained by using these two methods.

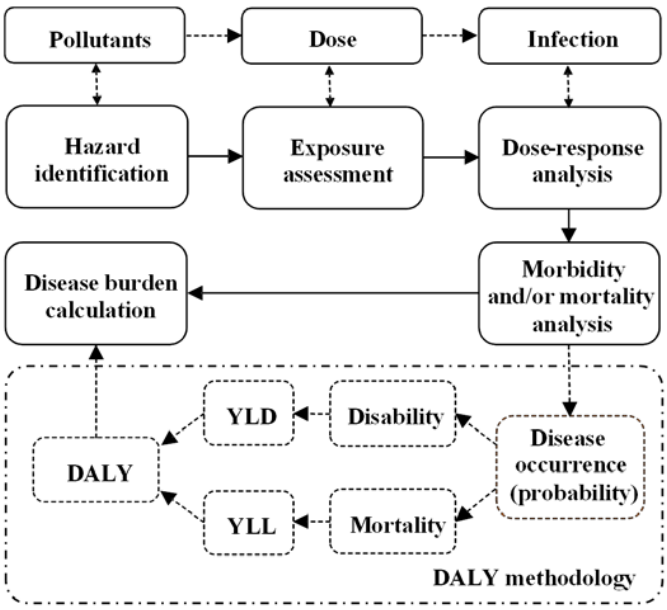

Fig. 6. A framework for a study of the environmental burden of disease using DALY
Source: [15]

The DALY method was also successfully used to quantify the burden on diseases caused by environmental pollution [12].

This research linked the concentrations of PM2.5 and ozone to the risk of mortality from four cardiovascular and respiratory systemic diseases and lung cancer. The results were that the PM2.5 was the fifth most prominent risk factor for mortality in 2015 and caused 103.1 million DALYs. Ozone is associated with a loss of 4.1 million DALY due to chronic lung disease.

Despite the relatively broad acceptance in theory and practice, certain criticisms were also made on account of DALY method. It was pointed out that some problems in application of application of DALY method in the assessment of health costs are independent from the social context and/or the vulnerability of specific population groups [22]. Thus, for example, it is said that persons living in the urban area with visual impairment can count on abundant assistance related to the application of advanced technologies in relation to a person of a similar health status living in a low-income rural community.

Despite the author's attempts to simplify and adapt it to practice, the application of the DALY method has remained complex. It requires the inclusion in the inclusion of additional data such as the age structure of the population, the data on life expectations, the assessment of cases of illness, etc.

Considering the diversity of approaches in using this method, it is important that in each individual case its changes are clearly and transparently cited the variables used (e.g., life expectancy and inclusion of age-factor factors through a certain weighting system, etc.).

2.3 Cost of Illness – COI

The Cost of Illness (COI) method is considering the actual financial costs of the illness. It includes the direct costs of healthcare treatments as well as the indirect costs such as the loss of income caused by inability to work (opportunistic costs). In this method, non-market costs are usually not considered, such as, for example, pain and suffering due to illness [23].

Decreased productivity is usually calculated on the basis of the average wage or gross national product (GDP) per capita projected for the observed period in the future, and then discounted to obtain its present value (this approach is characteristic of the concept of human capital). Another approach to the calculation takes into accounts the lost time and costs incurred by the employer due to the need to replace staff in the period of their sick leave. If one of the family members must take sick leave, this indirect cost may also be included in the final settlement.

The COI approach is enabling to make a partial estimate of the benefits of taking certain measures that can be expressed financially, such as the amount of savings achieved in individual cases of illness (and related costs) observed over a given period of time or throughout the life time. Although the application of this method can also be complex and is bringing the risk of making errors in the calculation, it is considered as a relatively objective measure. It used very often in the economics of health, especially in situations in which the policy makers want to estimate the costs which society explicitly spends on

illness. On the other hand, COI do not show how much it would cost to prevent the disease, or how much a society is willing to pay for it. There is also no clear ethical justification that would require more resources to be allocated to the effects of illness/health that has a greater financial impact in terms of creating higher costs. One of the key disadvantages of a COI approach is that it fails to include all of the cost-related economic costs associated to the disease (for example, psychological or other non-material, indirect or in general difficulty estimating costs). Some authors therefore consider that the cost of a health assessed by COI is generally underestimated.

2.4 Revealed Preferences

The preferred preference methods are based on how individuals actually behave in the market: for example, the amount individuals spend per unit to provide filtered air in the enclosed space in which they live shows how much they value the avoidance of contaminated air in an enclosed space.

One of the most frequently used methods of preference is the method of the so-called "hedonic pricing". In this model, when assessing the value, both the internal characteristics of the goods being sold, and the external (contextual) factors are used simultaneously. An example of such a "hedonistic" pricing is to analyse the movement of real estate prices depending on the proximity of noise sources such as airports, based on which it is estimated how many people are valued and how they are willing to pay (more or less) to live in an environment in which there is noise as a form of pollution. (He *et al*., 2014). Based on this approach, the Noise Sensitivity Depreciation Index (NSDI) indicator has been developed as a measure of how many percentage points are changing the prices depending on the change in the unit of noise. It should be kept in mind that the amounts so obtained do not include any of the costs associated with health care costs caused by excessive noise – they only indicate how much money people are willing to accept in an environment with noise, or how much they are willing to pay to avoid life in such an environment. Hedonistic price determination is widely accepted as a standard method for measuring noise impact. However, meta-analyses have indicated that in some situations there are wide and unexplainable variations in the values of NSDI.

2.5 Environmentally Attributable Fraction – EAF

The method of determining a fraction that can be attributed to an environment is essentially a quotient which is defined as "the percentage of a particular category of disease that would be eliminated if the impact of environmental risk factors was reduced to the lowest possible level". The Environmentally Attributable Fraction (EAF) is calculated as a product of frequency of risk factors multiplied by the relative risk of the disease associated with that risk factor. The EAF is a method which was used as a tool for optimization of the resource allocation strategies in accordance with public health priorities. Also, it was used in estimating the cost of illness caused by living environment and working conditions. Costs according to this method are calculated according to the following formula:

Costs = Disease rate x EAF x Number of inhabitants x Costs per case

"Cost per case" represent discounted lifetime costs caused by a particular illness, including direct health care costs, rehabilitation costs, and decrease of productivity-hence, although it falls into non-market, this method is nevertheless derived from market variables.

2.6 Willingness-to-Pay – WTP

The *Willingness to pay* method is applied in situations where it is not possible to determine the market value of certain health-related measures and programs (e.g., pain or stress). The *Willingness-to-Pay (WTP)* method is estimating the monetary values of specific policy measures based on the expressed preferences. The expressed "willingness to pay" for the specific measures, represents the method of determining the expressed preference which can be used to determine the monetary values that can be used in the performing CBA.

This method seeks to determine how much participants in the process are willing to pay for their health in terms of how much funding they are willing to allocate to specific measures to eliminate the effects of environmental pollution. The application of this method in practice, however, has shown that people's WTP depends largely on their financial status. Factors that can stimulate individuals in their WTP for certain measures are the income they have, their awareness of the impact of environmental pollution on health, while, on the other hand, the adverse effects on WTP have factors such as density of population in the area of their living, public spending for this purpose and the degree of development of institutional infrastructure.

2.7 Willingness to Accept – WTA

The Willingness to Accept (WTA) is a method that aims to estimate the willingness of participants in the process to accept cash benefits to compensate for the increased risk of environmental pollution.

This method has certain advantages in a situation where one wants to assess the willingness to accept the risk of individuals. Specifically, this is more appropriate for individuals because they cannot, in principle, be expected accurately to express their "willingness to pay" to eliminate the effects of pollution caused by industrial pollution.

2.8 Value of Statistical Life (VSL)

The Statistical Value of Life (VSL) is an economic method of evaluating life risk. VSL is derived from a compromise that people prefer to make between the risk of fatal outcome and well-being – this could also be formulated as "the value of preventing a fatal case". VSL is based on a theory of compensation which states that the workers should be paid more to accept tasks that are not pleasant to them or could be dangerous. It should be kept in mind that the use of these amounts has certain limitations, since they indirectly reflect the ability to pay and therefore are discriminatory in relation to the poor.

Considering that it is linked to income and usually driven by inflation (Viscusi, 2010), the value of VSL varies over time. According to some studies, VSL reaches its maximum value in people in their middle age, and it is therefore suggested that higher wight factor should beis used for younger ages than for adults.

The VSL method in the USA has been used extensively in risk monetization in cost-benefit analyses, especially in road safety assessment cases and in relation to air pollution assessment. The VSL was estimated to be USD $ 7.4 million. According to 2005 OECD surveys, VSL was estimated at $ 3.0 million in member states of the organization, while it was estimated at $ 3.6 million for the EU [21]. In the European Union, these assessments have been accepted as a good and applicable risk monetization practices in its area.

2.9 Value of a Life Year (VOLY)

The VLS method is particularly suitable for estimating loss of lives at a young or middle age people.

For example, the average victim of car accident loses 35-40 years of life; on the other hand, deaths due to air pollution causing severe lung or heart problems are mostly affecting the elderly in their 70's or 80's. On the other hand, the Value of a Life Year (VOLY) method can be considered as an alternative to WTP. It considers the number of years a person lives at risk. This method has been used in practice in Europe to estimate human health-related costs caused by environmental pollution.

The cost of pollution expressed in lost years of life can be calculated by multiplying the remaining years of life and the value of the year of life (VOLY). Desaigues *et al*., (2011) have used a conditional rating to determine VOLY for Europe and 1,463 people in nine EU countries (France, Spain, United Kingdom, Denmark, Germany, Switzerland, Czech Republic, Hungary, and Poland) were surveyed. It is estimated how many people are willing to pay to reduce air pollution, which would extend their life by three or six months. Based on the results of these studies, it has been estimated that the value of VOLY in Europe could be € 40,000 (Desaigues *et al*., 2011). Results for VOLY varied across countries: they were the highest for Switzerland and Denmark and lowest for Poland and Hungary. This obviously reflects the impact of the average income difference among the respondents on the expected values of the indicators.

3. Conclusion

Assessing the risk of pollution of the environment (land, water, air) for human health is especially important in the context of allocating significant amounts of always limited financial and other public resources in the field of health. Life and health of people have an immeasurable value and their valuation in commercial and market terms would be wrong, and it would be very problematic in ethical terms.

Health risk assessment and monetization of this risk, however, plays an important role in optimizing decisions in the field of spending public funds. Without them, decision-makers in public health policies area would be left without key instruments in the definition of public preferences for the allocation of limited resources. Such instruments make it possible to take into account the full cost of health impacts, including the costs of health services, effects related to decrease of labour productivity and most importantly, the loss of the benefits caused by premature death, as well as the pain and suffer that sick people are exposed. In the last 30 years numerous studies have been carried out, within which a rather wide set of methodological tools for the estimation of all these phenomena was developed, and then for their monetization, i.e., expression and financial terms. The paper briefly presents some of the most

important methods for evaluating non-market and non-financial risks related primarily to environmental pollution for human life and human health.

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